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GERHARD HENRIK ARMAUER HANSEN

1841-1912

The discoverer of the leprosy bacillus. His life and his work.

by

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INTRODUCTION [1]

Gerhard Henrik Armauer Hansen was truly an extraordinary person about whom there exists for most physicians and medical scientists an abysmal lack of information. This, despite the fact that he was the first to associate a specific microorganism with a chronic, infectious disease. The disease was leprosy, long known in Hansen's native Norway and other Scandinavian countries. The minute "rods", "sticks" or "bacillary forms" that he described as associated with the dermal lesions of leprosy were, in fact, the microorganisms known now as *Mycobacterium leprae* ([16]).

The above paragraph is the introduction to a paper about Armauer Hansen which was read by W. H. Feldman at the leprosy conference in Washington, D.C. in 1965 and then asked, "What did he see and when?"

There are very few Norwegian scientists whose life-work has borne such rich fruit as the work of Armauer Hansen. In addition to discovering the leprosy bacillus, he set up and carried out precautions against leprosy which distinctly aided in combating one of man's most feared diseases. As a result of his scientific and administrative work he received worldwide appreciation, far greater than it has otherwise been the fortune of a Norwegian physician to obtain.

Living at a time when scientists were more widely versed than the specialists of today, Hansen also produced important publications on zoology and marine biology and wrote several popular scientific essays. The following is the story of this man, his life and his work.

PARENTAGE

Gerhard Henrik Armauer Hansen's father descended from a Danish family from Æreskøbing on the little island of Ærø which lies southwest of Fyn ([46]). The first member of this family to settle in Bergen was Hans Peter Hansen (1773-1824). He sailed to and from the Netherlands under the command of his uncle and later had his own ship. In 1797 he settled as a merchant captain in Bergen and married Agnethe Wibroe (1770-1825). She was the stepdaughter of the merchant Hans Falck Greger and his wife (nee Ameln) who lived on Kalfaret. The house still stands and, although the interior has undergone extensive changes, the exterior has for the most part been preserved.

Mrs. Hansen was a very cheerful and active woman about whom there are many amusing stories. She started her own business while her husband was at sea and it developed into the finest general store in town. Her profits were large but, at the same time, she was very generous to deserving cases and became a well-known person in Bergen ([23]). Her husband returned home sick and died at the age of 52 and Mrs. Hansen died the following year.

Six of their children, three boys and three girls, reached adulthood. One of the boys was Claus Hansen (1800-1885), a wholesale merchant who later became a bank cashier. He was the father of Gerhard Henrik Armauer Hansen.

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[1] Editorial note: This manuscript was submitted long before the demise of Professor Vogelsang on September 20, 1977. With his understanding, it was held in file till such a time as its publication would not significantly interfere with the regular flow of manuscripts for this JOURNAL.

When the word "leper" is used in quotation marks it has occasionally been allowed to stand for historical reasons, with the recognition that this JOURNAL, in general, eschews the use of this word in accordance with the principles of the International Leprosy Association.

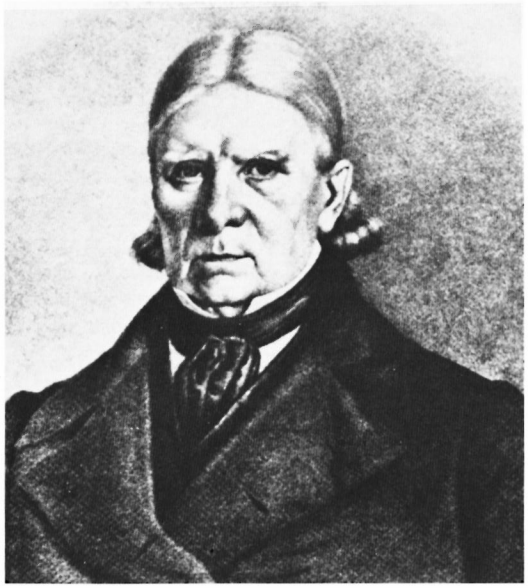
Certain portions of this translation have been previously published by Professor Vogelsang in MEDICAL HISTORY and in the translation of *The Memories and Reflections of Dr. Gerhard Armauer Hansen* by G. A. Hansen. They are referenced accordingly and permission for their use has been obtained.

In addition to the usual reference numbers, Professor Vogelsang used the letters A, B and C to designate categorized references appearing in Appendices I and II. These have been retained in deference to maintaining fidelity with the original work.

In the text reference is made to "anesthetic" and "nodular" types of leprosy, as well as to "smooth" and "nodular" types. This is historical and, in general, the terms "anesthetic" and "smooth" are consonant with "tuberculoid" while "nodular" refers to the lepromatous type.

On his mother's side, it is the Armauer family who especially manifested themselves ([53]). In 1758, Johan Conrad Armauer (1733-1805), who was born in Worms, immigrated to Bergen as a carpenter and sought permission from the carpenters' guild to work. In 1762 his test-piece (a piece of work done by an apprentice for admission to the rank of master) was accepted and that same year he became a citizen of the city. The following year he married Helena Cramer (1736-1818) who was born in Bergen and was the daughter of an innkeeper, Friedrich Cramer (1706-1764) and his wife Beata Jansdtr. Hammechen (1710-1758).

Johan Conrad Armauer was regarded as a very skillful carpenter and from 1762-1766 he was the head of the carpenters' guild. He also worked as an architect. For three generations several skillful carpenters were among his descendants in Bergen. In 1805 he died of a protracted illness; his wife survived him by 13 years, dying in 1818. They had eleven children of whom eight, three sons and five daughters, survived their parents.



Master-builder Gerhard Henrik Armauer (1776-1854), great-uncle of Armauer Hansen after whom he was named.

The ninth of these children was a boy, Gerhard Henrik Armauer (1776-1854) who was a very respected man in Bergen and a very skillful masterbuilder who constructed several large wooden buildings in Bergen, including the playhouse for the Dramatic Society. He was the head of the carpenters' guild from 1812-1814 and for nine years he was a building inspector in Bergen. He was also one of 16 citizens selected by the people to act as a representative to voice complaints and make suggestions to the Magistrate.

In 1804 he married Wilhelmine Caroline von Barwig (1780-1873) who was born in Bergen and was the daughter of the later artillery lieutenant in Bergen, Torkel Carl von Barwig (1742-1788) and his wife Cecilie Catharina (1748-1808). Gerhard Henrik Armauer was a powerfully built man, almost a giant, and was the central figure in the family. He was loved by both large and small. His wife was a stately woman and was cordial even though her manner was reserved. She died at the age of 93 and up until her old age she daily wore lace cuffs about her wrists.

In 1802, Gerhard Henrik Armauer's youngest sister, Henricha Margaretha (1780-1847), the eleventh child, married a tanner and master-shoemaker, Andreas Michelsen Schram (1762-1830). He had previously been married to a cousin and had six children from this earlier marriage. He had been a widower for only half a year when he remarried and he and his second wife, Henricha Margaretha, had twelve children. One of their daughters was Elisabeth Concordia (1812-1883), the mother of Gerhard Henrik Armauer Hansen.

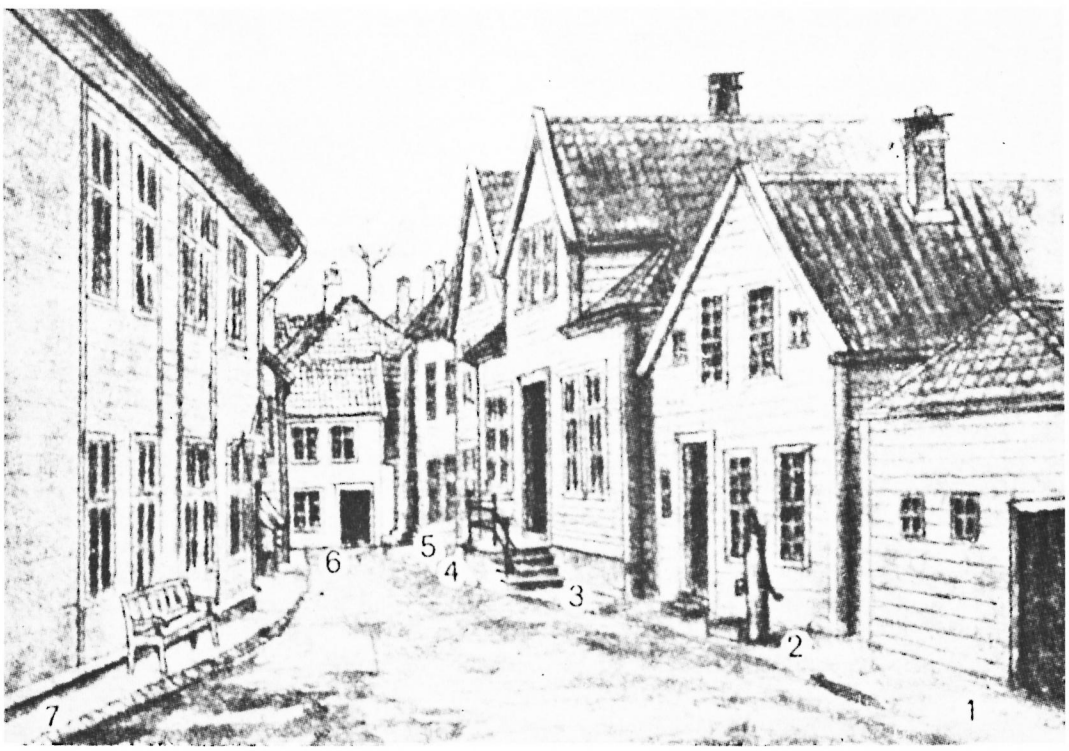
CHILDHOOD HOME

Most Norwegian towns have arisen in areas that have favorable harbors with easy access and have, therefore, developed into natural centers of communication. This was certainly the case with Bergen, the childhood home of Gerhard Henrik Armauer Hansen. The last German medical officer in Bergen, J. A. W. Büchner (1730-1815) ([49]), gave the following description of that city in about 1770:

> Bergen has one of the most beautiful, spacious and safe harbors which rarely freezes, even in the hardest winters. It also has the invaluable asset of the ships being able to reach the open sea, both to the north and to the south, without hindrance and in this way carry out voyages to their ports of destination. This great advantage is the city's main source of wealth and enables trade with both neighboring and distant places.[2]

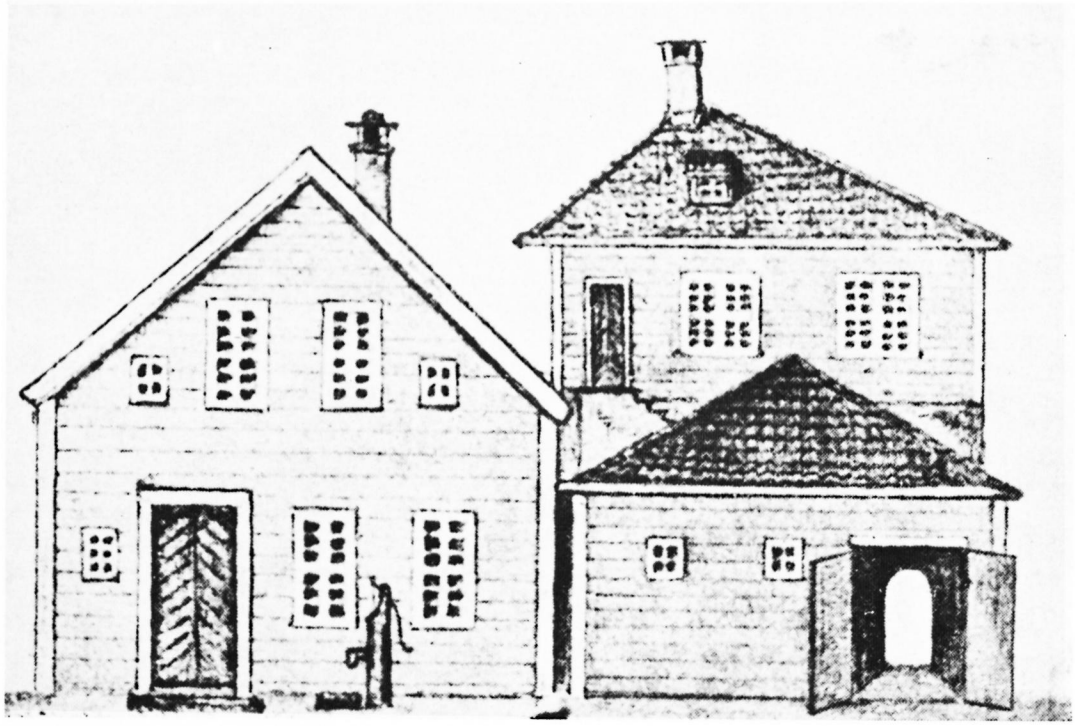
The city of Bergen grew up around this harbor, called Vaagen, which is shaped like an extended horseshoe. The city developed into a natural shipping port for fish from northern Norway and, at the same time, became the port of entry for merchandise being sent to the western and northern parts of Norway from foreign countries. Foreigners quickly recognized the facilities of the city and during the Middle Ages the Hanseatic League had a trading center, the Hanseatic Office, situated on the eastern side of Vaagen along the German Wharf.

During the 15th and 16th centuries the Hanseatic League gradually lost its power. An increasing number of foreigners settled on the other side of Vaagen and, at the same time, several of the old Hanseatic firms were taken over by Norwegians. Many of the earlier Han-



Kroken in 1830: 1) The stable; 2) Master-shoemaker Andreas Michelsen Schram's house; 3) Painter Johan Georg Müller's house (brother-in-law); 4) Master-builder Gerhard Henrik Armauer's house (brother-in-law); 5-6) Herman Køhler's property (brother-in-law); 7) Dwelling of the minister of St. Mary's Church.

[2] Editor's note: This passage was translated from German to Norwegian and then to English and consequently may not appear as it would if it were translated into English directly from the German text.



Master-shoemaker Schram's house with stable and summerhouse.

seatic merchants and their families continued to live in Bergen and, in addition, due to hard times in Europe, new foreigners continued to immigrate to Bergen.

German was spoken in the "German Office" and the Germans also had their own church, St. Mary's, where sermons were delivered in German until the end of the last century. The small, wooden houses of several craftsmen surrounded St. Mary's and were both their homes and their workshops. North of the church there was a dead-end street called Kroken. Here the maternal grandfather of Gerhard Henrik Armauer Hansen, Andreas Michelsen Schram (a tanner and master-shoemaker) had his little house, workshop and tanning yard ([23]). There was a stable beside the house and behind it was a garden path with a summerhouse built over a vaulted cellar with a laundry. In 1811 Schram had bought this property, in addition to his own, from a wine-shop keeper who had used the place as a holiday cottage and the cellar as a reloading place for wine. The summerhouse consisted of two large rooms and a broad corridor. Upstairs there was a room in the attic with a small chamber on each side. The grounds of the garden sloped so much that there was a direct entrance from the garden to the corridor. This corridor led to some steps which again led to the courtyard behind the stable. It was an excellent playground for the children.

Most of the other houses in Kroken belonged to close relatives of Mrs. Schram. In the house next to the Schrams lived the master-painter Johan Georg Müller (1771-1822) who was married to Mrs. Schram's older sister, Maria Dorothea (1774-1838). Müller ran his own paint store and had a large workshop with many journeymen and apprentices. He also painted a number of large interior decorations in the living rooms of wealthy men in Bergen. He established a drawing school and was the stage director in Bergen from 1794 until his death. For seven years J. C. Dahl, the famous Norwegian painter, was employed as an apprentice by Müller until his talent was discovered and he was sent abroad to further his education.

The next house belonged to Mrs. Schram's older brother, the afore-mentioned master-carpenter Gerhard Henrik Armauer, and the two center houses on the same side of the street belonged to Herman Køhler (1765-1820), a wholesale merchant on the German Wharf, who

was married to Mrs. Schram's sister Johanna Helena (1777-1811). The house on the other side of the street was the dwelling of the priest for St. Mary's Church. Friends and relatives lived in the other houses surrounding the church. Everyone knew each other and life here was as in a small village with people going in and out and numerous flocks of children. There were 12 children at the Schrams', the Müllers had 18, of whom 9 lived, and the Køhlers had 5 children. Although the Armauers were childless, they continually had several foster children in the house. The Armauer family was musical and a number of them were excellent tenors and church concerts were given in which some of the young daughters participated.

The living was good as far as food was concerned but the living conditions were modest. The Schrams' living room also served as a dining room and the room next to it was the parents' bedroom. The daughters slept in a back-room and the upstairs hall served as a "lying-in room", a room for the sick and for the delivery of babies.

Master-shoemaker Schram had one son, Conrad, who became a shoemaker and eventually took over his father's workshop. The eleven other children were girls, all dark-haired beauties. As they grew up, they were courted by young merchants and captains in Bergen. One merchant's wife exclaimed, "What do these shoemaker's daughters possess that enchants our sons?" However, when it became apparent that these shoemaker's daughters fully matched the merchants' daughters in manners and social grace, they were well received in the families and soon took their places there. When there were no more births in the Schram house and several of the daughters were provided for, the lying-in room on the second floor was no longer needed. Therefore, the Schrams took in a lodger, a young man named Claus Hansen who had started his own business on the German Wharf.

Claus Hansen had grown up on the other side of Vaagen. As a boy he was full of life and as a young man he was one of the town's gentlemen, both at balls and at the skating rink. As a lodger at the Schrams' it was inevitable that he would fall in love with one of the daughters and so, at the age of 28, his love fell upon Elisabeth Concordia who was 12 years younger than he. Their engagement was announced after her confirmation in the spring of 1829.

Meanwhile, master-shoemaker Schram had become an old man and his health declined rapidly. He died on Elisabeth Concordia's eighteenth birthday, December 26, 1830. Therefore the wedding, which took place on February 23, 1831, was a quiet family affair without the festivity, singing and endless speeches which are still common at weddings in Bergen. However, Claus Hansen's friends had told the sisters of the bride that they would come to the wedding anyway and they surprised the guests with music during dinner, turning it into a real Bergen wedding after all.

Claus Hansen rented the ground floor of a small house near St. Mary's Church. They had many friends living in the neighborhood and, although their house was modest, they had many lively visits with these friends. Their two eldest children were born in this house.

Although Conrad Schram now ran the shoemaker's shop and Mrs. Schram, his mother, helped with the leather shop, their house in Kroken was too large for the two of them. Therefore, the Hansens moved in with them and Mrs. Schram provided much support for Mrs. Hansen and her ever-increasing brood of children. In the meantime, Conrad Schram also established a family and since they were also living in the house, master-carpenter Gerhard Henrik Armauer, Mrs. Schram's brother and the family advisor, tore down the stable and enlarged the old summerhouse with a new building that extended to the street. This was the Hansens' future home and this house still stands in Kroken today.

CHILDHOOD

Gerhard Henrik Armauer Hansen was born in Bergen on July 29, 1841. He was the eighth in a family of 15 children, 10 of whom were boys. Claus Hansen was proud of his children. Several of them became great personalities and worked their way up to important positions in Norwegian society. The well-known parish minister of Trinity Church in Christiania, Andreas Michael Hansen (1834-1901) was Armauer Hansen's older brother; Dr. Klaus Hanssen

Hans Peter 21 years | Thrine 17 years | Morten 18 years | Claudine 16 years | Andreas Michael 19 years

Father 53 years | Carl 14 years | Mother 41 years | *Gerhard Henrik Armauer* 13 years | Agga 23 years | Malla 10 years

Otto 6 years | Lorentz 2 months | Albert 7 years | Klaus 9 years

The Claus Hansen family in 1853. The photograph was taken on the christening day of shipowner Lorentz Wesenberg Hansen. Two children were not yet born, coming one and four years later (Johan Daniel and Elisa).

(1844-1914), an important personality with distinct leadership qualities and the founder of the National Society Against Tuberculosis, was a younger brother of Armauer Hansen; shipowner Lorentz Hansen (1853-1913) and critic and theater manager Johan Daniel Irgens Hansen (1854-1895) were also younger brothers of Armauer Hansen.

Of Armauer Hansen's five sisters, two were unmarried. The first born in this large flock of children was Agnes (Agga) Margarethe Hansen (1831-1919). In 1904 she published her *Familje-Optegnelser (Family Notes)* [23] the first part of which consists of letters to her youngest sister Elisabeth (Elisa) Concordia (1857-1885), who was married to Theodor Henrik Lødrup, a teacher in Skien. Elisa died after her third child was born. When Elisa was born, Agnes Hansen was already 26 years old. Their mother was tired after all of these births and therefore Agnes had to help look after and bring up her youngest sister. Her *Familje-Optegnelser* is a charming and excellent description of the family circle through several generations in Dreggen and around Kroken and, likewise, of their circle of acquaintances.

The other unmarried sister was Ida Charlotte Amalia (Malla) Hansen (1843-1915) who was born after Armauer Hansen. She was a masterful administrator of a girls' school and a well-known person in Bergen. Of the sons, one died young and unmarried. All of the rest established families and several of them had many children. Claus Hansen had a total of 53 grandchildren, 30 of whom were boys.

Hansen is a very common name in Norway. Consequently, in order to distinguish one family from another, it has become increasingly common to add another name in front of and hyphenated with the family name of Hansen. In the third generation after Claus Hansen one therefore finds cousins with family names like Armauer-Hansen, Fischer-Hanssen, Martens-Hansen, Quist-Hansen, Scott-Hansen, Serck-Hanssen, Wiese-Hansen, and Wolford-Hansen. Many of these combined names are the mothers' family names which are joined with their own surnames. Armauer-Hansen is taken from his great uncle Gerhard Henrik Armauer's surname and Quist-Hansen from the other great uncle's name, Morten Quist Jacobsen. On the other hand, Scott-Hansen arose in a different way. Armauer-Hansen's older brother Andreas Michael Hansen was, in his youth, a seamen's priest in Scotland. As a reminder of that time he received permission to give his two sons the last name of Scott-Hansen.

While the other members of the family still write Hansen with one "s", Chief Physician Klaus Hanssen was more radical on that point. He changed his father's "C" in his first name to "K" and to follow the new Norwegian writing he wrote his surname with two "ss". The same thing was done by Fischer-Hanssen and Serck-Hanssen.

The frequent pregnancies reduced Mrs. Claus Hansen's strength even though she had her eldest daughter Agga to help her in the management of the house and in the care of the youngest children. The family was tightly knit, each member eager to help the others whenever the need arose.

Mrs. Hansen's second eldest sister, Charlotte Amalia (1808-1888), had married the son of a wealthy merchant and Russian Consul in Bergen, Johan Ernst Mowinckel (1759-1816) and his wife Magdalene Christine Wiese (1765-1835). This son, Gerhard Mowinckel (1797-1878), a ship's captain, left the sea and bought the large estate of Hop Manor on Askøy, the large island nearest to Bergen, and lived there as a landlord ([52]). They had no children. Of life at this place Agnes Hansen tells ([23]):

> We had it even more free, if possible, when we had a chance to go with the milkboat to Hop on Askøy which Uncle and Aunt Mowinckel owned and where Emilie Tornøe (a cousin) was foster-daughter; our kind-hearted Aunt Marie (a sister of Mrs. Hansen and Mrs. Mowinckel) was also there and took responsibility for the yard and garden together with Aunt Amalie. Here we were always met with open arms and only Uncle, when there was poor autumn weather, was irritable, but this hardly bothered us because we knew where his heart lay and knew that the first rays of the sun or a quick visit from one or another would clear his humor. If we were so fortunate as to have father and mother along, everything was fine. If we then had to stay overnight because of poor weather, many times we lay in rows on the floor in the large storeroom. If I should begin to tell about Hop I would never finish. We tore around in the big house and yard, in the fields and forest, on land and water and usually met both young and old on top of Kongshøien (a point with a very broad view) in order to watch the sunset and there let loose our joyful hearts in endless screams from us children and later in more harmonic tones from the older and more musical lips which usually ended with "Silent Night, Holy Night" or "Sleep in Peace" and similar songs. Quiet and seriously we then went to rest, or went to the harbor followed by aunts and Uncle in order to row to the city again, refreshed both in body and soul. Uncle and Aunt, who themselves were childless, had a very great and good influence on all of Aunt's siblings' flocks of children, but especially toward Aunt Tornøe's (nee Helene Schram), Fischers' (nee Fredrikke Schram, both mother's sisters) and us. As long as any of us live we will tell of their goodness to the younger generation and their names are fondly remembered.

To this aunt and uncle Gerhard Henrik Armauer Hansen was sent as soon as he could go, to be brought up and he stayed there until he was seven years old. The two aunts and the elder cousin, Emilie Tornøe, taught him to read and to count but since all three were very kind ladies, the instruction of the little rascal was not strict.

Agnes tells that her aunt admired this boy. When his parents visited him he would read his lesson for them. In her old age she still remembers when Armauer Hansen, with the coolness which was characteristic of him, read "The lion is a large animal, comma, it lives in the forests and gets its food by hunting, full stop." His aunt and uncle had looked on with expressions of delight. For the most part, Armauer Hansen lived outdoors in the fresh air, took part in hay-cropping and hay-making in the summer, learned to skate in the winter, lived on rustic fare, was well fed and grew strong.

When he reached the age of seven he returned to his home in Bergen to continue his education at the school where his father gave lessons. His father was a hard working man and as a teacher he demanded high standards of work from his students, not least of all from his own

sons. His father had a friend, teacher Reehorst, who followed the boys' development with interest. Following his advice, Armauer Hansen continued his education at Bergen's Cathedral School, or the Latin School as it was called in oral tradition. He was a clever student but, as he himself said (B100), he never managed to be one of the top students of the class. As a boy he always used the expression "Right is right"; this surely described and predicted his character throughout his life.

Sermons at St. Mary's were still begin given in German every second Sunday and the children were repeatedly instructed to go to the church, probably for the educational purpose of listening to a German sermon. Armauer Hansen tells, however, that what interested him most in the church was climbing up in the tower where his uncle, the parish clerk, let him ring the church bells.

Armauer Hansen mentions that, when he was a boy, life in the streets of Bergen was quite different from what it later became. The traffic was not heavy so the boys could play and tumble about the streets and amuse themselves wherever they pleased. He records that at that time Bergen only had eight policemen and, therefore, it was rare to find them patrolling the outskirts of town. Consequently, the boys who lived there were able to do as they liked.

The Danish author Carsten Hauch ([24]), whose father was the governor of Bergen at the time, tells in his memoirs that a servant accompanied him to and from school. He was not allowed to come in contact with the boys in the street and he was even forbidden to answer if they spoke to him. Armauer Hansen tells that the boys from the different parts of town were enemies and were constantly quarreling and fighting with each other. Each boy had his own particular enemy whom he never passed on the street without fighting. Armauer Hansen's special enemy was nicknamed "Freckles" because he had so many freckles on his face. Once Armauer Hansen succeeded in knocking out one of his enemy's front teeth. Perhaps in extenuation, he said that for a long time he had pains in the thumb which struck the blow.

The parents knew very well that the boys fought but they never interfered. They were probably of the opinion that it was useful and Armauer Hansen himself was of this same opinion in his later years. The boys developed undaunted spirits since it was a disgrace to be a coward or to be afraid of a beating and they also had a rather high code of honor. They only used their fists; they never fought with stones or keys, never tripped their opponents or employed other underhanded tricks. However, their enemies did not have this same high standard of honor. They had no admiration for Ivanhoe and three or four of them would not hesitate to attack a single boy. It was, therefore, impossible for a boy to walk alone through the enemy's domain.

Jens Gran ([20]) says that the boys formed a republican community where there were no distinctions in rank among the members of the gang. The wealthy man's son was equal to the day-laborer's son and the leader of the gang was the boy who had the quickest tongue and the strongest hands. Gran regarded life in such a gang, where everyone was active, as the best preparation for the school of life. The good-looking mamas' boys who were not in the gang became impractical homebodies.

Armauer Hansen states that after his childhood experiences he, as an adult, hardly ever interfered in boys' fights. He said that boys do not have the power to beat each other to a pulp and that a black eye should be regarded as an honorable decoration. Armauer Hansen felt that there was only something shabby in a fight if older boys attacked boys smaller than themselves and that one can claim to be a pacifist but there is enough of the barbarian in each of us for us to respect a boy who defends his real or supposed rights with his fists.

The discipline which the boys practiced on each other was good but this was not always the case with the discipline which their teachers tried to impose on them. The teachers almost always overlooked the importance of voluntary subordination and the fact that boys have a sense of honor and it pays to appeal to it (B100).

Armauer Hansen had an old rationalist for his religion teacher. The boys feared his sharp tongue for he was witty and would make fun of them when they tried to express themselves. He was a very learned man and tried to convey his knowledge to his students. However, he despised the clergy and always made biting remarks about them and their sermons. Therefore, Armauer Hansen felt that it was not surprising that the examiner at their graduation

examination in religion in Christiania (Oslo) said that the students from Bergen were very learned but that their religion did not seem to come straight from their hearts.

CLAUS HANSEN'S BANKRUPTCY

The first years after Claus Hansen had gotten his new house in Kroken were a happy time for the family. The children had the big yards behind the house where they could play with the many other children who lived on the street. Additionally, the boys had their constant feuds and fistfights with their archenemies, the boys at Stølen. Family and friends went in and out of the newly built house and it was a lively company with music and singing but the food was rather simple and sparse. Trade on the German Wharf was good. Northerners came regularly with abundant fish and returned home with their purchased goods.

However, this lighthearted spirit changed as time went by. The good times were gone and it became more and more difficult to make profitable trades. Troubles hit one businessman after another and then came the crisis years, 1848-1851, with the unusually strict credit rules, Many did not manage to survive this time of crisis despite persistent struggle and intense work. Among these unfortunate men was Claus Hansen, whose business in Solegaarden was not doing very well. One day he said to his wife, "Lise, this year we have spent more than we have earned." She understood the seriousness of this so they reduced their consumption but it was increasingly difficult for Claus Hansen to make his business successful although he worked intensely and fought against the crisis as best he could. In addition to his business, in 1841 he took a job as a bank cashier in the Bergen branch of the Bank of Norway and he also spent a few hours as a teacher at the school. Eventually his situation became critical and in May 1851 he had to close down his office in Solegaarden.

These were hard times for the family and, of course, the children were affected, not least of all a proud and conscientious boy like Armauer Hansen who was ten years old at the time. Now was the time for him to work hard both in school and elsewhere. His eldest sister, Agnes, said in her later years that any man who had seen an honorable merchant go bankrupt in those times must note with astonishment how easy it is to settle such matters today—to arrange everything and to continue as if nothing has happened. However, in those days the creditors sealed up the effects and the front door was locked until people were chosen to administer the liquidation. The furniture was usually put up for public auction.

Claus Hansen was completely shattered when he told his wife that he had been forced to declare bankruptcy. But in spite of everything he was lucky for he had many loyal friends. His wife sent a message to his steadfast friend, merchant Wesenberg and with his help and that of other good friends the "cottage" in Solegaarden was sold and he himself got the contract. While other bankrupt tradesmen had to leave their houses and homes, no one would buy Hansen's house "because he", as a young merchant had said, "must have a house for himself and his 12 children." (He had 12 children at that time, later they had 3 more). Through the kind assistance of friends, the house was bought back for 2,000 Spd. ($2,000).

The family moved over to the old summerhouse where they used to have their bedrooms. Here they arranged a combined living and dining room and the long corridor was made into a kitchen with their larder and mangling room located in the garden. The parents slept in the room in the attic while the little boys were placed in one of the small side rooms and the older ones in the other. The little girls were put in the front room and the other rooms in the house were rented out. All things of value which the parents had collected over nearly 20 years were sold to provide the bare necessities.

Claus Hansen's working day was now even harder than before. In the early morning hours he taught bookkeeping privately to students and then he taught in the school from eight to ten o'clock. He walked from there to the Bank of Norway where he had been a cashier for some time. In the afternoon he was back at school and after that he gave private lessons.

The eldest daughter, Agnes, had to quit school and earn her own living by sewing dresses. This was helped by the fact that her family still had samples of thread, silk and linen from

grandmother Hansen's general store in Smaatrandsgaten. The others had to help their mother with the housework.

The eldest Hansen son was already seafaring. The second one, who later became a parish minister, earned an honest living for several years as a teacher in a Sunday school for apprentice boys and by giving private lessons. This income was put aside to be used for his years of study. Later Armauer Hansen earned some money in the same way.

Claus Hansen's eldest sister, Catharine Elisabeth (1799-1853) was married to the merchant Morten Quist Jacobsen (1789-1854) who came from Randers as a business apprentice. Without any capital the couple began a little spice and distribution business in Bergen and had no other help in the business so the wife took a full part from the beginning of the marriage to the last year. They were equally friendly toward all, large or small, young or old, and gradually developed a good business and became prosperous people. The wife died in 1853 and was followed one year later by her husband. They had no children so their fortune went to members on both sides of the family. Claus Hansen inherited 2,000 Spd. ($2,000) and he had come so far in paying off his debts that it was now possible for him to think about his own house. The money was used to build an additional floor in the summerhouse which gave the family new sleeping quarters and more space.

At the public auction, Claus Hansen had obtained many groceries at a very reasonable price and, therefore, their storeroom was well supplied and they had a good deal of meat, as was the practice at that time, in the basement. The many children were, therefore, able to eat heartily and their appetites were satisfied each day.

ARMAUER HANSEN'S YEARS AT THE UNIVERSITY

The degree examinations in those days took place at the University of Christiania (Oslo) so in 1859 Armauer Hansen traveled to Christiania to take his final matriculation examination. He had a very interesting and pleasant time in the capital and was happy to meet so many new acquaintances. He was never nervous before the examinations because he was always well prepared. He listened with astonishment and slight ridicule to the poor characters who day after day counted how many more bad marks they could tolerate. His physical strength resulted in his being appointed as bouncer for student gatherings. He took his duties so seriously that one night when an older student, who was very drunk, stepped up to the podium and started shouting nonsense Hansen went up, took hold of the man around the waist and carried him out of the room.

In his second year at the University he became acquainted with the natural sciences for the first time. This was a field which, at that time, it was difficult to grasp in school. He went to all of the lectures in zoology and physics and had an increasing desire to learn more about these subjects. He was quickly convinced that one must use one's eyes to learn to recognize the different herbs. This knowledge led him to botanize on all his trips to the country and the more he studied the greater was his pleasure and satisfaction in finding out for himself the names of the particular plants he had in front of him. On the other hand, he felt no attraction for speculative philosophy, feeling that it was beyond human understanding.

Like several of his brothers, Armauer Hansen was extremely interested in athletics. Together with the later Superior Court Judge, Ernst Motzfeldt (1842-1915) and our great mathematician Marius Sophus Lie (1848-1899), he would perform gymnastics. They would swing in the rings and then, when at a certain height, do a backward somersault, landing on the padded mat on the floor. When Sophus Lie tried to do this he released his grip on the rings while they were going backwards and consequently went flying through the air, landing bottom first on the floor. He sat up with a shocked expression and Motzfeldt and Armauer Hansen burst out laughing. At this he became very annoyed, failing to see their amusement at him practically killing himself. But in the middle of the scolding he was giving them the mathematician in him took hold and he said calmly, "It's quite astonishing. I had calculated exactly where I should let go." So, even a great mathematician can be mistaken when it comes to benefiting from precise calculations (B101).

Armauer Hansen's medical studies completely captured his interest. He had such a sensitive nature that the first time he watched an autopsy he became sick. Later, when he performed the autopsies himself, his misgivings about handling cadavers disappeared at once and his eagerness to learn outweighed all other considerations. In his *Memoirs* he wrote (B101):

> After I commenced dissection myself I gradually lost my misgivings about handling the cadavers. My eagerness to learn outweighed all other considerations. I not only spent most of my studies up to the first grade in the dissection room, I was always willing to complete the work of those who were little interested in widening their knowledge. The satisfaction and pleasure of discovery for oneself is magnificent and that is what makes research so intriguing. In his search for the truth the student begins to believe more in his own observations that in those of his teachers.

From this one can see how the born scientist is awakened and shaped by his own work.

Armauer Hansen could not devote all of his energy to the work he had undertaken because he had to support himself the whole time he studied in Christiania. There was no such thing as a student loan in those days. He was first employed as a tutor for a boy in a private family who was only four years younger than he and who later became the Norwegian Custodian of National Monuments. This was Hermann Major Schirmer (1845-1913). Armauer Hansen was fortunate to be taken into this highly cultured home when he was still so young and he gratefully remembers this time in his *Memoirs* (B101):

> . . . The family received me warmly and I was treated more as a friend than a paid teacher. Many are the fond memories of these people who contributed so much to my upbringing. Never since have I met anyone just like Mrs. Schirmer, a scintillating hostess at a dinner party who drew each guest individually into contributing to the evening's entertainment.

At the age of 15, Hermann visited relatives in Bergen and wrote a letter home which his mother showed to Armauer Hansen. Armauer Hansen answered him in a letter which is cited here in its entirety since it provides good insight into young Armauer Hansen's views on style and manners.

> My dear Hermann;
>
> Don't take offense at these lines because they consist only of some friendly advice which I feel justified in giving you. The reason for this letter is that I have recently read a letter that you sent to your mother and sister. In this letter I found several expressions which disturbed me, for example, "the devil" and "devilish". These expressions are not in keeping with dignified diction. It must also be remembered that these and similar expressions sound worse when they are written. They become so attached to the individual who writes them that it becomes impossible for him to express his meaning without using such words. You must admit that expressing yourself with such profanity and blasphemy does not show culture. While speaking it is possible that a swear word may inadvertently slip out. It is far from being polite and only indicates that the individual does not have control over himself or his tongue. In writing, it is always necessary to be careful of what may offend the ear. It always seems worse when a younger individual uses such language because it either indicates a lack of culture or an immature attempt at manhood. I must further remark that you must especially take care not to say such things to your parents or to ladies. The relationship between parents and children demands a respect which is offended by such outbursts and the ladies' sensitivity and feeling for that which is beautiful is hurt by such rudeness.
>
> With regard to the rest of your letter, I noted with pleasure that your speech is light and your thoughts quick. However, you must be careful not to let them be so quick that you alter the real facts or try to be amusing or witty. The latter is such a difficult task that when one is not naturally witty or humorous, it is better not to write anything which can be taken as an effort to be amusing. One may very well write both quickly and lively without being witty. Now you should not wrinkle up your nose and be cross because I act as your mentor and criticize your letter. When I call attention to things which can be corrected, take it in good faith and as an expression of good will towards you. Live well.
>
> Yours,
> G. A. Hansen
>
> P.S. Please regard this as a matter between us and do not mention it to others.

This must be said to be a very well written letter from a young teacher to his even younger student. It also gives an expression of the respect which Armauer Hansen felt should be shown to parents and women. It is a letter which would be a very useful and instructive reminder to many young people today.

Armauer Hansen was later employed as a teacher in a girls' school. All went well as long as he only had to teach the very young girls but when he was given the task of educating teenagers in the natural sciences things did not go so well.

> . . . when I attempted to teach science to those in their teens, everything went awry. I was still too immature; not that I fell in love but I just couldn't command my pupils' respect. I was eager to lecture to them in chemistry but it was a subject that didn't interest them in the slightest. Each of us has some peculiarity which is his Achilles heel and invitation for teasing. Mine, in particular, was my use of the expression, "Now then—" as preface to some point I wished to make. My mischievous students could always anticipate when it was coming and before I could speak I was greeted with a girlish chorus of, "Now then—".
>
> I was probably wrong but it struck me that the young ladies had no natural instinct for natural sciences. We often went out for botanic studies but my attempts to interest them in researching flowers and plants were dismal failures (B101).

When Armauer Hansen was ordered to teach from a book on food chemistry to help the girls with their cooking, even though he had no knowledge of cooking, he protested and this resulted in his dismissal. Suddenly he found himself without any means of making a living.

> . . . I tramped the streets for three days begging for work. There were no offers. On the third day I lost hope, walked home crying from frustration, and suddenly knew the pain and anger of a young man who could offer ability and willingness but could find no one with use for them (B101).

Consequently, Armauer Hansen was forced to return to Bergen and become dependent on his parents but, luckily, this did not last long. Before he had been home a month the prosector of anatomy at the University of Christiania offered him a position. The prosector was going to travel abroad and he asked Armauer Hansen if he would substitute for him during his absence. This indicated that people in the University circles already had an eye on Armauer Hansen and on his abilities as a teacher and research fellow. He was permitted to bring a bed into the room which the prosector occupied at the University so he had free lodging, free heat and 15 Spd. ($15) per month. Never before had he been so wealthy.

Armauer Hansen was 22 years old and was making his first appearance as a teacher and instructor of students who were almost his own age but he was able to gain their respect. He had studied anatomy diligently, loved his profession and required that his students have the same interest and love of work that he had. After his year as prosector, he started tutoring courses in anatomy, a job which paid him much more than regular teaching had. He also continued as a teacher of natural sciences at a boys' school where he started a campaign for greater cleanliness, for which he was a warm spokesman throughout his life. At first he tried to speak to them about cleanliness but, finding this of no use, he tried other methods which led to the boys keeping a piece of soap in their pockets and washing themselves under the water-tap in the schoolyard. When recess was over they were very proud to show off their clean faces and hands.

Armauer Hansen must have had an impressive working ability. He himself said that in his youth he literally did not know what it was to be tired, either physically or mentally. He would fall asleep the minute his head touched the pillow at night and would awaken at 5:30 a.m. no matter what time he had gone to bed. He worked the best between 6:00 and 8:00 a.m. Even during the term before the second session's examination, which was the hardest time for the medical students, he tutored courses for four hours every day. He worked industriously until 8:00 p.m. at which time he closed his books, never working any later.

Armauer Hansen was a very opinionated student and he felt that he understood things as well as, or perhaps better than, his old teachers. As a student he was undoubtedly strongly influenced by Emanuel Fredrik Hagbarth Winge (1827-1894), who was first a professor of pathologic anatomy and later of internal medicine. In 1858 Winge was appointed as prosector in pathologic anatomy. His work is considered as part of the evolution of medical research in Norway. He taught the young students everything that was new in medicine which the old professors did not know since they were too old to get involved in the new discoveries.

With regard to the other University professors, the professor of internal medicine, Andreas Christian Conradi (1809–1868), had a very fine mind and was a brilliant man from whom there was much to learn with respect to the examination and diagnosis of patients. However, he had such a sophisticated attitude that the students hesitated to communicate

with him and once he did not even know the name of one of the candidates who had worked under him for half a year.

Armauer Hansen undoubtedly had more respect for the surgeon Professor Christen Heiberg (1799–1872), better known as "The Knife" who, like Armauer Hansen, was born and raised in Bergen. He took an interest in each individual student and was an excellent teacher who taught them how to use their mental faculties and become sensitive towards death and pain. He would say, "Death and pain you must feel with your head." They had to first look at the patient and then draw their conclusions from what they had seen. With his great experience, "The Knife" himself had remarkable powers of observation.

"The Knife" had developed a special eye operation which he believed was useful for most diseases of the eye. Unfortunately, at one examination "The Knife" asked Armauer Hansen about a cure for a particular eye disease. He hoped that Armauer Hansen would mention his operation but Armauer Hansen did not because he could not see any use in it. "The Knife" mentioned it himself and Armauer Hansen answered, in accordance with his strong convictions, "It is not much good in this case." "The Knife" became angry and started yelling at Armauer Hansen, who was also angry and yelled back. The two gentlemen literally sat on opposite sides of the table and quarreled as if they were two young boys, leaving each other in a gust of rage. "The Knife" did not want to give Armauer Hansen a passing grade but the censors insisted he do so and, since "The Knife" was basically a fair man, he gave Armauer Hansen a high mark.

All of the students who had been present, except one, agreed with Armauer Hansen. When tempers died down, Armauer Hansen realized that the single student, who later became a missionary doctor, was right. He therefore went to "The Knife" and apologized for his impudence but "The Knife" was unable to forgive him completely. At the next clinical examination, Armauer Hansen was uncertain of a diagnosis and, although he had discussed the possibilities, "The Knife" gave him a low mark.

Before "The Knife" died he and Armauer Hansen became good friends again. When Armauer Hansen passed through Christiania on his return from Germany he visited "The Knife" and was able to truthfully report that he had attended several surgical clinics but had never met anyone who could match "The Knife" as a teacher.

The medical students were dissatisfied with the instruction in pharmacology. Armauer Hansen was the leader in his circle of friends and together with two friends were the leaders in formulating a petition to be signed by all of the second division medical students and to be sent to the college in order to get Ernst Ferdinand Lochmann (1820–1891) as a teacher in the subject and in 1867 the latter was named professor. At that time many of the doctors were indignant that the undergraduate students had taken it upon themselves to participate in a university appointment. Armauer Hansen himself was sorry later that he had had a part in getting Lochmann appointed. He was, no doubt, a fine mind and had read a great deal but he was not much of a researcher. His numerous suppositions were never based on independent observations.

Armauer Hansen felt that during his years at the University the students received no education with regard to the intellectual climate in Europe. At private parties, however, the students argued these points vigorously.

At that time there was much cheating during the clinical examinations. In order to prevent this, the students concerned were not allowed to visit the hospital and possibly become familiar with the patients as long as the examinations were in progress. Nevertheless, the students still obtained detailed information from the young doctors, admitting clerks and nurses. Later, the examination system was changed and, accordingly, cheating became more unthinkable. As a part of his daily routine, Armauer Hansen always went to the morgue so before the examinations started he asked Professors Conradi and Heiberg for permission to continue going to this room, promising not to use this as an opportunity to cheat. Conradi rubbed his hands together and said, "We have been given so many promises which have not been kept." And with that the audience ended.

One of the major events during Armauer Hansen's years at the University was his first foreign travel in 1862 when he was a participant in a student excursion to Copenhagen. They

traveled by small steamship from Christiania, got caught in a driving storm and it was not long before some of the students became seasick. In his *Memoirs,* Armauer Hansen tells, "We comforted them as they hung over the rail by rolling the drums and making speeches which admonished them for losing their souls to the fjord when they should be saved to brighten the Danish plains. Somehow it didn't improve their health." (B101)

The main saloon of the steamship had been converted into sleeping quarters but there were twice as many students as there were sleeping accommodations so they had to sleep in two shifts, each lasting half of the night. Armauer Hansen was on the second shift and when he entered the room it was not as fresh as it had been on deck and the place was filled with all sorts of strange noises, thus making it difficult to sleep (B101).

The next morning they arrived at Malmö in fine weather and had an excellent breakfast with schnapps and other drinks. Afterwards they visited the University of Lund. They spent the following time in Denmark where their days were marvelous from one morning to the next.

One day some of the students were invited to a luncheon at a residence outside of Copenhagen where the lady of the house proposed a toast to the Norwegian students. Soon afterwards, Armauer Hansen rose and, according to his own account of the event, said some clumsy words. It was the first public speech he had made and he was so confused that when he was supposed to lift his glass his hand trembled so much that his wine spilled all over him.

Swedish students had also come to Copenhagen to attend a meeting where the Swedish and Norwegian students promised to come to the assistance of their Danish friends if Denmark was attacked by Germany. Armauer Hansen was not at all enthusiastic about "Scandinavianism" and he felt awkward listening to it repeatedly at the student association in Christiania. Even as a schoolboy he had been taught so much about Denmark's crimes against Norway that he had no cordial feelings towards Denmark. Therefore, he did not go to the meeting and later was glad that he had not participated. If he had gone he would have felt obligated to take part in the Danish-Prussian War in 1864 or else would have had a guilty conscience if he had stayed peacefully at home. It is this failure of the other Scandinavian countries to help Denmark in 1864 which the Norwegian author, Henrik Ibsen, expressed in his poem "A Brother in Need."

ARMAUER HANSEN'S FIRST YEARS AS A MEDICAL PRACTITIONER

In the autumn of 1866, Armauer Hansen passed his medical examinations with honors and in 1867 he served as an intern in the main department of Rikshospital, the National Hospital in Christiania. This was both an instructive and enjoyable year for him. When his service at the National Hospital was over, he passed through Bergen on his way to Lofoten where he was employed as physician for the fishermen who fished for cod every winter. His office was in Henningsvær in Lofoten and this was his first assignment as a practicing doctor. He had plenty to do because during the cod-fishing season there were 6,000 fishermen in Henningsvær.

Armauer Hansen found it interesting to watch the cod-fishing and the abundant bird life which existed there, even during the winter. To protect the Eider ducks, no shot was ever fired around the place and consequently all of the birds were extremely tame. When anyone went rowing the Eiders parted just enough to make way for the boat. There were plenty of seagulls who would snatch fish from the beaks of the Eiders after the ducks had done the work of diving for them.

The "Northland boat" is a type of boat which is very rare today. It had very elegant lines, retaining the lines of the original Viking ships, and looked really beautiful when the sun shone on the great sails with their special shape. Armauer Hansen tells that he had never seen a more beautiful sight than the moment on a winter's day when the whole fishing fleet sailed with a following wind on a bright day. After Armauer Hansen had seen this impressive sight he understood why the Norwegian crusader, Sigurd Jorsalfar, had waited with his fleet until he was able to sail with a following wind before entering Constantinople.

The Northerner, who is slow on dry land, behaves quite differently when he is in a boat. There he is sprightly and active and it is as if he is not himself until he is at sea.

When Armauer Hansen started his practice in Henningsvær, he tried to examine the fishermen in the way he had examined patients at the National Hospital in Christiania, i.e., by asking them questions about how they felt. However, this method failed completely in Henningsvær and it was absolutely impossible for him to learn what was wrong with them by asking questions. He found that he had to give them a physical examination and depend almost entirely upon what he learned from this examination in making a diagnosis. When he got to know the fishermen better he tried to get some of them to tell him what was wrong but in most cases this was impossible because the fishermen just could not express themselves. In his *Memoirs,* Armauer Hansen mentions a typical example of this unsuccessful approach (B101).

> A man would come into the office and, after having carefully surveyed it, would ask, "Are you the doctor?"
> "Yes, what is wrong with you?"
> "Oh, I am so ill!"
> "I see. Just what ails you?"
> "I am covered with spots."
> "Yes, I can see that. Tell me, just how they feel."
> "Oh, something terrible."
> "Do they itch, burn or ache?"
> "Well, I have spots all over me."
> "Yes, but where do they bother you most?"
> "All over my body."
> "Where are they particularly painful?"
> "On my head, on my chest, on my stomach, on my arms, on my legs. As I've already told you all over."
> "Well, try and tell me how it feels everywhere."

He continued this way for ten minutes without getting any real information from the man who was covered with spots and terribly ill.

When the weather was too rough for the boats to leave the harbor, the fishermen came through the door of the consulting room from early morning to late evening. It was, of course, because they were bored and had nothing to do. Therefore, they either had to go to church or visit the doctor complaining of all sorts of minor ailments. For example, Armauer Hansen tells of one such day when a fisherman came in and complained of pains in his face. Examining him, Armauer Hansen found a little pimple on the man's nose, pinched it open and sent the man on his way.

They were, on the whole, sensitive to pain, except for the people from Trondheim who were, in most cases, vigorous men and not afraid of pain when Armauer Hansen had to cut open a swollen finger, of which there were many. The worst were the fishermen from the islands beyond Lofoten. If one of these had a swollen finger and were told that a hole should be cut in it, the patient asked worriedly, "Does it hurt?" "Of course it will hurt, very much." Then the poor fellow would begin to cry so that tears flowed down over the chin but when Armauer Hansen cut, they did not protest. It was fright that chiefly gripped these people.

The law permitted the fishermen to leave the harbor after 5:00 p.m. on Sundays in order to set their lines in the sea, but this was never done. When they were asked why they did not start fishing at that time their answer was, "It would be a sin against the Lord" and "He will reward us in other ways." Armauer Hansen was not, as we shall learn later, of a religious nature but he was tolerant and could have understood it if they had worshipped God instead of working on Sunday evenings but instead they preferred to lazily lie in their beds, smoking and chewing tobacco and spitting.

On the whole the hygienic conditions were miserable but Armauer Hansen faced a stone wall when he tried to correct them. He tried to get Dreier, the owner of the fishing camp, to put ventilators in the fishermen's shacks. Dreier was a practical man and would have liked to follow the doctor's advice concerning improvements but he knew the men well and was sure that if he put smoke vents in the roof, the fishermen would nail them shut. Armauer Hansen had more success in his conversations with Dreier's wife who was a very generous woman. The year 1867 had been a bad one and so there was little that year in the way of grain and

potatoes and, as a result, there were some cases of scurvy. Armauer Hansen had told Dreier's wife what these patients needed and he sent them one after another to this generous lady who supplied them with vegetables.

When the winter fishing of 1868 ended in Lofoten, Armauer Hansen returned to Bergen where he began to investigate the disease known as leprosy, to which he would make such important and decisive contributions. His short stay in Lofoten was of great value to him for it had taught him much about patience which is needed both in dealing with people and in research. Additionally, later in his life he had much to do with fishermen and with the coastal population and his experience in Lofoten helped him in his work with these people.

LEPROSY

A. The History of Leprosy

The disease which Armauer Hansen undertook to investigate and where his results were so impressive and decisive was leprosy, *lepra* or *elephantiasis graecorum* and has been one of mankind's worst curses for thousands of years. It is thought to have existed from earliest times.

The disease had already been brought to Europe from Egypt several hundred years B.C.; first to Greece and then further to the rest of the Mediterranean. Leprosy spread with the Roman armies from Italy further into Europe, however, its largest spread and significance for Europe was not until after the Crusades. It was especially the lower classes, the numerous beggars and prostitutes, who were attacked by the disease but in a few cases it could be found in the higher and highest social classes, including sovereigns and clerical figureheads. Thus, it is said that King Alfons II of Portugal had leprosy and died of this disease in 1223.

In the Middle Ages the disease had an extraordinarily large spread and consequently was greatly feared. Numerous leprosy hospitals were established, the so-called leprosaria, and there were very strict rules governing the movement of leprosy patients. A person with leprosy was regarded as and dealt with as if he was no longer alive. When he was admitted to a leprosy hospital a mass for the dead was read about him. Some of the leprosy sufferers received permission to go around as beggars but they had to ring bells as a warning so that people whom they met could avoid coming near them.

Leprosy reached its height in Europe in the 12th century but by the 15th or 16th century the number of cases had so greatly decreased that several of the leprosaria were empty and could be used in other ways. By the beginning of the 17th century the disease had faded out in large parts of Europe. The reasons for this decline in the incidence of leprosy in Europe have been lively discussed through the years. Some have felt that the decline was due to the fact that when a disease has ravaged a population for a long time, a resistance or immunity will develop, after that the most susceptible to the disease will have died of it. However, this doesn't apply to leprosy in tropical countries and also to countries like Norway where the same decline in incidence was not apparent.

Others have felt that it is in part the very strict precautions carried out and consequently the fear of it in the population that have in time led to an almost complete eradication of leprosy in most of the European countries. It is also claimed that contributing causes to this might have been rising standards of living with improvement in cleanliness, nutrition and general hygienic principles adopted by the countries. Many have also felt that pestilence and other contagious diseases raging, especially among those with leprosy, played a role in the decrease of this illness.

B. The History of Leprosy in Norway (C6, C11, C13)

It is not known for certain when leprosy first appeared in Norway or where it came from (A56) but it seems likely that the disease spread to Norway from the British Isles in Viking times. The Norwegian Vikings had active contact with the other people of the North Sea and had settlements in Ireland, Scotland, the Faroe Islands, Iceland and Greenland. The Vikings

not only brought home goods and gold but also captives of both sexes. Irish women were said to have been especially attractive to the Vikings and leprosy was widespread in Ireland as early as the 10th century. Indeed, the first recorded leprosy hospital in the British Isles was founded in Ireland in about the 7th century ([51]).

It appears that the Norsemen knew and feared the disease. In England and especially in Ireland, the Norsemen had learned to look at leprosy as a horrible disease which they must combat with all their might and main. In 921 when King Gudrød of Dublin plundered Armagh in Ulster, Ireland's celebrated sanctuary, according to the Irish Year Books, he spared "the houses of prayer where the men of God and the lepers stayed." ([8])

When we consider the cruelty and brutality of the Vikings during their raids, it is apparent that it was not out of pity that they spared "the houses of prayer where the men of God and the lepers stayed." It is more likely that the shocking appearance of the leprosy sufferers horrified them and that they were afraid of being infected themselves. However, the Vikings had no knowledge of the long incubation period and the insidious onset of the disease and consequently they did not have the knowledge to prevent the spread of the disease to other Viking settlements or to their native country.

A disease such as leprosy must be well established before it is subject to legislation. In the oldest Norwegian laws it was stated that a promise of marriage was not binding if one of the partners was found to have leprosy and also that those with leprosy were exempt from military service. Consequently, these laws indicate with reasonable certainty that leprosy was fairly common in Norway by about 1,000 A.D. ([15]).

In the Middle Ages it was the clergy and the nuns who took care of the sick and, therefore, most of the hospitals were associated with a church or monastery. The oldest known hospital in Norway was founded in Nidaros (the present Trondheim) in the 12th century and was associated with the cathedral. In most of Western and Southern Europe the leprosy hospitals were dedicated to St. Lazarus so it is not easy to explain why the Scandinavian countries chose to associate St. Jørgen (St. George)[3] with the leprosy sufferers. However, he was probably chosen as patron saint in memory of his victory over the dragons which perhaps symbolized the victory of the leprosy patients over their disease ([41]).

The Norwegian Vikings who raided Ireland and Scotland were mostly from Western Norway where the conditions were favorable for the rapid spread of leprosy. Therefore, most of our knowledge of leprosy in Norway during the Middle Ages is associated with the history of Bergen and the leprosy hospitals found there ([44]). Of these, St. Jørgen's Hospital in Bergen gives us the most information. It was founded about 1400 and in an old document it was called "The Spital in the Field". As a result of the fires which, throughout the years, have devastated Bergen's wooden buildings, St. Jørgen's went up in flames several times but was rebuilt on the same site each time. As Bergen expanded, "The Field" became a more and more central part of the town and today St. Jørgen's is more or less in the middle of the city, a stone's throw from the railway station.

From the 15th century, the prevalence of leprosy began to decline in Norway and in the other European countries and by the end of the 16th century it had almost completely disappeared in southern Norway and the inland areas (C13). St. Jørgen's Hospital in Bergen was originally founded only for leprosy patients from Bergen but later non-infected individuals were admitted. The decline in the prevalence of leprosy resulted in the relaxing of precautions and soon the disease reappeared in those parts of the country where it had not been completely eradicated. This was the case not only in Bergen but all along the western coast of Norway and, consequently, leprosy patients from all of the coastal districts were admitted to St. Jørgen's Hospital.

The part of the hospital where the leprosy patients lived was demolished in 1701 and a new building was constructed, partly because the old buildings were scattered and partly because it was too small. About a year after the reconstruction of the new building, a big fire broke out in Bergen and turned large parts of the town into ashes. St. Jørgen's was totally destroyed by the fire but was immediately rebuilt. It was, however, so poorly constructed

[3]Editor's note: St. George was the ancient patron saint of European leprosy victims. Int. J. Lepr. **41** (1973) 243-244.

that in 1745 considerable alterations were needed. The increase in the number of leprosy patients meant that the building was too small and overcrowded and so in 1754 it was demolished and a new, larger, two-story building replaced the old one, allowing additional space for the steadily increasing number of inmates. These old buildings and the adjacent wooden church are still standing in Bergen (C11) and they show what poor conditions the leprosy patients lived under. One gets an unpleasant impression of the conditions in the hospital from the hospital's chaplain, Johan Ernst Welhaven (1775-1828), published in 1816 ([50]). He wrote that the patients were saved from hunger only by the support of compassionate men, especially during the years 1813 and 1814. He declared that conditions had to be improved if the hospital was not to continue to be a graveyard for the living. The patients had to cook their own food since there were only two women attendants to keep order in the rooms.

In 1817, for the first time, a physician was attached to this hospital but true reforms did not take place until 1839 when Daniel Cornelius Danielssen (1815-1894) started his scientific investigations at St. Jørgen's. Daniel C. Danielssen was born in Bergen, the son of a watchmaker. His parents were poor so when he was only 13 he had to take employment as a pupil in a pharmacy. At the age of 17 he developed tuberculosis of a hip-joint which confined him to his bed for a year and a half and left him permanently lame. During his long illness he prepared himself for the student examination which he passed when he was 20. Only three years later, in 1838, he obtained the highest marks as *examinatus medicinae* in Christiania, a medical qualification which was of a lower degree than the ordinary medical degree.

Danielssen returned to Bergen in 1839 and remained there for the rest of his life. Back in Bergen he immediately began his scientific investigations on leprosy while at the same time engaging in other studies in the natural sciences. He was a member of the Board or the Council and the founder of several societies for public utility and safety. He was also a member of several state committees and of the Norwegian Parliament ("Storting") ([6], C13).

C. Leprosy's Modern Medical History

The great discoveries in the natural sciences of the 19th century contributed to the advancement of medical science in that they became the means of investigating and understanding the physiologic and pathologic processes of organic life and provided a firm foundation for the diagnosis and treatment of diseases. In the place of speculation came the serious, objective observations of the different phenomena of health and disease.

Around 1840, Schleiden had established the science of the plant cell and its significance as the structural element in plants and Schwann the animal cell concept, whose central point was that all animal tissue consists of and arises from cells. Earlier the so-called humoral pathology had been predominant in medicine. According to this teaching, the blood was of overriding significance, both in sickness and in health.

In 1858, Rudolf Virchow introduced his cellular pathology with the famous classical "All cells from cells" which brought a completely new fundamental view into teaching about sickness and, therefore, has been of extraordinary significance for medical science. In this teaching, the significance of the blood and humors stepped into the background and cells, the organic structure of life, were assumed to represent the life force and were regarded as the seat of the disease processes. The Norwegian doctors also benefited from these history-making results.

In 1840, Carl Wilhelm Boeck (1808-1875), who later became professor of dermatology at the University of Christiania, obtained a travel grant from the Norwegian government to study leprosy and to develop preventive measures against the disease. On his first trip he went to Bergen where he and Danielssen decided to collaborate on leprosy studies at St. Jørgen's and to prepare the opus that was to be the great turning point in our knowledge of leprosy. In 1847 they published their celebrated work *Om Spedalskhed (On Leprosy)* ([11]), which led Bergen to be regarded as the European center for leprosy research for many years.

Danielssen and Boeck's work gave a meticulous description of the disease picture of leprosy and of the disease's pathologic anatomy. A year later, a French edition was published in Paris ([12]). In 1855, the French Academy conferred on them the "Prix Monthyon" for this work. They donated the money received to the Royal Frederik's University with the intent

Chief Physician Daniel Cornelius Danielssen. His portrait in oils by Anders Monsen Askevold, 1856.

From Danielssen & Boeck's Atlas, 1847. A 28 year old woman with nodular leprosy and horn-scabies. Painting by J. L. Losting.

that the interest, when it reached a certain sum, should be awarded for a work in dermatology every third year. In 1882, this prize was awarded for the first time to Armauer Hansen for his work on leprosy and the leprosy bacillus.

Om Spedalskhed was accompanied by a large atlas of drawings of leprosy cases. A century later, in 1948, de Souza Araujo of Rio de Janeiro, published a facsimile reproduction of this atlas, stating in the preface that he wished to "pay homage to the Government of Norway, which was the first in the world to realize a scientific and humane prophylaxis for leprosy and to the real founders of modern leprology, the very illustrious Norwegians, Danielssen and Boeck." ([43])

In the 1830's and 1840's there was a considerable increase in the number of persons afflicted with leprosy in Norway. They were chiefly confined to the coastal districts and were particularly numerous around Bergen. This increase in the number of cases caused the authorities to feel that it was necessary to initiate measures to prevent the further spread of the disease (C11).

In 1845, the Norwegian Parliament voted to build a new leprosy hospital in Bergen and in 1849 the Lungegaarden Hospital was opened. Although Danielssen continued as physician for St. Jørgen's, he was also appointed Chief Physician for the Lungegaarden Hospital. This was a large wooden building which housed 60 leprosy patients and 24 patients who had other dermatologic diseases, thus permitting Danielssen to perform comparative studies on different skin affections. However, the whole building burned down on Christmas night in 1853 and six leprosy patients and one servant lost their lives. The hospital was immediately rebuilt, this time as a solid stone building designed for 96 leprosy patients. The hospital gradually acquired an important medical library, a laboratory for scientific research was established and many scientists from far and near visited the hospital. In 1862, Danielssen's second great work on leprosy, on the anesthetic type, was published from this hospital ([13]).

The increase in the number of leprosy patients continued in the 1850's and the first reliable census of this disease in Norway, taken in 1856, reported a total of 2,858 cases. At that time Norway had a population of about one and a half million, therefore, about two per thousand of the population were afflicted with leprosy. They were particularly numerous in Bergen, where the prevalence was up to twenty-five per thousand. Consequently, more hospital rooms for leprosy patients were needed and in 1857 Pleiestiftelsen for Spedalske Nr. 1 (Nursing Institution for Leprosy Patients No. 1) was opened as the third leprosy hospital in Bergen, having about the same medical staff as the other two. This hospital was located beside the Lungegaarden Hospital and was a large wooden building, two-stories high with two wings, that was designed to house 280 leprosy patients.

In these years the basis for regulations against the spread of leprosy was that the disease was hereditary. Danielssen and Boeck had strongly stated in their work that they regarded leprosy as a hereditary *dyscrasia* and this was the prevailing opinion at the time. However, a change occurred when Armauer Hansen was employed by the leprosy hospitals in Bergen to begin his investigations into the causes of leprosy.

In 1858, Rudolf Virchow was invited by the Norwegian government to visit the endemic areas and investigate the nature of leprosy. He made this trip during the summer of 1859. In *Die Krankhaften Geschwülste* ([48]), he mentions his trip to Norway:[4]

> Although I had the opportunity to see hundreds of leprosy patients and to collect all possible data concerning the nature of the local lesions, I nevertheless reached the conclusion that any judgement on the question of etiology, even from the best material under study, could be properly reached only if comparative studies of greater scope from various leprous territories in the world were added.

With regard to the studies in Bergen, Virchow says:

> Modern scientific knowledge of leprosy dates from the work of Danielssen and Boeck *Om Spedalskhed* in Norway. This splendid monograph gives an excellent picture of the disease. Work from earlier times is only of minimal scientific interest.

D. The Manifestations of Leprosy

The most characteristic signs of the beginning of leprosy are either changes in the skin or symptoms of the peripheral nerve involvement. Those cases in which changes in the skin clearly appear early and take the form of nodules (lepromas) while nerve changes appear late and are not prominent, have a different course from those cases where nerve changes dominate the disease manifestation while the skin manifestations appear only as spots. One therefore distinguishes two forms of leprosy, the nodular and the smooth forms.

Nodular leprosy (lepromatous) is characterized by the appearance of lepromas in various locations in the skin. The nodules, little by little, increase both in size and number, either uniformly or irregularly. Mucous membranes are also attacked (upper respiratory system) and changes can occur in the viscera, especially in the liver and spleen. Almost no lepromatous patients are free of eye complications. If the progress of the disease is not rapid then, in time, symptoms also develop in the nerves in the form of periodic fevers. Some die during these periods while in others there may be stagnation followed by new periods of fever. Lepromatous leprosy (untreated) on the average lasts eight to ten years.

In the smooth form (tuberculoid) episodes of pain and fever occur and under these attacks patches appear in the skin having a brownish discoloration and sharp margins. The patches gradually become anesthetic. They can last from a few days to months or years, can disappear and reoccur. Soon the peripheral nerve branches and main trunks are attacked, as a rule symmetrically. Pain, paralysis and muscle wasting are accompaniments. Fingers become clawed. Ulcers may develop and fingers, toes, yes even a whole foot, may be lost.

The smooth leprosy (tuberculoid) can undergo healing at all stages. Many of these patients become very old. Death often occurs from kidney disease or from afflictions of advanced age. On the average this type of leprosy lasts for at least 20 years.

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[4]Editor's note: this passage was translated from German to Norwegian and then from Norwegian to English so may not be an exact translation.

ARMAUER HANSEN AND D. C. DANIELSSEN

On January 1, 1868, Armauer Hansen was appointed physician for Pleiestiftelsen for Spedalske Nr. 1 in Bergen. This was the appointment he received after having been physician for the cod-fisherman in Lofoten. From August 1 of the same year he was also associated with the Lungegaarden Hospital. Here the young doctor encountered quite different surroundings from those he had during his student years at the University of Christiania. As physician at Pleiestiftelsen, Armauer Hansen had a new chief and this was D. C. Danielssen. Danielssen was 53 years old and was one of the most outstanding medical scientists of that time and it was a stroke of luck for Armauer Hansen to meet such a prominent personality while he was still so young.

There is a very characteristic anecdote about the meeting of Armauer Hansen and Danielssen. Professor Gerhard Gran, Armauer Hansen's brother-in-law and a Norwegian literary historian, tells of this in the obituary he wrote for Armauer Hansen in 1912 ([19]):

> It was 1868, Armauer Hansen was 27 years old, cheerful, courageous and filled with confidence and faith in the future. Danielssen was then at the height of his glory and his name was world-renowned due to his research on leprosy. Armauer Hansen had been attached to "Pleiestiftelsen" and made his dutiful visit to his new chief. It was a brief visit for they had only begun talking a short time when Armauer Hansen suddenly exclaimed, "... it is, however, my conviction that your opinions about leprosy are completely wrong. You believe that the disease is hereditary but not infectious. The truth is that it is infectious but not hereditary." Danielssen, who was short-tempered and not free from (superficial) vanity, became furious and showed the bold "Geldschwabel" the door. The next day, however, Danielssen called for his new assistant and made the following little speech: "Young man, I have reflected on what you said yesterday and, of course, you are very wrong but I understand that you have something on your mind and I will help you as best I can. You shall have a laboratory in the hospital and if there is anything else you need, like books and other equipment, tell me and I will procure them *per fas* or *nefas*."

The story is, perhaps, too good to be true and Armauer Hansen himself never touched upon the episode in the same way as Gerhard Gran did. On the other hand, he mentions in his *Memoirs* that, due to his earlier investigations, he was already convinced that Danielssen's results concerning the etiology of leprosy were not substantiated. He also noted that Danielssen was not very flexible when it came to his beliefs and it was not easy for him to bend, even in the face of strong counter-arguments, to any questions appearing to challenge the main line of thought in his life-work.

This was a strict but healthy school for the young doctor and he writes about his relationship with Danielssen during this time (B101):

> ... Despite his years, his spirit and outlook had the resiliency of youth and I responded to it eagerly. Almost every day we discussed the urgent and elusive details of our mutual concern as I followed him from the hospital to the city. There was always the possibility of new illumination, thanks to his lack of preconceptions and his genuinely scientific attitude. He relentlessly encouraged, even drove me, to produce irrefutable proof of my own conclusions.

It gave growth to young abilities to face such an opponent.

During the first period in which Armauer Hansen was attached to Pleiestiftelsen for Spedalske Nr. 1, he tells that he was very disgusted because he had never before seen so much misery assembled in one place. However, when he put his hands on the patients to examine them, this feeling of disgust gradually disappeared and was replaced by an increasing interest in learning about the disease properly.

Armauer Hansen had a very long working day because his studies interested him more than anything else but he also had a great deal of fun. As a young, good-looking doctor he was invited to many parties where he was served excellent food and good wine. He enjoyed conversation but could not dance so he decided that it was necessary for him to learn. He found it fun and gradually he became an eager dancer. He was, however, not musical and was never a good dancer but was entertaining to talk to.

ARMAUER HANSEN'S FIRST SCIENTIFIC PUBLICATIONS

Armauer Hansen's first scientific paper was a prize essay on the normal and pathologic anatomy of lymph nodes. He submitted this to the University of Christiania in 1869 and was awarded a gold medal for it. It has been said that he was awarded the King's gold medal in 1869 for a work presented to the University and that this work was not published but that statement is incorrect. It was not the King's medal but Professor Skjelderup's gold medal that was awarded to him. Michael Skjelderup (1769-1852) was the first professor of medicine at the University of Christiania and he functioned as a lecturer in anatomy, physiology and forensic medicine. In 1849, on his 80th birthday, he established "Professor M. Skjelderup's Bequest" of 1,000 Spd. ($1,000). The interest was to be used for a gold medal to be awarded for prize essays and it was this gold medal that was awarded to Armauer Hansen in 1869. The work presented was published, but not until 1871 (B1).

Lymph nodes from leprosy cases were included in the material of his prize essay. In these nodes Armauer Hansen observed some yellowish granular masses and, following up on these observations, he found the same yellowish granular masses in nodules from other leprous organs also. These observations were printed as his first communication in 1869 (A1).

This publication is accompanied by a plate in which are shown figures from cutaneous nodes and nodules from the spleen and retina. In the two following years, Armauer Hansen continued these studies and wrote two new communications (A2, A3). In the first of these he elaborately discussed the skin affections and the nodular formations in different tissues were shown. In the continuation of this paper, Armauer Hansen described the clinical picture of the disease. He discussed the correlation between the two types of leprosy, the nodular and the anesthetic, and called attention to the fact that all types of leprosy start with skin affections.

These studies and observations increasingly convinced him that leprosy must be a specific disease with a specific cause and that it was infectious and he continually tried to find new evidence to support his belief. The observations which he made during these two years must be regarded as forerunners of the discovery of the leprosy bacillus.

FURTHER STUDIES

In order to continue his leprosy research, Armauer Hansen found it necessary to improve his education in pathologic anatomy and especially in microscopy. He received a travel-fellowship and in the spring of 1870 he went to Germany to study, starting in Bonn where he made several important acquaintances.

One of Germany's greatest microscopists at that time was Max Schultze, who was in Bonn. Armauer Hansen obtained working space in his laboratory but he found that the scale of this laboratory was rather primitive. Schultze had two young assistants who were meant to teach the students but Armauer Hansen knew much more than the two of them put together so, in reality, it was he who functioned as the instructor.

They saw the great man, Max Schultze, only now and then on short visits. It was difficult or even impossible to get him interested in things other than that on which he was concentrating. At that time it was the retina and his laboratory was known as "The Retina Factory". As a result of his own studies, Armauer Hansen found something regarding ossification which he thought was completely new, but it was absolutely impossible to get Schultze interested in it. Some months after Armauer Hansen had returned home, he was informed that another scientist had described just the same feature. Since by this time Armauer Hansen was infected with the German desire to be first, he was annoyed that he had lost priority but fortunately he had so much to do that he soon forgot the whole incident.

In those days, duels were very common among German students. Shortly before Armauer Hansen had arrived in Bonn, one of Bismarck's sons had received a cut on his scalp in a duel. Although it was treated, he developed St. Anthony's Fire (erysipelas) in the wound and was close to death. Consequently, a notice was posted on a wall of the University Hall

announcing that dueling was prohibited. However, underneath this notice it said, "If anyone defies this order and engages in a duel, the use of padded helmets and eye shields is recommended." This document was signed by the Secretary of State.

The student who had wounded young Bismarck received a wound himself soon after. The cut went from his forehead down over his cheek and split both his upper and lower lips and 18 stitches were needed to sew it up again. When the wound healed, no plastic surgery was done, for the broader and uglier the scar was, the better. Such scars appealed to the German girls who regarded them as proof of courage and manliness.

At that time in Bonn there were many Prussian "Junkers" (young noblemen) who pretended to be studying but Armauer Hansen could not see that they did much more than drink beer, ride horseback and duel. He himself fell in with friends who were against duels and in the evenings they met each other in a beer parlor where they smoked tobacco, drank a lot of beer and discussed various problems. They were against Bismarck and his policies. This was a very pleasant time but suddenly the peaceful situation changed.

In July, 1870, the French declaration of war came and on the same day a declaration appeared on all street-corners and houses outside the city which said, "As of this day the North-German Army is mobilized." Every man knew what he had to do; he reported to his depot, got his uniform and weapon and was then sent to the nearest railway station. Eighteen thousand soldiers passed through Bonn each day and in addition to the regular trains, other trains carrying civilian passengers ran both to the north and to the south.

In Bonn, Armauer Hansen had been together with Hjalmar Heiberg (1837-1897), the later professor in pathologic anatomy and general pathology at the Royal Frederik's University in Christiania, the day after the declaration of war. Armauer Hansen accompanied him to Cologne since he was going home and Armauer Hansen was going to Dusseldorf and Rotterdam to meet a friend arriving from home. The train was overcrowded with people who had been taking the cure at Ems and Wiesbaden (Bathing Resorts) and there were not fewer than 72 cars in the train which Armauer Hansen and Heiberg traveled on. All of the passengers were convinced that the French would overrun Germany in a couple of days. When Armauer Hansen returned to Bonn his friends were more or less of the same opinion. However, Armauer Hansen had seen the precision with which the German troop transports operated and was convinced that the French would not invade Germany. He told this to his friends but also told them that he hoped that Germany would receive an initial setback so that they would not be too arrogant and sure of themselves when they finally won (B101).

Under these circumstances it was naturally impossible to work in the laboratory. Even Armauer Hansen, who was a foreigner, could not sit calmly at his microscope. After a few days, the news of victory in the battle of Wörth arrived. Armauer Hansen decided that it was now time to leave Bonn so he picked up his luggage, boarded a Rhine steamer and went to Bingen. There he got a Red Cross armband and continued on to Saarbrücken where he arrived the day after the battle had been fought. He went out to the battlefield which had not yet been cleared. The sight of the dead horses, lying on their backs with their guts spilled out and all four legs raised stiffly made a far worse impression on him than did seeing the dead soldiers.

In Saarbrücken, Armauer Hansen got a glimpse of the German headquarters and of Kaiser Wilhelm, Bismarck and Moltke, the latter making the greatest impression on him. He had never seen a man with such a fine and narrow face, such calm eyes and such a tightly shut mouth. It seemed that a lever would be needed to pry it open. Moltke resembled a spider, calmly sitting in the center of his web, holding all the threads in his hands.

Armauer Hansen traveled by train to Zurich and then continued on foot through Switzerland and Tyrol and by steamer down the Danube to Vienna. Here he met several Norwegian colleagues who were studying there. They would eat lunch together and then meet at a cafe or go to a theater in the evening. In the daytime, Armauer Hansen worked eagerly in the laboratory on problems that interested him.

All of a sudden something happened which was to greatly change his way of looking at life. One day he passed a bookstore and noticed a book in the window entitled *Natürliche Schöpfungsgeschichte (Natural Evolution)* by Ernst Heinrich Haeckel ([21]). He bought the

book, went home and started reading it and continued reading steadily for two days, neglecting his laboratory work. In his *Memoirs* (B101), he writes:

> Never had I read anything like it. The whole world stood out in an entirely different light than that which I had known. All I had been taught as a child collapsed as something unreal. The track on which my thought had formerly moved suddenly terminated and everything beyond was out of focus. There was, however, one compensation; my scientific searching had prepared me to spiritually absorb the mental shock of those two days.
>
> Revolution though it was, it left me only temporarily shaken. I returned to my work, which had already gripped me with all the power of a very controversial subject, and began to apply the beginnings of my new knowledge. I did so quietly.
>
> Later, after I had returned to Norway, I studied the works of Darwin in depth. They became the foundation of my outlook on life. It was a time in which I came into the full realization of how a country like mine had remained so far removed from significant developments in the outer world.
>
> As a student I had never heard a word about this man Darwin and his work, either at the university or in my circle of acquaintances. As far as I know, I was the first man to bring the scientist and his teachings to the attention of the Norwegian people when I wrote a series of articles for the Bergen Post.

An account of Darwin's principal work, *The Origin of Species by Means of Natural Selection* ([14]) had, however, appeared earlier in two articles in a Norwegian journal in February/March 1861 ([1]) but Armauer Hansen's personal discovery would surely have been news for practically all of Norway. For Armauer Hansen himself it was a decisive experience, one could call it a conversion. He later wrote (B100):

> In the expected, conventional sense my stay abroad hadn't taught me a great deal. Its unexpected benefit had been what I had learned of Darwin and his teachings. I now commenced to study his books thoroughly and from them reached the heart of scientific research and reasoning: to set aside every preconceived opinion and to diagnose from every approach that might have bearing on an ultimate solution. Nothing I had previously encountered had so fertilized my thought and my work. My goal had become that of researching as open mindedly and honestly as Darwin had, to be as thorough and, at the same time, as cautious as he in arriving at my conclusions. My previous scientific experience had left me well prepared to accept his teaching.
>
> Today I still cannot recommend too strongly to any new researcher that he reads at least one of Darwin's books. He will benefit from it throughout his entire life, not simply during his working career.

Darwin gave Armauer Hansen a new stimulus as a naturalist and in 1886 he published in Norwegian an excellent little book entitled, *The Theory of the Descent of Man, or Darwinism* (B23).

Some time before Armauer Hansen left Vienna he was visited by a Norwegian colleague, Jacob Heiberg (1843-1888) who was an old friend and who was later a professor at the Royal Frederik's University in descriptive and topographical anatomy, histology and embryology. He stayed with Armauer Hansen for eight days. When Armauer Hansen returned to his room after having accompanied Heiberg to the railway station, he found on his table a round trip ticket to Venice which his friend had left there without saying anything. Armauer Hansen immediately bought a German-Italian phrase book, packed his portmanteau and took the first train to Venice. He stayed in Venice for one week but not for the purpose of visiting scientific institutions. He spent a whole day feasting his eyes on everything around him. He marveled at and enjoyed the paintings in the Dog Palace and in the Academy of Fine Arts and every day ventured forth on the Grand Canal in a gondola in order to enjoy all the beautiful sights to be seen in the sunlight, which was of an entirely different quality than north of the Alps. In Vienna he found the women generally beautiful but they took second place to the Italians. Even if every one was not more beautiful, still their movements, walk and expressive gestures presented quite another impression of beauty. After short stays in Vienna, Dresden and Berlin, he returned home to continue his work.

THE DISCOVERY OF THE LEPROSY BACILLUS

Upon returning home to Bergen, Armauer Hansen immediately resumed his investigations concerning the etiology of leprosy. As mentioned earlier, from his studies he had become increasingly convinced that Danielssen and Boeck's theory of heredity was not sufficiently proven. It was now up to him to try to prove the infectiousness of the disease.

In 1871, Armauer Hansen was given a grant by the Norwegian Medical Society in Christiania to study the causes of leprosy. For two summers he traveled around the districts of Western Norway where leprosy was the most widespread, examining as many leprous families as possible. In addition to carrying out these epidemiologic investigations, he continued his laboratory studies at the Lungegaarden Hospital in Bergen. In 1872 he published a report in a Norwegian journal (A4) which was based on epidemiologic and clinical studies. In this report he described leprosy not as a hereditary dyscrasia but as a chronic, infectious disease. He followed up this opinion in his next report which contained his classical description of the leprosy bacillus (A6). Since this was Armauer Hansen's major work, a further account of its contents will be given.

In this paper he first thoroughly discussed the terms "hereditary" and "congenital". He referred in detail to all of his investigations, both in the laboratory and in the districts where the leprosy sufferers and their families were examined. He attacked and tore apart point by point all of the arguments that had been made in favor of the theory of heredity and he stated his own arguments in support of his opinion that leprosy was an infectious disease. For the most part, this paper consisted of data supporting his view on the etiology of leprosy and his belief in the contagious nature of the disease, but it also contained important information about his discovery of bacilli in leprous lesions.

In hopes of finding the causative agent of the disease, Armauer Hansen started examining blood samples but, even though he carried out many comprehensive investigations, all was in vain. As mentioned earlier, in his first publication Armauer Hansen described brownish granular masses in nodules from leprous organs. These had already been referred to as "brown bodies" by Danielssen and Boeck in their great publication of 1847. In the atlas that accompanies this work, there are three drawings showing these "brown bodies", also called "cellules".

Rudolf Virchow was of the opinion that Danielssen and Boeck in their work, which constituted the most comprehensive and exact investigation of the disease, had perhaps gone too far by placing in the same group a series of nodular changes in the lungs, liver and abdominal cavity, since it could not be excluded that some of these changes had tuberculosis as their cause.

Danielssen had, by steady preservation of these preparations, acquired a significant collection of leprous organ changes. This collection was kept in the Lungegaarden Hospital and was lost when the hospital totally burned down in 1853. Danielssen immediately started to build up a new collection. At that time he regarded the "brown bodies" as specific for leprosy. In 1859 when Virchow visited Bergen, Danielssen showed him his material. Virchow, however, interpreted the "brown bodies" only as fat-degenerated cells which were not specific for leprosy since they could also be found in syphilis and lupus. Eagerly enough, Danielssen bowed to the authority of Virchow.

On the other hand, Armauer Hansen, through further studies, proved that these brownish granular masses were not degenerated cells as Virchow had thought and he was of the opinion that they were specific for leprosy. After his investigations on the blood samples had failed, he tried to find the bacilli in the brown elements and this time he succeeded. The part of the report in which Armauer Hansen described the leprosy bacillus has been translated into English and published in the INTERNATIONAL JOURNAL OF LEPROSY ([40]), and parts of this are cited below.

> Nodules were examined in large numbers immediately after extirpation with scissors washed clean in alcohol. When there was superficial ulceration of the nodules with incrustation, there was always found a mass of bacteria in and under the crusts; therefore I have constantly chosen nodules with the cuticle entire. The microscopic preparations were made partly by picking up the fluid oozing out of the cut surface upon squeezing, partly by incision and scraping of the base of the node.
>
> Depending on the age of the nodule, there are obtained preparations in which there are found, besides blood, either only round cells, fragments of capillary vessels, and small bundles of connective tissue, or also larger cells and large and small brown elements. If the preparations are examined without any admixture, there can be detected here and there rod-shaped bodies either at rest or in slightly oscillating movement. When the cells are preserved entire, their number is small. If now a drop of water is added to the preparation, the rods move more quickly, and little by little more and more rods appear; the older the nodule is, the more numerous the rods become.

> The cells, but not the brown elements, swell considerably in water, and if one examines them with strong lenses . . . one detects in many cells, besides granules, also rod-shaped bodies which do not take part in the dancing movements of the granules, but swing more slowly from one side to another at very sharp angles. If now the cover glass is moved, whereby many of the swollen cells are burst, the number of the rods in the preparation becomes extremely large, and they move very briskly. The size differs greatly, varying from 0.006 to 0.015 mm.
>
> It goes without saying that I have carefully examined the distilled water which I added to the preparations. Even if perhaps one or a few bacteria were present in the water and escaped my attention, the water in any case could not have brought in the mass of rods which were found in the preparations.
>
> . . . . That rod-shaped bodies exist in the leprotic nodes, and that the majority of them are, in any case, without the cells, must be regarded as beyond doubt after what was said above; but whether these rods are bacteria and the large brown elements perhaps cells which include zoogloeic masses, is another thing.
>
> . . . . Finally I must remark that the rods in the fresh preparations, or at least a large part of them, as well as the brown elements, are not attacked by potash-lye, and that they are stained by osmic acid with the same intensity as bacteria and zoogloea.
>
> Since the results of the examinations are still uncertain and I intend to continue the research, I did not want at this time to mention in reports the details of my records. Many things are still lacking for the direct demonstration of specificity of leprosy, but I also thought I should give in this report an account of my examinations, which I had intended to do.

At that time, bacteriology was in its infancy and the idea that a living agent was the cause of a chronic disease had few supporters. Technics were not well developed and the method for the detection of microbes was very primitive. After very simple staining with osmic acid, Armauer Hansen succeeded in demonstrating the rod-shaped bodies which are regarded as the causative agent of leprosy. He described them as rods which "are partly found together in bundles, crossing one another at very sharp angles". He concludes his report with the following lines:

> I have now prepared my topic from all points of view which I, for the present, feel are significant and overall I find manifestations which speak to the specificity of leprosy, nothing whatever which distinctly contradicts it and absolutely nothing which speaks in favor of non-specificity.

THE TIME OF THE DISCOVERY

There is a rather large discrepancy in different textbooks on bacteriology and microbiology concerning the date on which Armauer Hansen first observed the rod-shaped bodies in leprous nodules which later became known as *Mycobacterium leprae* (Hansen's bacillus). The date oscillates between 1868 and 1879. Since most of Armauer Hansen's publications are written in Norwegian and since very few of the authors of textbooks and manuals are able to read this language, it is understandable that there have been some misunderstandings (C10).

It is regrettable that in his *Memoirs* Armauer Hansen himself states that he cannot remember when he first observed the bacillus in leprous nodules. It should be noted that when Armauer Hansen wrote his *Memoirs* he was 69 years old and was already an old and sick man whose activities were, consequently, reduced. It is therefore necessary to turn to other sources of information in order to determine the time of the discovery.

The first publication mentioning Armauer Hansen's microorganism that I have found is a report by H. V. Carter, the surgeon-major of the British Army in Bombay ([9]). He visited the Norwegian leprosy hospitals in August and September of 1873 and in his report he concisely recounts the information which he obtained there. I quote directly from his report:

> At the present day in no other part of the world, so far as I am aware, are there equally complete, well-conducted, and successful leper-asylums as in Norway; and the physicians in charge are often eminent men, versed in modern science and of European repute.
>
> These advantageous conditions form a most striking contrast with what is known of the arrangement and direction of the lazarettos of old. They arise, of course, out of the circumstances of the case; here is a decisive experiment, conducted in the eyes of watchful Europe by a nation which, though small in numbers, has yet acquired a high position in the intellectual ranks of the age.
>
> In conclusion, I have sometimes thought that we should be willing to admit more than one mode of origin of leprosy. It is, however, improbable that so characteristic a disease should be due to several general causes; and the more promising inquiry would be that of its origin from a combination or succession of influences, which separately could not produce the affection (C9).

He continued with the following footnote:

> I take this opportunity of alluding very briefly to the latest investigations with which I have become acquainted, from their great interest and value. Dr. G. A. Hansen of Bergen is engaged in a series of inquiries which cannot but throw much light upon the origin and nature of leprosy. These point to the parasitic origin of the disease; and by Dr. Hansen's kindness I have myself seen the minute organisms (a species of *Bacterium*) which are present in living leprous matter taken from the interior of a "tubercle". Should these inquiries terminate in demonstration, it would be necessary to reconsider the topics I have just mentioned, for, as Dr. Hansen justly remarks, if leprosy be shown to be a specific disease (like cholera, syphillis and the exanthemas, etc.), then its propagation by hereditary transmission must be very limited, because no specific disease presents real hereditary characters. Some might admit that the proofs of heredity in disease are of the hypothetical order; and as regards leprosy it is not, perhaps, impossible to understand most of the signs of supposed heredity on the ground of local infection or personal contagion. I now rejoice to hear that Dr. Hansen's investigations are likely to be soon made public, because of the light they will furnish where illumination is much needed (C9).

Armauer Hansen had not only discussed his discovery of the bacillus with H. V. Carter but had also demonstrated the small organisms to him. Carter himself confirmed that he had seen them in material which had been taken from the inner part of a leproma. This occurred in September 1873. I have brought Carter's publication to the attention of a very respected microbiologist who has written about the leprosy bacillus in a large handbook and cites 1880 as the year of the discovery. His answer was that this could be a suggestion that H. V. Carter was not a bacteriologist. But who could be called a bacteriologist in 1873?

As mentioned previously, the grant which Armauer Hansen received in 1871 was given to him by the Norwegian Medical Society in Christiania and, therefore, the report of his research was presented to this society. Older members of Armauer Hansen's family have told me that they are convinced that he sent this report to the Medical Society in the autumn of 1873. On request, the secretary of the society was so kind as to send me the journal of the proceedings for the years 1846-1880. Unfortunately, the journal does not include comments for the years between 1871 and 1875.

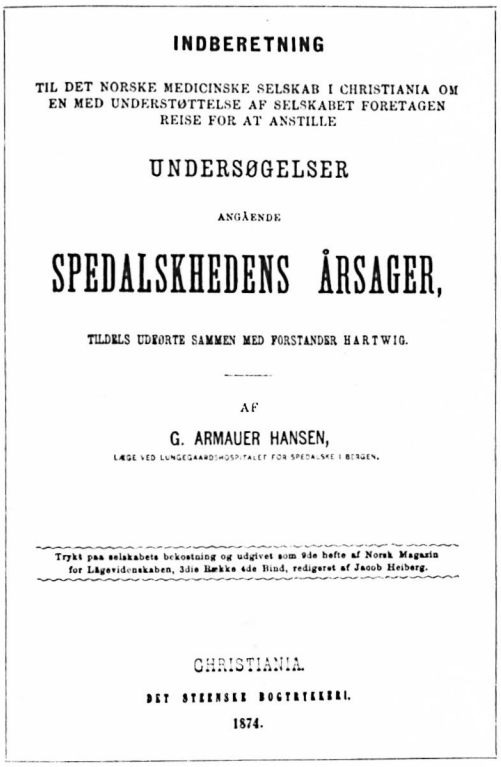
It is quite clear that when the council of this society read his report they considered it so important that they decided to give it special status in their journal, the NORSK MAGAZIN FOR LÆGEVIDENSKABEN (The Norwegian Magazine of Medical Science) (A6). It appeared as No. 9 of Volume 4 of the then current series 3/1874 but with separate pagination; No. 8 of the volume for 1874 ends on page 544 and No. 10 starts on page 545. In No. 9, Armauer Hansen's writing covers pages 1-88, after which case reports of 69 families with leprosy appear on pages I-LIII. Therefore, the report is to be regarded as a supplement to the volume for 1874. In the volume of this journal for 1874 which I have at hand, Armauer Hansen's report is found as a supplement at the end of the volume but his report also exists as a separate publication (C11, C12).

As noted, for the most part this report consisted of data supporting Armauer Hansen's belief in the contagious nature of the disease but it also contained information about his observations of bacilli in lesions. The latter have been translated into English and presented in the INTERNATIONAL JOURNAL OF LEPROSY ([40]) with the editor adding the following footnote:

> From the *Norsk Magazin for Laegevidenskaben* 4 (1874) 76-79. Translated at the National Institutes of Health, Bethesda, Maryland, by Mr. Pierre Pallamary, for Dr. George L. Fite. This material was not in the form of a separate article, we are informed, but was a part of Hansen's annual report for 1873, thus establishing that year as the time he made the observations recorded.

I regret to state that the editor's information is incorrect although I do agree with his statement that 1873 is the year the leprosy bacillus was discovered. In 1873, Armauer Hansen was resident physician at the Lungegaarden Hospital and at Pleiestiftelsen for Spedalske Nr. 1 in Bergen. It was his chief, D. C. Danielssen, who wrote the annual reports and Armauer Hansen's special report was for the Medical Society in Christiania.

It is Armauer Hansen's great achievement to have been the first to suggest that a chronic disease may be caused by a microorganism. He observed the leprosy bacillus in 1873, whereas the tuberculosis bacillus was not discovered until 1882, the typhoid bacillus in 1883, the diptheria and cholera bacilli in 1884, the tetanus bacillus in 1886, etc. We will return to the actual discovery of the leprosy bacillus in the next chapter.



INDBERETNING

TIL DET NORSKE MEDICINSKE SELSKAB I CHRISTIANIA OM EN MED UNDERSTØTTELSE AF SELSKABET FORETAGEN REISE FOR AT ANSTILLE

UNDERSØGELSER

ANGÅENDE

SPEDALSKHEDENS ÅRSAGER,

TILDELS UDFØRTE SAMMEN MED FORSTANDER HARTWIG.

AF

G. ARMAUER HANSEN,

LÆGE VED LUNGESAARDSHOSPITALET FOR SPEDALSKE I BERGEN.

Trykt paa selskabets bekostning og udgivet som 9de hefte af Norsk Magazin for Lægevidenskaben, 3die Række 4de Bind, redigeret af Jacob Heiberg.

CHRISTIANIA.

DET STEENSKE BOGTRYKKERI.

1874.

The title page of Armauer Hansen's description of the leprosy bacillus.

Armauer Hansen in 1873, the year he discovered the leprosy bacillus.

THE SO-CALLED HANSEN-NEISSER CONTROVERSY

Although Armauer Hansen was convinced that the rod-shaped bodies which he had discovered in 1873 were the cause of leprosy, his common and critical sense told him that this was still not sufficiently proven. He knew that Jacob Henle (1809-1865), in his dissertation of 1840 ([27]), had laid down on theoretical grounds certain postulates that would have to be satisfied before any *contagium vivum* (living microorganism) could be accepted as the cause of a disease in man. The way to prove the parasites' etiogenesis was to isolate them and show by experiments that they were pathogenic. These postulates were formulated in 1840 before any human pathogenic microorganism had been seen or discovered. Forty years later these requirements became known as Robert Koch's postulates.

Armauer Hansen knew that none of Henle's postulates were accomplished. Therefore, in the following years he worked incessantly on new investigations in hopes of showing with certainty that the discovered microorganism was really the cause of leprosy. He expanded his material and in all of the leprous nodules from different organs he was able to find the rod-shaped bodies, in accordance with the postulate which stated that the microorganism must always be demonstrated in association with the disease.

Armauer Hansen together with O. B. Bull published a paper, "The Leprous Diseases of the Eye" (A5) in 1873. This paper was accompanied by reproductions of the regressive element of brown color which he had both described and drawn in 1869 in his first preliminary contribution to the characterization of leprosy.

After the German scientists Weigert and Koch had introduced new staining methods, Armauer Hansen tried to stain his bacillus employing these methods. In 1879 while he was

carrying out these investigations, Albert Neisser, a pupil of Robert Koch, visited Bergen in order to study leprosy. Neisser was 24 years old and Armauer Hansen was 38. The young man was cordially received by Armauer Hansen who demonstrated the rod-shaped bodies to him and hoped that Neisser, since he came from Koch's laboratory, would be able to help him with a successful stain. However, Neisser also failed.

When Neisser left Bergen he had in his suitcase a large amount of leprous material that had been given to him by Armauer Hansen. As soon as he returned to Breslau he proceeded to apply recently devised staining methods and with these he succeeded in staining the bacilli so that they could be demonstrated in a much more distinct form than had been possible for Armauer Hansen and the primitive methods he used.

Armauer Hansen and Neisser had totally different natures, Neisser being an enthusiast. Immediately after he had found, in his own words, "to my intense surprise" stained bacilli everywhere in the material he brought back from Bergen he, in the same year (1879), described the bacilli he saw as the causative infectious agent of leprosy. In October he gave a lecture about this in the local association and published a dissertation on his findings ([36]).

In 1955, the two well-known researchers Fite and Wade ([18]) presented a historical overview of the events that followed, the so-called Hansen-Neisser controversy, and they gave a critical analysis of Neisser's contribution to the demonstration of *Hansen's bacillus*. The overview shows how a young man can misuse an older colleague's courtesy and openheartedness and also elucidates on the pursuit of priority in the light of findings which were previously in evidence. Armauer Hansen was a truth-seeker and truth and honesty must be the basic principal of all research. The controversy is interesting and will therefore be referred to in the following pages. Fite and Wade present the following introduction to their overview ([18]):

> There is uncertainty about what role Albert Neisser played in establishing the leprosy bacillus, *Mycobacterium leprae*, as the etiologic agent of the disease—not in its original discovery, the credit for which goes without question to Hansen. Most people today are quite unaware that Neisser comes into the picture at all; in this connection he has been chiefly forgotten. On the other hand there have been a very few who regarded his role as the principal one, and Neisser himself is said always to have felt keenly that he was not accorded his proper place in the picture . . . .
>
> It is most difficult today to realize the skepticism and opposition that Hansen had to face, first when he tried to introduce the idea that leprosy is contagious, and later about the nature and significance of the rod-like objects he observed under the microscope in material from nodules.
>
> As regards the bacillus as the causal agent, the first difficulty was the absence of precedent. As Hansen himself wrote later, the teaching that bacteria cause disease was then in its infancy, and no chronic disease was known to be of bacterial nature. In his earlier contacts with leprosy patients, he occasionally saw one that, "agreed strongly with my idea that leprosy was a disease with a specific cause and not one due to a mode of life or that was inherited." So he had the conviction that there must be a contagious element, and he was driven to hunt for it, although he had never seen any pathogenic bacteria.

There can be no doubt that Fite and Wade with their comments give Armauer Hansen full credit for his discovery of the leprosy bacillus. In connection with this, it is of interest to hear what Neisser wrote in his first article in 1879 ([36]):

> The etiology of this disease is no more determined today than it was three centuries ago. Even during recent decades writers on the subject have vacillated between climatic and social factors, or between heredity and contagiousness, or have incriminated both as being of importance . . .

Neisser discussed his stay in Bergen and mentioned the material which he was provided with and continues:

> Having quickly returned home with this wealth of material I immediately began to study it and to my intense surprise found everywhere bacilli in large numbers, in all 14 pieces of skin and nodules, in the liver, spleen, testes, lymph nodes, and cornea. These rods appeared to be something previously unknown, even as they did to those to whom I had previously shown preparations on the 3rd of September. The singularity of their appearance awakened the hope that further investigations might bring light to an obscure question.

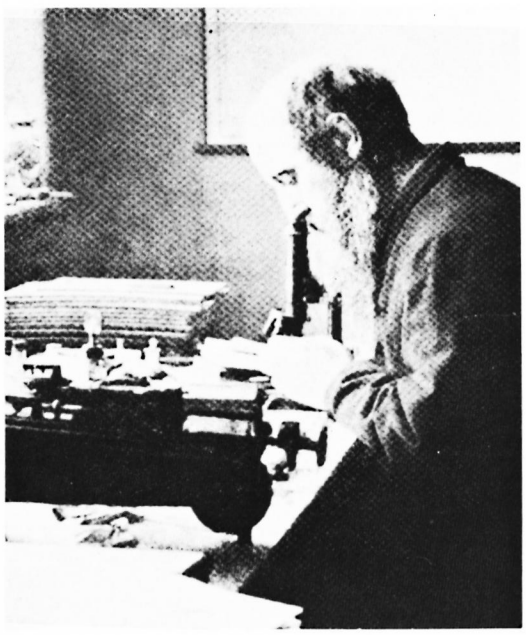
After having read Neisser's article, Armauer Hansen felt that it was now time to publish his discovery in languages other than Norwegian. He quickly wrote a new report which was published in English, German and Norwegian periodicals in 1880 (A9-A11), partly to maintain his priority and partly to provide additional details. The three articles which Armauer

Hansen entitled *"Bacillus leprae"* have been examined and found to be identical. This thrice published article begins with the following paragraph ([18]):

> I had not intended to publish my investigations on this subject yet, but now feel compelled to report what I have accomplished up to the present time in my work on this infectious agent. A few years ago I showed my preparations and communicated my opinions on the parasitic nature of leprosy to a Swedish physician, Dr. Eklund. In a recent brochure, "Om Spetälska", he refers to the specific causative agent of leprosy as something which he himself had discovered in the form of a micrococcus. In addition, Dr. Neisser of Breslau, who spent a part of this last summer in Bergen for the purpose of studying leprosy, has just published the results of his investigations of the preparations which he obtained here. He, too, found the preparations filled with bacilli, which he regarded as species-specific and the causative infectious agent of leprosy, a view shared by the bacteriologists Ferdinand Cohn and Dr. Koch. I am making this report now, partly to maintain my priority in this matter before a scientific public larger than Scandinavia alone, and partly to bring my work up to date with additional details omitted from the 1874 report to the medical society in Christiania because of the then incompletely proven results . . . .
>
> In my previous communication I reported in greatest brevity that I frequently found small rod-shaped bodies in the granuloma cells, and, indeed, routinely on adequate search, whereas they were never found in blood samples. In the basis of recently repeated investigations I am wholly unable to confirm Dr. Eklund's micrococci . . . .[5]

In this article, Armauer Hansen noted that after spending a long time investigating blood samples of leprosy patients without finding bacilli in them he began to study leprous nodules. In his article he entered some of the notes which he made during these investigations.

> Case No. 755—Johannes Gül, vigorous nodules; February 28, 1873. A nodule was taken from each side of the nose with scissors and laid on a carefully cleaned watchglass; cut through the nodules; no softening; scraped the surface with the edge of the knife and placed the parts removed on an object glass and without adding fluid covered it with a glass cover. Almost only round-cells were seen, very few with granules of fat, some finely granulated, others containing rod-shaped bodies which are sometimes bordered by parallel lines and sometimes pointed at both ends. In the latter instance they are about twice as thick in the middle as the others. Such bodies are to be found where fluid-spaces are formed by the pressure of the glass cover surrounded by a dense mass of cells. In these spaces the bodies move in the manner of "bacteria."



Armauer Hansen in his laboratory, ca. 1880.

[5]Editor's note: Dr. Eklund had claimed to have seen "micrococci" in blood samples just taken from leprosy patients.

In the archives of Pleiestiftelsen for Spedalske Nr. 1, where the old records are kept, I have found that of Gül. In the publication the name is misspelled for it is really Giil. He was 12 years old when admitted to Pleiestiftelsen for Spedalske Nr. 1 on August 27, 1866 and died there on January 31, 1874 (C12).

Armauer Hansen did not state specifically that these findings were actually the *first* observations of rods in the little brown bodies but it seems safe to assume that they probably were. If he had seen them earlier he would not have spent as much time investigating blood samples as he did. Therefore, once again it may be concluded that it was early 1873 when Armauer Hansen made his first observations on the leprosy bacillus and that the date of discovery is probably February 28, 1873.

In the following year, 1881, Neisser's next article was published ([37]). He begins by saying that he is not happy about publishing his investigations so soon but adds:

> I wish to have the honor of having given this microorganism, which no one before that time had seen, a place among fungi calling forth disease and this despite the repeated declarations of earlier discovery which the famous researchers (Hansen, Danielssen and Klebs) have endlessly pointed out...
>
> When I was in Bergen in July and August of 1879 Hansen did, it is true, hold the personal (or, as he called it, subjective) view that the "rod-shaped structures" played a role in leprosy, a view which appeared objectively compelling to absolutely nobody at all. Indeed, even his Bergen colleagues granted no significance to his findings, although acquainted with them for years. Some were firm opponents of the idea of contagiousness of leprosy, and I recall very well Danielssen's ironic query, "If Hansen had shown his bacteria to me, too." There was no talk of a "bacillus", and extremely little of staining or culture technique ([18]).

To this article by Neisser, Fite and Wade made the following comments ([18]):

> ... when one looks back at Neisser's first article, and begins to realize the situation, one can understand how Hansen must have felt about it. He could scarcely have failed to be infuriated.
>
> Neisser started out by discrediting Hansen, who had willingly shown him everything he could and had surely been instrumental in providing Neisser's material. Far from genuinely giving Hansen any credit Neisser spent much effort to assert the importance of his organisms as against Hansen's. Hansen must have felt the impudence sorely, especially from a person much his junior in years and experience....
>
> It is difficult not to interpret the introductory remarks in his 1879 article as purposely designed to eradicate Hansen from the picture, even before he got around to getting himself in. He did not succeed, and the palm for the original discovery has been awarded to Hansen. Neisser's complaint evidently received little if any attention at the time, even from his own colleagues, who very likely saw the matter quite clearly and in its true light.

In his *Memoirs,* Armauer Hansen does not devote particularly many words to the subject of the conflict with Neisser. He writes (B101):

> I didn't think there was any particular hurry to publish my discovery since I felt there was still a great deal to be done before one could claim that the bacillus was definitely the origin of the disease....
>
> Danielssen was absolutely furious, though, especially over Neisser's description of his attitude towards my bacillus. He told me off severely since, in his opinion, there was a definite and deliberate attempt to steal my finding. Under the circumstances I felt it prudent to have my observations printed in a German publication. As far as I have been able to ascertain, this effectively established the fact that it was I who found leprosy's origin. In medical literature it is now partly referred to as the Leprosy Bacillus, partly as Hansen's Disease.

After the controversy in the years 1879-1881, some German scientists tried, without success, to call the leprosy bacillus Neisser's bacillus. Later there was a compromise and the designation Hansen-Neisser's bacillus was used, but this was short lived and later it was Hansen's name alone that was attached to the leprosy bacillus.

It has been the tendency to associate the name of the discoverer of a disease producing bacillus not only with the bacillus but also with the disease. In professional journals and especially American ones, it is not infrequent to find leprosy called Hansen's Disease. The latest which I have seen on this subject is a proposal to change the disease's name to "Hansenosis". In itself it can be flattering to have a Norwegian scientist's name as the designation for a microorganism and a disease, but personally I cannot agree with this designation. Both leprosy and the leprosy bacillus are internationally known concepts today which there is no reason to change.

There are some bacteria called acid-fast and both the leprosy bacillus and the tuberculosis bacillus belong to this group. The latter was discovered by Robert Koch in 1882 but it has been increasingly uncommon to see it called Koch's bacillus. The common name today is

tuberculosis and the scientific name, *Mycobacterium tuberculosis*. Likewise, it is natural to continue to call the agent of leprosy the leprosy bacillus, and scientifically *Mycobacterium leprae*.

A SERIOUS SENTENCE

Fite and Wade ([18]) made the following comments on Armauer Hansen's thrice published article (A9-A11):

> If this sounds like a weak article, it is because it is weak. Little new is recorded, and that inadequately. There is no evidence of more than a trivial amount of fresh work. We can but wonder whether between 1874 and 1879, Hansen really appreciated the importance of his observations. (See also C9)

Although the 1880 article gives the date of the first observation of the leprosy bacillus, I agree that otherwise little new is recorded in this article but in this year Armauer Hansen himself well understood the importance of his observations of 1873. During these years one finds sides to Armauer Hansen's work which many scientists, also leprologists, and among these Fite and Wade, are not familiar with. One must to a high degree become aware of Armauer Hansen's advancement in his fight against leprosy. Very early in his examinations of leprosy patients and the spread of the disease he began to have suspicions that leprosy was an infectious disease which must be blamed on a specific infectious substance. In order to accomplish this goal he first intended to obtain a deeper familiarity with pathologic anatomy and microscopy. Bacteriology at that time could be ignored since it was still essentially an unknown concept.

After having acquired this foundation for his further studies, he first spent some time examining the blood of leprosy patients but since he didn't find anything here that could be interpreted as infectious, he started investigating the leprous skin nodules and there found the rod-shaped bodies which, as time went on, he was convinced were the cause of leprosy. On the basis of these investigations and as a result of them, he sensed that leprosy was an infectious, contagious disease and he therefore proceeded to find a means to prevent the spread of the illness since he had as his goal the complete eradication of the disease. And during these years, following his proposal, the first Norwegian law to combat leprosy was adopted.

It is therefore not correct to presume that Armauer Hansen did not understand the full significance of his discovery. But at the same time he was fully aware that if he was to convince the whole scientific world that his viewpoint was correct and that the rod-shaped bodies were actually the cause of leprosy, he must continue to clarify a number of problems. He therefore worked enthusiastically and incessantly to find new evidence for the existence of his rod-shaped bodies. He could have written supplementary reports on his negative results, but his critical nature told him to wait in the hope of giving new positive contributions. How many scientists have not tried, without success, both to cultivate and to transfer *M. leprae* to animals and also to man? It has been time wasted, and most of it has never been reported.

During these years Armauer Hansen tried to cultivate the bacillus on artificial media and to transfer it to animals—all in vain. After having inoculated many rabbits without results, he started to transfer leprous material from man to man. This was not a new idea since leprous material had previously been inoculated into human beings several times in Bergen leprosy hospitals (C8).

In 1844, D. C. Danielssen inoculated material from a leprous nodule into himself and later the same year he inoculated two caretakers and a nurse in St. Jørgen's Hospital in Bergen; all inoculations gave negative results. In the autumn of 1846 a small leprous nodule was placed under the skin of the upper part of Danielssen's left arm and the incision was sutured. The sutures cut through and eight days after the inoculation suppuration occurred, resulting in an ulcer which healed after a few weeks.

In 1856 Danielssen, his medical assistant, the sister, two nurses and a male helper at the Lungegaarden Hospital in Bergen were all inoculated with nodule tissue, blood and pleural exudate. Reactions in the form of slight lymphangitis occurred only after the inoculation of

the pleural exudate. In 1857 several syphilitic and favus patients were inoculated with nodule tissue, and in 1858 Danielssen and a nurse were reinoculated; all gave negative results.

The inoculations were mostly carried out on the upper part and sometimes the lower part of the arm, by using a lancet on which nodule material was placed. The inoculations reached the deeper layer of the skin. The reactions consisted of slight transient rubor and edema in the inoculation area.

Armauer Hansen suggests that it must be regarded as good luck that none of the inoculated subjects got sepsis or pyemia, as firstly, the inoculations were carried out in the pre-antiseptic age and, secondly, pleural exudate was on occasion used in which leprosy bacilli never exist, while other microbes may.

In addition to the nodular and the maculo-anesthetic types of leprosy, mixed cases may also be seen. It was Hansen's intention not only to transfer leprous material from man to man, but also to see if it was possible to make a maculo-anesthetic case nodular. In the first case, a recently extirpated leprous nodule was inoculated under the skin of the lower part of the arm in a maculo-anesthetic patient; no reaction resulted. The second case is more interesting as court proceedings were initiated in connection with it and Armauer Hansen was found guilty (C8).

From the legal proceedings, one gets a good insight into Armauer Hansen's pronounced honesty. While his colleagues and also to some degree the Medical Director tried to minimize the experiment, Armauer Hansen pointed out his real intention, the hope that a leproma would develop in the patient's eye. Both the conditions of the judgement and the sentence itself are interesting so the following transcript of the proceedings will be referred to in its entirety.

May 31st, 1880
The City of Bergen Law Courts
Case No. 99/1880
Legal Proceedings
against
Gerhard Henrik Armauer Hansen

The following sentence was pronounced:

By order in council of 17 April 1880, Gerhard Henrik Armauer Hansen, resident physician at "Pleiestiftelsen for Spedalske Nr. 1" (the leper hospital in Bergen), and medical officer of health for leprosy, was prosecuted for having, on 3 November 1879, used a cataract knife which just previously had been used to cut a nodule from a patient suffering from nodular leprosy, on the eye of another female patient in the hospital.

The defendant, who was thirty-eight years of age, was in 1868 appointed resident physician at "Pleiestiftelsen for Spedalske Nr. 1" by the Civil Government Office. By order in council of 11 August 1875, from 15th of the same month, with six months' notice on both sides, he was also appointed medical officer of health for leprosy in Norway. By the same order the medical officer for leprosy was instructed to serve as resident physician at "Pleiestiftelsen for Spedalske Nr. 1". The latter order was, however, repealed by order in council on the same day as the indictment was made.

The facts are essentially as follows:

On 3 November 1879, the No. 1 deponent, a female patient suffering from the anesthetic type of leprosy, who had been in "Pleiestiftelsen for Spedalske Nr. 1" for seventeen years, was asked during the round to accompany the doctor to the office as he wanted to speak to her. Two other doctors were working there. Although she did not know the reason she had been asked to attend, she stayed anxiously beside the door and started to weep. The doctor asked her to come to the table. She then saw that he had a sharp-cutting instrument in his hand which he brought up to her eye. The deponent is of the opinion that he did not at that time touch the eye, which she safeguarded by holding up her left arm, and at the same time pressed him back with the right one. The defendant states that he made an incision in the conjunctiva of her left eye with the instrument, a cataract knife, which a short time be-

fore had been used to cut into a nodule from a case of nodular leprosy. Although it was his intention, he did not succeed in inoculating the material into the eye, as she did not keep the eye still. One of the other doctors in the room then calmed down the deponent and placed her in a chair. It was then possible to carry out the operation, placing the material from the cataract knife under the conjunctiva of the eye. The deponent is of the opinion that she was inoculated twice, and after the first incision asked the defendant not to touch the other eye, she was afraid she would lose her eyesight, but she was told that she would not.

The defendant, as well as the other doctor, regarded the two incisions as a misrecollection on the part of the deponent who said that she had her hands free during the operation. She pointed out that both incisions were very painful. On the other hand, the defendant suggested that an anesthetic eye should be senseless, but admitted that he had not examined for this in advance. As witnesses the two other physicians declared it to be impossible without preceding examination to state with certainty whether or not the mucous membrane of the eye is anesthetic. One of these physicians, an opthalmologist, was of the opinion that the operation is so harmless that it would not have caused any considerable amount of pain even in a healthy eye, but added that the pain might be aggravated in such a nervous and hysterical subject as the deponent, due to her imagination. He, however, had examined the eye, and found it rather insensitive, although it was not quite insusceptible to touch.

The deponent stated that she had pain in the eye for seven weeks and that it was so strong that it disturbed her sleep. She had not been able to use the eye for reading since.

The defendant stated that instead of the intended growth of a nodule in the eye, the result was an inflammation which could not have caused pains of the severity the deponent had described. In similar cases of inflammation of the eye, he had never heard of aching in the eye and the temples. Such unconscious exaggeration on the part of the deponent may have been a consequence of what the ophthalmologist called her nervous and hysterical condition. The same ophthalmologist had also declared that her impaired vision was caused by another eye disease which had nothing to do with the incision, but might probably have disturbed her sleep. The defendant, however, admitted that he was not justified in carrying out the operation as he had neither obtained her permission in advance, nor told her of his aim in doing it. He had omitted this as he took for granted that the deponent would not regard the experiment from his point of view, and if something happened, he was sure he could get the affection under control.

The defendant then explained the motives for his unjustified operation: Some years earlier he had tried to prove his theory of the infectiousness of leprosy by carrying out experiments trying to transfer the disease to rabbits. As these experiments did not give positive results, he was forced in his report to use his other arguments only and to state that in his search for the causative agent of leprosy, he had seen rod-shaped bodies like bacteria. As a result of a publication by a German physician, Dr. Koch, reporting interesting and convincing examinations in pyemia, septicemia and anthrax, and demonstrating their dependence on bacteria, the defendant learnt a new method for staining microbes. Using this new method, he succeeded, in the autumn of 1879, in demonstrating the bacilli in the leprous nodules much more easily.

The presence of bacilli is not sufficient to prove the infectiousness of the disease; it is also necessary to transfer the bacilli experimentally to animals and human beings. After corresponding with Dr. Koch, and because the unsuccessful experiments on rabbits led him to presume that the leprosy bacillus could only live in man, he started experiments attempting to transfer the bacilli to human subjects. He was of the opinion that he was justified in this, even if the subject should have some pain, because he had chosen a subject who had suffered from leprosy for many years, and therefore would not be exposed to a new disease. He was quite sure that there was no risk of loss of vision, even if the inoculation should have resulted in a nodule. He himself had several times extirpated nodules from eyes without any trouble, and had succeeded in saving the eye-sight. With regard to the question of whether a nodule developing in an eye was able to spread further into the body of the patient, the expert declared that on analogy to all experience from other diseases, it could not be pre-

sumed that patients suffering from the anesthetic type of leprosy would in casu *become inflicted with the nodular type of disease. The defendant, on the other hand, was of the opinion that at the present stage of scientific knowledge it was impossible to know what would happen, but he was convinced that he could counteract the spread in the body by extirpation of a contingent nodule at the start. The great scientific and national importance of finding the answer to the question had therefore forced him to act as he did.*

This, in the main, is the evidence used in the case.

After some arguments and interpretation of the law, the sentence of the court was:

The defendant, Gerhard Henrik Armauer Hansen, will (and here are mentioned the sections of the law used) be deprived of his position as resident physician at "Pleiestiftelsen for Spedalske Nr. 1", and is also to furnish the expenses connected with the case.

This sentence was discussed animatedly and reprobated in most Norwegian scientific circles. It was announced in the court that the case had been submitted to the Director General of the Norwegian Health Directorate, in advance. In a declaration he stated that the experiment carried out by G. Armauer Hansen appeared to him to be no more radical than must be regarded as justifiable, if the patient had given him permission to carry it out, after having been told what might happen. Although the patient had not given her distinct permission for the operation, she had on the other hand not distinctly opposed it. The Director General had therefore decided that there was not sufficient reason to give Hansen other than a serious reprimand.

The Director General was of the opinion that the experiment had been carried out to contribute to a question with the most important consequences for science, the nation and the patients and that it had been performed by a man who had already made considerable contributions to the question mentioned.

Although Gerhard Armauer Hansen was deprived of his position as resident physician at the Bergen Leprosy Hospital, he continued in his appointment as medical officer of health for leprosy in Norway until his death in 1912.

A photostat copy of the sentence is filed in the Armauer Hansen memorial room in Bergen which was inaugurated on 12 February 1962.[6]

This judgement of May 31, 1880 was animatedly discussed in scientific circles and the decision was strongly criticized. Patrick Feeny ([17]) writes that it is true that in those days doctors were a law unto themselves, even more so than today, but that Armauer Hansen went beyond the bounds of what is permissible. The sentence, however, states that even a famous man must obey the country's laws and that the court has to protect each citizen against encroachment by more influential individuals.

As mentioned in the conditions of the judgement, Armauer Hansen had been appointed medical officer of health for leprosy in Norway and the official advisor on leprosy for the Norwegian Government. He held this position until his death.

A STUDY TRIP TO THE UNITED STATES

In the middle of the 18th century there was a great deal of emigration from Norway to the United States and emigration was especially great from the coastal districts of Western Norway where leprosy was widespread. Most of the Norwegian emigrants settled in the Midwestern United States and in this century there are still areas in that part of the country where most of the inhabitants are of Norwegian descent. There are places where they have their own churches and the Norwegian language is still understood by a number of residents.

[6] Editor's note: The above English translation by Professor Vogelsang (in italics) of the court case appeared in Medical History **7** (1963) 182-186. Excerpts from this article also appear on pages 290-291. The same material appears in the Norwegian version of his book on the life of Armauer Hansen. A discussion of this case also appears in the International Journal of Leprosy: Blom, Knut. Armauer Hansen and Human Leprosy Transmission. Medical Ethics and Legal Rights. IJL **41** (1973) 199-207.

It is quite certain that leprosy was an unknown disease in those areas of the United States where the Norwegian emigrants settled and up until that time, the disease had not occurred in these areas. Therefore, Armauer Hansen was of the opinion that it would be very interesting to investigate the occurrence of leprosy among the Norwegian emigrants in these areas. The question of heredity would surely be cleared up by such studies.

Carl Wilhelm Boeck had been in the United States from September 1869 to July 1870 ([2]) and he was given the best possible conditions in which to examine the individuals among these Norwegian emigrants who had leprosy. Of the 18 Norwegians with leprosy that he observed in the United States, nine cases had occurred some time after their arrival in the United States. As a consequence of his observations, Boeck was of the opinion that it was definitely possible for leprosy to break out among individuals who had arrived from Norway and had a predisposition towards the disease. The symptoms might not develop until many years after arrival and might be of great intensity. He further observed that exacerbations of the disease had occurred in the United States among those who had brought the disease with them from Norway.

Boeck expressed the opinion that if he had previously doubted the hereditary nature of the disease, he no longer had any doubts. His opinion was that his observations in the United States gave satisfactory proof for the hereditary nature of the disease, not only among the original immigrants but also among their descendants.

Already in his report of 1874, Armauer Hansen mentions that Boeck had made a study trip to the United States to investigate the occurrence of leprosy among Norwegian emigrants and that the conclusion drawn from this journey was that leprosy must quite certainly be regarded as a hereditary disease. Armauer Hansen felt that the United States was the best place for such investigations since it had been established that leprosy had not previously existed in the areas where the Norwegians had primarily settled. It was, therefore, impossible to put the blame on local conditions or even on changes in living conditions as causes of the disease. He was of the opinion that it was necessary to find out if it was possible to demonstrate atavistic inheritance among the emigrants to the United States of whom one could be certain that they did not have the disease when they left Norway. If it was impossible to find such cases, it would speak against inheritance of the disease. On the other hand, one must bear in mind that in the United States it was absolutely necessary to exclude infection when it was well known that leprosy cases who had many vague symptoms of the disease had emigrated from Norway to the United States. It is known that between 1856 and 1885, at least 52 people with leprosy emigrated to the United States.

Armauer Hansen was of the opinion that it was impossible to ignore the possibility that the cases of leprosy which Boeck had examined in the United States could have either brought the disease with them from Norway or been infected in the United States as a consequence of their close contact with leprosy cases. In this connection he mentions the long incubation period before symptoms appear which may often occur in leprosy.

Although it was more and more generally accepted that Hansen's bacillus was the cause of leprosy, new investigations were necessary to prove it with absolute scientific certainty. The controversy between heredity and non-heredity and the discussion as to whether a contagious disease could really be hereditary continued for many more years. Since heredity could not disappear with emigration to the United States, in 1886 Armauer Hansen asked the Norwegian Parliament for a travel grant to the United States with the hope of solving this problem. However, his application was denied.

Dr. Eduard Bøckmann (1849-1927) had from 1875-1886 been employed as physician for Lungegaarden Hospital and St. Jørgen's Hospital in Bergen and had in addition been resident physician at Pleiestiftelsen for Spedalske Nr. 1 from 1879-1881. He had specialized in ophthalmology and was one of the doctors who had been present in the room in 1879 when Armauer Hansen had made the inoculation in the eye of the female patient at the hospital. As ophthalmologist, he also served as expert in the court. Bøckmann later practiced for two periods of time in different places in the Scandinavian settlements in the Midwestern United States. In 1886 he left Bergen for good and settled in St. Paul, Minnesota. When he heard that the Norwegian Parliament had not made the necessary appropriations to Armauer Han-

sen for a travel grant, he wrote to Armauer Hansen and said that it would be a great pleasure for him to defray the expenses of his trip to the United States. Armauer Hansen was delighted over the invitation from his old friend and colleague and in January 1887 he crossed the Atlantic on board a small steamer which went from Kristiansand to New York.

In St. Paul he was cordially received by Bøckmann and his wife and was treated with the greatest kindness. He stayed there the whole winter, had his office in their home and made comprehensive investigations of the abundant material which Bøckmann was in a position to provide him. With the arrival of summer, he left the Bøckmanns' and traveled around the areas where the Norwegian emigrants had settled, interviewing and examining the descendants of emigrants who had had leprosy. He was fortunate to have had excellent help in his work from two Norwegian doctors, Drs. Hoegh and Gronvold, who had kept records of the Norwegian leprosy cases in their districts.

It was a very hot summer but Armauer Hansen was continually on the move. He was amazed when his driver would cut straight across a hay meadow or through a wheat field without hesitation. Everything was so big in this country that it would have taken a long time to drive around the fields (B101).

Armauer Hansen visited a great number of his countrymen in the United States and it was a pleasure for him to speak with them and become acquainted with the conditions under which they lived. Throughout his whole life he was an advocate of great cleanliness and he noted with pleasure that the first thing a Norwegian farmer seemed to have taught himself in the United States was to heighten his personal hygiene and his instinct for hard work. On his numerous trips around the districts of Norway it had rarely happened that a farmer did not have time to talk with him but this happened often in the United States. Sometimes he almost had to plead for a quarter hour's conversation. It was not because the farmers here were less courteous than the farmers and fishermen in Norway, but because they were so much busier.

Armauer Hansen was very satisfied with his trip to the United States and the results of his studies were exactly what he, from a theoretical point of view, had expected.

> I can in no way accept the idea that the descendants of leprous parents, even under apparently favorable conditions, can develop the same disease. The results of my studies in the United States during the last year seem to me to give full evidence that this is not the case. Among the numerous descendants of people who had leprosy and were living in the United States, it was quite impossible to find a single case that had developed the disease over there.
>
> I regard this as perfectly valid proof of the accuracy of what I, chiefly on theoretical grounds, have insisted to be the non-hereditary nature of leprosy. Because this was just a theoretical claim, I can understand why it wasn't completely accepted. Therefore, my journey to the United States was so important because I hoped to find full confirmation of this veritable truth, a hope which was completely justified.

THE NORWEGIAN LEPROSY ACTS

Armauer Hansen regarded himself as a man who was never afflicted with any particular vanity or personal ambition. Throughout the years his incentive had been whether or not he would really be able to solve the much discussed and unsolved question of the cause of leprosy. If he was able to do this, then the manner in which the disease could be brought under effective control would be much more certain and clearer. He was of the opinion that if the disease was hereditary, there was nothing, or very little, to be done to combat it. On the other hand, if it were a bacterial and infectious disease, there would be a very good chance of being able to do something about it.

By studying the statistics on leprosy in Norway, he came to the conclusion that the precautions which had been taken against the disease so far had contributed to the decrease in the number of cases of leprosy in Norway. He interpreted this as a strong argument for his belief that leprosy was a contagious and infectious disease.

Armauer Hansen's discovery of the leprosy bacillus necessarily brought about changes in ideas, not only as to the cause of leprosy but also regarding the manner in which the disease could be controlled. Fortunately, the then Director General of the Norwegian Health

Directorate, and through him the legislative body, accepted Armauer Hansen's point of view. As Medical Officer of Health for Leprosy in Norway, Armauer Hansen prepared the new Norwegian laws on the disease. The Norwegian Leprosy Act of 1877 and the amended act of 1885 are the fruits of his indefatigable endeavors (C13).

The first Norwegian leprosy law was passed on May 26, 1877 and this law dealt with the care of impoverished leprosy cases. Its most important provision was probably that it prohibited placing these people in "legd", which was a special communal relief system used in Norway for providing for the poor. The poor were sent from farm to farm, staying some weeks at each, during which time the owner of the farm had to provide for them. Such a vagabond type of existence could easily result in the spread of the disease. The law further stated that these impoverished leprosy sufferers, as a rule, must be sent to hospitals or official homes for the poor. If they did not stay in a home, they had to be provided for in a manner permitted by the local health authorities. Husband and wife were not to be separated if they wished to live together, however, they might be separated against their will if the health authorities deemed it necessary. After death, the leprosy patient's clothing had to be disinfected before it could be used by another person. Violation of this law was punishable by fines.

The second law was passed on June 6, 1885 and was more comprehensive with regard to isolation. The health authorities could order leprosy sufferers to live in precautionary isolation away from their families. However, exceptions were made for married couples who desired to live together. Thus, the law of optional compulsory isolation permitted the patient to live at home provided that he observed the specified precautionary regulations (C6).

While the first law did not arouse any significant opposition, this cannot be said of the law of 1885. Despite its leniency, it aroused violent opposition and it was even hinted that the leprosy act placed the persons who had the disease in a class with criminal convicts. Although the law found some warm supporters among some authorities, it was met with severe criticism and strong opposition and was attacked by many leading physicians in Norway at the time. In the name of humanity they protested against "this last drop in the cup of suffering of the leprosy patients." At the Norwegian Medical Society meetings in Christiania there were long and very animated discussions which resulted in the law being almost unanimously disapproved of. Discussions continued in the two Norwegian medical journals, TIDSSKRIFT FOR PRAKTISK MEDICIN (The Journal for Practical Medicine) and MEDICINSK REVUE (Medical Revue) where numerous polemic articles, both pro and con, appeared.

One of the leading opponents of the law was chief physician Nils Wulfsberg in Christiania who wrote an article entitled "Coercion Act and Institutions Against Leprosy" ([54]). This called forth a prompt answer from Armauer Hansen which appeared in MEDICINSK REVUE in 1885 (A17) and contained the following footnote:

> In anticipation I must apologize if my contribution perhaps makes a somewhat complicated impression since I feel bound to comment on Mr. Wulfsberg's disposition of the material in his paper.
>
> The most curious thing in Mr. Wulfsberg's paper seems to me to be that, although throughout his whole article he treats leprosy as a contagious disease, he does not judge the new law from this standpoint. He regards it as sufficient to deal with the law from a humanitarian point of view. It is then necessary first to form and clarify one's own interpretation of what one means by humanitarian with regard to a contagious disease. My own standpoint in this connection is that it is a most human view to protect healthy individuals from contracting the disease. On the other hand, the individuals who have the disease not only have rights as human beings, but also obligations; among these the most important is to not transfer the disease to their fellow men. If it is possible to regard the new law from this point of view, I am of the opinion that it must be admitted that the law is as lenient as possible while at the same time it gives authorities in the different districts the opportunity of taking precautions against leprosy which they themselves find necessary....

The discussions, pro and con, continued and Armauer Hansen took part in them. In TIDSSKRIFT FOR PRAKTISK MEDICIN, No. 19, 1885, I found the following editorial comment:

> If one or another of our honored colleagues should want to continue this discussion in our journal, he will be given permission to do so but we are inclined, as far as it is possible, to avoid personal remarks.

Armauer Hansen made a quick reply to this editorial and I cite the first part of his comments as they give insight into Armauer Hansen's characteristic way of discussing problems (A19):

> I have a certain suspicious feeling that the editorial may refer to my contribution to the matter. If I am correct, as I suspect may be the case in view of common interpretation of personality and personal reflec-

tions, then I must be allowed to state that I do not feel I have used personal remarks other than those necessary to reply to Mr. Wulfsberg's paper regarding the matter. The only expression in my paper which may perhaps, although incorrectly, be regarded as a personal remark is, as far as I can see, my interpretation of Mr. Wulfsberg's reflections with regard to conditions in the county of Southern Trøndheim as unreliable. In my opinion this is a correct statement since it is absolutely true. One cannot win. If you tell the truth about something a person has done, you run the risk of being accused of being too personal yet if you only tell nice things you are not being truthful. In my opinion, the impression which I have given of Mr. Wulfsberg's argument regarding the matter in question is not only correct but it may also be proven that this is the case. If this may possibly be unpleasant for Mr. Wulfsberg, it is not I who should bear the blame. When one fences, one must not lay oneself open and it should not be forgotten that Mr. Wulfsberg started the fencing....

It is obvious that isolation in itself must always involve certain disadvantages for the individual who must be isolated but this cannot be avoided. In this respect we must weigh the disadvantages against the advantages which the community may derive from the isolation. I believe that I am a full-blooded friend of liberty who wishes to place the individual's freedom high yet at the same time I am a member of the community and, as a citizen, often find that this conflicts with my individual instinct for liberty. I have carefully turned this over in my mind and have come to the conclusion that it is quite simply a question of power. Who has the right—the single individual or the community? A person who suffers from a contagious disease is able to transfer this disease to his fellow men as long as they do not put up a defense or are unable to defend themselves. Nevertheless, it must be admitted that healthy human beings must be allowed to defend themselves against a contagious disease if they are able and willing. If it should happen that the healthy individuals find the contagious disease so unpleasant and dangerous that they, for no price, will submit to the possibility of contracting it, I believe that there are only two alternatives; either the healthy people must evacuate or the sick people must be put outside of the community, in other words, be isolated. If the sick person has any social feeling he will be willing to be isolated to prevent the transfer of the disaster to his fellow men. If he does not have this feeling, then there is no other alternative than to use force.

The discussion continued. However, in view of the excellent results derived from these precautionary health regulations, opposition to the law gradually ceased. As time passed, all attacks disappeared and the humane and careful manner in which the law was practiced silenced all protests. In some cases, admission to the hospital gave rise to some resistance on the part of the patient, owing to old superstitions, but as a rule it was easy to convince the public of the usefulness of these measures. The Norwegian Leprosy Act later served as a model for leprosy legislation in many other countries which suffer from this dreadful disease. The Norwegian Tuberculosis Law of May 8, 1900 probably would not have been passed if the leprosy law had not shown such good results.

THE DECLINE AND ERADICATION OF LEPROSY IN NORWAY

In about 1780, the last German medical officer in Bergen, J. A. W. Büchner, tried to cure some cases of leprosy with specific baths and diet ([49]) but, despite temporary improvement, did not succeed. He said, "After this unsuccessful attempt, there is nothing to do but to relegate the lepers in their tragic suffering to an earlier or later death, in that one regards their suffering as being incurable." After this pessimistic statement, however, Büchner attempted to limit the further spread of leprosy. He turned to the clergy since he felt that the clergymen were more universally trusted by the people than were the physicians. He gave them written rules with regard to regimen, cleanliness and bathing and asked for their support in his project. With the cooperation of the clergy and due to fear of the disease, his rules were partly followed by the population. Throughout the 45 years in which Büchner was on duty in Bergen, he kept a detailed record of the yearly admissions to St. Jørgen's Hospital and could declare that during those years the admissions had decreased from 14-17 to 8-10 per year.

Büchner did not give up hope that it would eventually be possible to eradicate the disease so that these human beings would not be lost to the community or to their families. However, he was of the opinion that this was not possible without financial aid from the government and without the help of both time and patience. He said, "It would be a great triumph for physicians and would give them praise and an unforgettable monument in the eternal temple."

Büchner left Bergen in 1803 and 70 years were to pass before the discovery of the leprosy bacillus would provide a scientific foundation for effectively combating the disease. In the intervening time, leprosy continued to increase so much that more hospitals for the disease

were needed. Several new hospitals were built and by the end of the 1850's there were 800 beds for leprosy patients. With the hospitalization of so many of the cases of leprosy, the number of cases started to decline. However, it was the discovery of the leprosy bacillus and the execution of the leprosy laws that brought about the real decline of the disease.

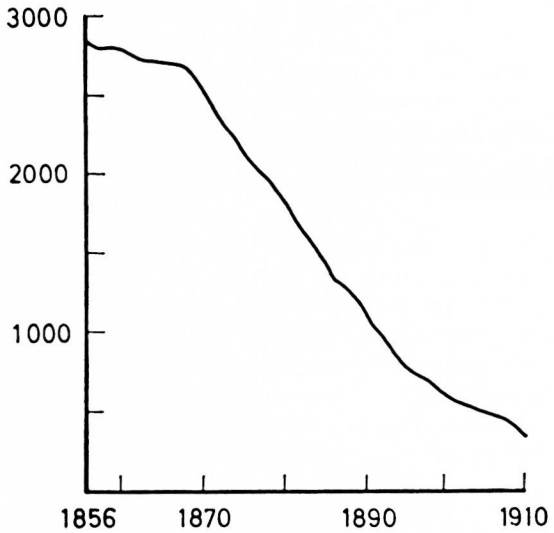
Armauer Hansen modestly says in his *Memoirs* (B101):

> While it is well known that our precautionary regulations have shown good results, I am now the one who gets most of the honor for it. This is undeserved. The original measures against the illness were already being formulated when I was a little boy who knew nothing whatever of the problem. I only happened to be fortunate enough to discover the cause and to prove that safeguards previous to my time had been correct and beneficial.
>
> My personal accomplishment has been to give the regulations rational proof and, to some degree, to widen them on the strength of having found the starting place of the affliction. I am satisfied with having done this much. It leaves me with the knowledge that my life has been of some use and that I have faithfully served my country.

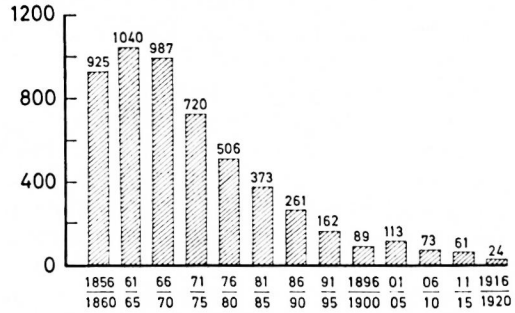
The first reliable census of leprosy cases in Norway was taken in 1856 and reported a total of 2,858 cases. In 1875 this had decreased to 1,752 cases. After the implementation of the Leprosy Act of 1885, the disease declined rapidly and steadily as is shown in Figures 1-4.

At the beginning of the 20th century, the number of cases had dropped to 577 and this rapid decline gradually led to fewer admissions and, consequently, more unoccupied places in the leprosy hospitals. In 1895, use of both the Reknes Nursing Home in Molde and the Lungegaarden Hospital in Bergen for leprosy cases was discontinued. The number of patients in the Lungegaarden Hospital had dropped to 42 and in 1895 the patients, the medical library and the research laboratory were transferred to Pleiestiftelsen for Spedalske Nr. 1 and from that time on scientific investigations on leprosy were carried on there. The Lungegaarden Hospital and adjacent area was sold to the town of Bergen which first used it as a hospital for infectious diseases and later, from 1912 on, as a hospital for tuberculosis. Armauer Hansen's only son, Daniel Cornelius Armauer-Hansen (1876-1950), named after D. C. Danielssen, was Chief Physician for tuberculosis at this hospital from 1929-1946. In 1953, the Lungegaarden Hospital was demolished to provide space for the enlargement of the Bergen Railway Station (C11).

As early as 1891, Armauer Hansen's brother, Chief Physician Klaus Hanssen who founded the Norwegian National Association Against Tuberculosis, proposed that the revenues from St. Jørgen's Hospital be used to build a hospital for "consumptives". In 1896 the Norwegian Parliament accepted this proposal and the hospital's revenues were used to build a



Number of cases of leprosy in Norway, 1856-1910.



Number of new cases of leprosy in Norway, 1856-1920.

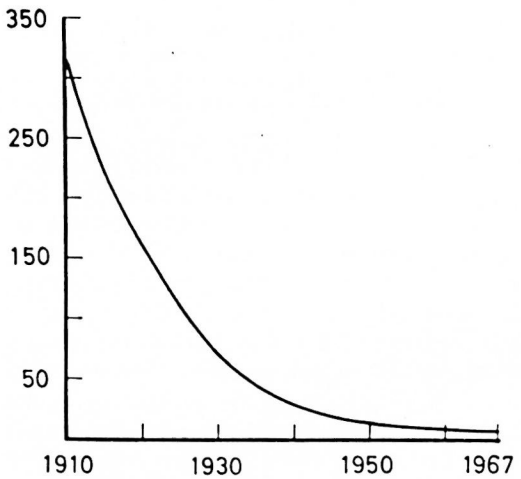
tuberculosis hospital which opened in 1902. However, the number of cases of tuberculosis had also declined so much after the last war that a few years ago the tuberculosis hospital was transformed into a mental hospital.

In 1910, the number of cases of leprosy dropped to 326; in 1920 to 160; in 1930 to 69; and the decline has steadily continued. There are now only four persons with leprosy registered in Norway.[7] After the last World War, in 1951, three new cases of leprosy were discovered (C11). They were two brothers, born in 1913 and 1925 respectively, and a sister born in 1923. They are from a small place outside of Bergen and their family has been infected with leprosy for generations. Thus, their mother and two of her brothers had had leprosy. The mother was admitted to "Pleiestiftelsen" in 1930 and she died in 1933. She had given birth to ten children, three of whom had died in infancy. Her husband and four of her living children are in good health. The progress of the disease in the three children with leprosy has been strangely uniform. In 1940 the youngest noticed that his hands had become thin and, as far back as she can remember, the sister's hands have been thin. For years all three have been plagued by burns on their lower arms and almost simultaneously they suffered a nodular exanthem on body and extremities. Microscopic investigation of a nodule showed typical leprous changes in all three. They are still under treatment. Two of them are employed in the rehabilitation center and one works in an office in Bergen. The fourth person with leprosy is a burnt-out case.

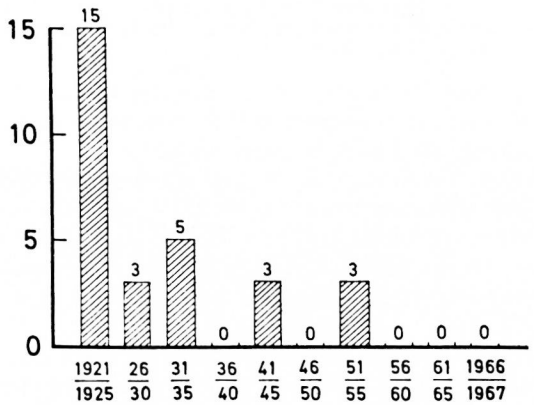
The last medical officer for leprosy, Chief Physician Reider Schøyen Melsom, decided that the situation made his position superfluous so he resigned (C6). He was honorably discharged as medical officer for leprosy on February 28, 1957 and Pleiestiftelsen for Spedalske Nr. 1 was then transformed into a rehabilitation center.

As early as 1896 it was decided that no new cases of leprosy should be admitted to St. Jørgen's Hospital but that the leprosy patients living there could continue to do so until they died. The last two leprosy patients at this hospital died at about the same time in 1946 and since then the hospital has been empty. There was a move to organize a historical medical museum in St. Jørgen's with the history of leprosy in Norway as its central theme. This museum was inaugurated by the Crown Prince of Norway in 1971.

With the resignation of the last medical officer for leprosy, a very long and important chapter in Norway's medical history was brought to a close. Even if some new cases of leprosy, contracted within the kingdom or overseas, should occur, there is no reason to believe



Number of cases of leprosy in Norway, 1910-1967.



Number of new cases of leprosy in Norway, 1921-1967.

[7] Editor's note: It should be remembered that these statistics referred to the situation in 1968 and therefore may have changed by now.

that under the improved hygienic conditions existing in the country today, a new spread of the disease in Norway would be possible. Therefore, leprosy may be regarded as permanently stamped out in Norway today.

Armauer Hansen once said to a peasant farmer that if he grew old enough he might live to see the time when there was no more leprosy in the country and that that would certainly be a most joyful experience. The farmer looked disdainfully at him and said, "You are a big fool. What would you make your living out of then?" Armauer Hansen replied that perhaps his country would not let him starve. The farmer agreed that this might be so but nevertheless it would not be a very splendid livelihood.

Armauer Hansen did not live to see the complete eradication of leprosy in Norway but he did have the fortune of seeing the number of cases of leprosy drop from about 2,220 in the year he discovered the bacillus to about 300 the year before he died.

THE BERGEN MUSEUM

In addition to his medical research Armauer Hansen, especially in his younger years, also carried out other investigations in the natural sciences and in 1872 he had already been elected to the Board of Directors of the Bergen Museum.

In 1825 the Chief Administrative Officer, Wilhelm Frimann Koren Christie (1778-1849) sent out an invitation to found a museum and natural science collection in Bergen, something which had been wanted by the leaders of the community for a long time ([7]). As a result, the Bergen Museum was founded that same year. For a long time Christie himself filled many of the positions at the Museum, acting as collector, technician and curator in both botany and zoology. In 1846 for the first time a salaried curator in zoology was appointed. Dr. Johan Koren (1809-1885) was employed in this position (B20). He was born in Bergen and took his examination for a medical degree in 1836. He held this position until his death but could not handle all of the work. Therefore, a few of the Board members participated in the organization of the collection's steadily increasing material and they also conducted broad independent studies.

D. C. Danielssen became interested in the Museum at an early stage ([6]). In 1852 he became a member of the Board of Directors and in 1864 he became chairman of the Board of Directors, a position which he held until his death in 1894. In his book *Zoologiens historie i Norge (The History of Zoology in Norway),* Hjalmar Broch says about Danielssen ([4]):

> Danielssen was a great personality and he put his stamp on a great many things in Bergen in his time. He was of such importance to the Museum that we can, without exaggeration, claim that the development, right up to the present Museum and University, is a direct consequence of his untiring and determined work to create an important and living scientific center in Bergen. No one else has had as great an influence on the Museum as he had.

Danielssen wanted to have interested young men on the Board of Directors and he wanted them to take part in the work in zoology. It was he who suggested that his younger colleague, Armauer Hansen, should be elected to the Board in 1872. Armauer Hansen had already taken part in zoological research initially working on mollusks and in 1875, together with Herman Friele (1838-1921), another member of the Board of Directors, he published the work "A Contribution to the Knowledge of the Norwegian Nudibranchs" (B3).

In the years 1876-1878 a large Norwegian North Sea expedition was carried out using a ship that belonged to the Navy and the general results of this expedition are of fundamental significance in several ways. The whole of the animal world of the Arctic living deep in the North Sea, chiefly below 600 m., was discovered. The boundary is, however, somewhat divergent in different places, depending on where the warm surface layers collect. For example, at Jan Mayen, where the Polar Stream dominates even the surface water, the arctic fauna come right up to the surface.

The expedition was led by the Professor of Zoology at the University of Christiania, Ossian Sars (1837-1927). He was on board the whole time but at his side for shorter or longer periods of time were Armauer Hansen, D. C. Danielssen and Herman Friele ([31]).

Armauer Hansen took upon himself the task of examining the expedition's catch of annelids and sponges, which resulted in a series of publications which were printed between 1879 and 1885 (B8-B10, B13, B14, B19). He described several new species and named two of the annelids after Danielssen: *Myriochele sarsi danielsseni* and *Cirratulus danielsseni.* Danielssen named a new species of the *gephyrea* (worm-like animals) *Stephanostoma hansenii,* presumably after his deceased daughter Stephanie, who was Armauer Hansen's first wife. Of this work Hjalmar Broch says ([4]):

> When one takes into consideration the medical work carried on at the same time, Armauer Hansen had an unusual capacity for work as he managed to process the material in such a short period of time. But it can't be denied that he probably would have done better to use more time. In today's interpretation, these works are not on an equal level with the world fame Armauer Hansen achieved in medical science.

Following Danielssen's death in 1894, Armauer Hansen became chairman of the Board of Directors of the Bergen Museum and also chairman of its natural history department. He held these honorable positions until his death in 1912, thus being a member of the Board for nearly 40 years and its chairman for 17. During this time the Museum's activities as a research institute developed greatly.

In 1884 the Bergen press supported the establishment of a research institute in Bergen and during the following years the possibility of founding a university in Bergen was raised several times in the press. In 1892, at the general meeting of the Bergen Museum Society, which was the highest court of appeal for all Museum affairs, a new law was passed and in the first paragraph it stated that one of the main goals of the Society's work should be the foundation of a college for Western Norway to be located in Bergen ([32]).

In 1895, one year after Armauer Hansen had been elected chairman, the later rector of the University of Christiania, the well-known geologist Professor Waldemar Christopher Brøgger (1851-1940) was called upon by the Board of Directors of the Bergen Museum to give a public address in Bergen. He gave the address the following title, "Concerning Founding a Free University in Bergen" ([31]). In support of his address, the assembly agreed to appeal to the Museum's Board of Directors to set in motion work for a new university in Bergen, relying on the Bergen Museum, in order to try to collect private contributions and, when possible, get public money for successive reparations for scientific teaching positions. In 1898 the Board decided that the interest of a newly established bequest should be used as salary for two permanent scholarships. The Museum's director at that time, Jørgen Brunchorst (1862-1917) wrote about this ([7]):

> With the bequest's help, the first step was made toward the expansion of the Museum's activities by a connection with other scientific men which is necessary to the assembly's administration, an advance which is not of little significance, that it is progress towards a university, a little advancement but still the first.

In 1899 the Bergen Museum Society set up a committee consisting of Armauer Hansen and six other Bergen physicians who were instructed to work out, as far as possible, a survey of the cost of founding and running a medical college in Bergen. Despite the fact that the committee reduced the expenses to the lowest possible level, the Museum's Board of Directors found that the project would entail such a great sum of money that the matter had to be put aside for the time being. However, Armauer Hansen brought the case up for further discussion in 1902 (B91). He suggested that the first part of the medical studies, i.e., the preclinical subjects, should not be taught in Bergen since the institutions needed for these studies would involve considerable expense. Instead, they should be content with a medical school for clinical teaching which would be attached to the hospital departments and institutions that were already existing and expanding. In further discussions of this subject, Armauer Hansen insisted that it was his opinion that one should not only think of the present but also take future conditions into consideration. He stressed that within 50 years time at least two training centers for medical students would be needed in Norway and that it would, therefore, be best to prepare for this in advance (B96).

> It is therefore my view that we should now work to ensure that our town shall be the second center of culture in this country and in doing this we shall not only be doing something that must be considered useful for the country but we shall be helping ourselves at the same time.

It was later proven that Armauer Hansen was right when he said that at least two training centers for medical students were needed in Norway. Because of the great flood of students to the medical faculty at the University of Oslo, the medical institutions and departments were increasingly overworked. Because of this the University had to limit the number of medical students which it could admit each year. In 1942, during the German occupation of Norway, the Germans closed the University and sent the students to Germany. When the students returned after the Liberation, the number of medical students to be taught was so great that the University could not handle them all. Consequently, in the autumn of 1946, clinical training for medical students was begun in Bergen and on August 30, 1948 the University of Bergen was founded. Armauer Hansen's idea was, in fact, followed, the medical training being limited to a clinical-medical faculty and it was not until 1964 that the preclinical subjects were also included.

Lectures have been held regularly at the Bergen Museum since 1904. In 1907 the Board of Directors decided that those in charge of the Museum's collections and institutes should give scientific instruction, the extent of which was to be decided upon by the Board. The Bergen Museum had been the private property of the Museum Society. As a result of the Board of Directors' action a teaching position in zoology was established in 1907 and a Swedish scientist was appointed to the post. In the same year the Museum Society's general assembly agreed on a proposal which, in any case, took the shape of a vote of no confidence in the Board of Directors ([32]). The one who made the proposal was E. I. Hambro, father of the President of Parliament C. J. Hambro. However, the chairman, Armauer Hansen, made it clear that he did not intend to resign from the Board of Directors and the remaining Board members were of the same view. The resolution caused the general assembly in 1909 to vote new funds for the Museum and it was stated that the Bergen Museum was an independent scientific institution which, on the lines of the University of Christiania, stood on the same level as other official institutions and enjoyed the same rights. At the same time, the role of the Museum Society was limited to supporting the Bergen Museum and its activities, particularly with regard to the development of a college for Western Norway.

The last great question that came before the Directors of the Bergen Museum while Armauer Hansen was chairman came in 1911 with the extension of the premises of the research institute. This followed the purchase of a considerable number of buildings in the vicinity of the Bergen Museum. Space was available in these buildings for an oceanography laboratory near the biological station. In 1912 this station obtained its own ship ([26]) and nothing was more natural than to name it after Armauer Hansen who, during his many years as chairman of the Bergen Museum, had shown:

> A warm interest in its progress and was always ready to support it with the weight that was associated with his famous name. As he was entirely convinced of the significance of research as the basis of all cultural progress, he never tired of working for the development of this institution.

In 1887, the Bergen Museum took over the publication of NATUREN (Nature), an illustrated monthly magazine on popular science ([29]) which, at that time, was in its tenth year of publication. During the first years, Danielssen and Armauer Hansen were members of the editorial committee. This was of great significance, not least of all for the teaching staff, since it enabled them to follow scientific progress through more reliable channels than the daily press as they had no other opportunity to keep themselves up to date with the strictly scientific papers. The magazine managed to survive the test of time and in 1973 its 97th edition was published by the University Press in cooperation with the University of Bergen, with one of the university professors serving as its editor.

When Armauer Hansen died, the editor of NATUREN, Jens Holmboe (1880-1943), wrote the following about his influence on the development of the Bergen Museum ([28]):

> The reason Armauer Hansen had such strong feelings for the Museum and could give this institution such a prominent place in his interest and his work, was surely first and foremost that he was instilled with the firm conviction of the great significance of research as the basis of every cultural advancement. He himself had, through discovery of the leprosy bacillus, provided the most striking example of how much can be given to our fatherland and to the whole welfare of mankind through a single scientific discovery. He did not hesitate to use strong words when it was necessary to stress the rights of science. And he felt that the authorities could never give too much for its advancement. He also felt that the rich who owned more than

they needed to keep themselves and their families, could not gain greater virtue than by making donations to the advancement of science. He stressed that a research institution that was carrying out fruitful work was in continual need of more money and, though he might put himself in an uncomfortable position, he did not hesitate to do so when he promoted the cause of research and the Museum.

BACTERIOLOGIC WHALING

In the archipelago some miles west of Bergen there is a little bay in a fjord which has a narrow entrance, is long-drawn and ends abruptly without a thoroughfare. Every year during the months of April-June the great whale *(Blaenoptera acutorostrata)* often strays into the bay where it is caught by the local fisherman. The meat, which is eaten, provides a welcome break from their continual diet of fish, and the blubber, when sold, provides an acceptable profit.

Whaling has taken place in this bay in exactly the same way for more than 500 years. This knowledge comes from a description given by the bishop to whom the fishermen had to give some part of their catch. In the spring they have watchmen at sea and when a whale is sighted in the adjoining sound, the fishermen are alerted at once, get into their boats and try to drive the whale into the bay. As soon as this is done they block the entrance with an ordinary fishing net which the whale could easily break but, curiously enough, the whale carefully avoids touching it.

The shooting then begins according to an old method which is their specialty and which is of great interest, not least of all from a bacteriologic point of view. The whale is 20-40 feet long and so spirited that it would be impossible to capture it with the local primitive tools. Therefore, they use what are called "death arrows". These arrows are forged from old iron, preferably from old church hinges or church windows. The iron tip is three to four inches long and is fixed to a wooden pole. When the arrow hits its target, it is only the iron tip that penetrates the blubber and finds its way into the muscles. The wooden pole, which is much broader, breaks off when it reaches the skin. When a sufficient number of arrows have hit the whale, they need only to wait for the course of events to take place.

After the whale has been hit by this type of arrow, the fishermen have to wait for only 24-36 hours before the whale becomes sick, surfaces often, and lets itself be harpooned and killed. A gangrene crust, bloody with rich gas bubbles, forms around the arrow and it was hypothesized that some kind of poisoning had developed. Bergen doctors F. G. Gade (1855-1933) and Klaus Hanssen were the first to state that this poisoning was of a bacterial nature and that upon microscopic examination of the diseased tissue, they found rod-shaped bacteria.

In 1886, Armauer Hansen together with Peter Ivar Nielsen (1855-1938), the Bergen municipal veterinarian, took part in a whaling expedition in order to undertake bacteriologic investigations of the whales' diseased tissue. Armauer Hansen also found rod-shaped bacteria but on cultivation he also found growth of a micrococcus which he felt was the cause of the damage to the tissues surrounding the arrow (B28). In his publications after 1880 (A9-A11), Armauer Hansen strongly criticized the Swedish Dr. Eklund who held that leprosy had as its cause a micrococcus. But now when it concerned the micrococcus which he had found in the whale, he was not so critically inclined against himself. Thus, even eminent investigators can draw faulty conclusions when they do so rapidly and without strictly controlled investigations. The few cultivations which were undertaken had occurred in the hunting area in the pouring rain.

After further cultivation efforts, veterinarian Nielsen concluded that the micrococci must be regarded as a simple accidental contamination and that the rod-shaped bacteria were the actual cause of the whale poisoning. Nielsen had just studied a disease of sheep called braxy and had discovered the bacillus which is the cause of the disease ([38]). In this disease, the sheep suddenly get sick, the abdomen swells on account of gas-production and the animals sometimes die within a few hours. Up until that time it had been assumed that the disease was anthrax, but Nielsen demonstrated that braxy was a specific disease which was caused by an anaerobic microbe known as *clostridium*. With his further studies, Nielsen proved that

the rod-shaped bacilli in whale meat were also gas-producing *clostridium* and were probably identical with the braxy bacillus. Here Nielsen allowed his imagination a little play and wrote ([39]):

> A clever chief may have gotten the idea of "putting evil" (i.e., causing gas-formation) in the large and difficult to handle whale by dipping the arrows into the infiltrated tissue of the dead sheep, shooting the thus treated arrows into the whale thereby killing him. His suggestion was accepted but he, naturally, had not been so dumb as to tell how the arrows had called forth this splendid result.
>
> That the infection remains on the arrow from one year to another is explained by the bacilli readily producing spores. Such spores are able to endure drying out and to remain alive under conditions where the bacteria would themselves disintegrate. The chief surely held this procedure secret and in this way received respect and great profit.

It therefore appears that it was a sheep with braxy that gave rise to this form of whaling which has persisted for 500 years.

Armauer Hansen later took part in several whaling expeditions from this place and it is for this reason and for the following little story that the narrative on bacteriologic whaling has been given. On the other side of Sotra, out through the North Sea, there is a place called Telavaag. During World War II this was a much used point of disembarkation to England for Norwegian patriots. Unfortunately, the Germans discovered this and all of the inhabitants were sent to Germany where many of them died and their home of Telavaag was destroyed when the Germans set fire to their houses.

Before the war, one old fisherman, Halvor Telle fled to his sisters in Fana. Here the local pastor, Th. Hovda, visited him and had many conversations with him. Halvor Telle told the pastor that he had known Armauer Hansen well since they had been whaling together. Among other things, he told him the following story.

> One day when we were together whaling, Armauer Hansen asked me: "How is it possible to know which parts of the whale you have shot, which are edible and which parts are poisoned?" "I will show you," I said and took a slice from the fresh part of the whale and threw it into the sea—it sank like a stone. I treated a slice from the poisoned part of the whale in the same way—it floated like dust. "There you see" I said. "Yes, now I see" said Armauer Hansen. But then I said to him, "You, Armauer Hansen, you are certainly a good scientist. You have found the leprosy bacillus and your name will surely live as long as there are human beings on earth but, alas! alas! alas! At the same time, how silly you are." This received a hearty laugh from Armauer Hansen.

Brinkmann ([3]), who referred to the story in a short article, adds that, of course, it was the abundant gas-production in the gangrenous tissue which caused the slices to float.

PRIVATE LIFE

On January 7, 1873, the same year that he discovered the leprosy bacillus, Armauer Hansen married Stephanie ("Fanny") Marie Danielssen, the daughter of his chief D. C. Danielssen. She was a good-looking young woman, 27 years old. They had a wonderful honeymoon and were both very happy but, unfortunately, she was infected with tuberculosis. The disease progressed rapidly and she died on October 25, 1873. Consequently, Armauer Hansen had no children by this first marriage.

As mentioned earlier, D. C. Danielssen had developed tuberculosis of a hip joint in 1832 and in the following years he had several hemoptyses. He had four children, three daughters and one son, all of whom were infected with tuberculosis and died at an early age. His son was a medical student who was 26 years old when he died.

On August 27, 1875, Armauer Hansen married Johanne ("Hanne") Margrethe Tidemand, nee Gran (1849-1930). She had previously been married to Adolph Tidemand (1845-1873), an engineer and shipbuilder who was the son of the well-known painter Adolph Tidemand (1814-1876). She had two children by this first marriage, Adolph and Constance ("Conny"), who consequently became Armauer Hansen's foster children. Adolph Tidemand was trained as a mechanical engineer and lived abroad for many years but spent his last years in Bergen as a motor vehicle safety inspector. In her youth, Conny Tidemand was a technical assistant at the Gade Institute and later was for many years a secretary for the Society for the Prevention of Cruelty to Animals.

Mrs. Armauer Hansen (nee Gran) just after her marriage to Armauer Hansen.

Armauer Hansen's only child was from this marriage, a son baptized Daniel Cornelius (1876-1950), named after Armauer Hansen's first father-in-law and then chief. Daniel Cornelius Armauer-Hansen, like his father, studied medicine and after receiving his university degree he became resident physician at the Bergen Municipal Hospital where his uncle, Klaus Hanssen, was Chief Physician. The latter was especially interested in tuberculosis and therefore his house provided young Armauer-Hansen with a brilliant insight into and knowledge about the disease and its manifestations. From 1914-1925 he was assistant physician at Pleiestiftelsen for Spedalske Nr. 1 and also had a private practice. The old leprosy hospital, Lungegaarden, had been turned into a tuberculosis hospital in 1912 and in 1929 Daniel Cornelius Armauer-Hansen became Chief Physician at this hospital and held this position until he retired in 1946 at the age of 70. He died in 1950.

In 1908, Daniel Cornelius Armauer-Hansen married Ingeborg von Erpecom (1886-1954) and from this marriage there was also only one child, a son born in 1910 and named Gerhard Henrik after his grandfather. He was educated as a businessman and has lived abroad for most of his life. He is now the director of a large business in Vancouver, Canada.

D. C. Armauer-Hansen's first marriage broke up in 1920 and in 1922 he married Agnes ("Aggi") Alvilde Bjelland, nee Kaltenborn (1892-1972). She was the widow of the director of the Bjelland Canning Company, Stavanger, and had two daughters by this marriage, both of whom are married. She and D. C. Armauer-Hansen also had a daughter who was born in 1923 and named Johanne Margrethe after her grandmother. She married a French painter and now lives in Paris.

D. C. Armauer-Hansen died in 1950 at the age of 75 but his wife still lives. [Editor's note: Mrs. D. C. Armauer-Hansen died in 1972.] In her youth she was a beautiful, lively and charming girl who, up to the present, has retained her appearance and her charm. Armauer Hansen died ten years before she married his son. Consequently, she cannot provide any interesting information about her father-in-law and, unfortunately, her husband destroyed

all of the correspondence between father and son before he died. In the first eight years of their marriage, Mrs. Gerhard Armauer Hansen was still living but she died in 1930 at the age of 81. Aggi Armauer-Hansen remembers the old lady as a lively widow with a good sense of humor. I think she was fortunate to have first met her mother-in-law in her old age because Hanne Armauer Hansen's family had an entirely different impression of her in her younger days.

Her family had lived in Bergen for 400 years. Through marriage the family's members had been tied to and related to almost all of the influential families in the city. Her father, consul Christen Knagenhjelm Gran (1822-1899) ([45]), played a considerable role in Bergen's political, financial and cultural life. He established and for many years ran an impressive company comprising both shipping interests and export of fish. In addition to being honorary consul he held many other positions of trust, both private and public. There were six children from his marriage to Constance Mowinckel (1827-1889), two daughters and four sons ([52]). A younger brother once emphasized that growing up in a comfortable home with a secure cultural tradition often provides good fortune and a sobering influence. It may also foster independence, a high-spirit and liberal ideas. However, he also realized that a wealthy father runs the risk of having children who love pleasure and whose work sometimes may suffer from a lack of active effort.

Hanne Armauer Hansen was the oldest child ([45]). After her came Wenche Gran (1852-1916) who married Johan Wallace Hagelsteen Bøgh (1848-1933) in 1875. He came from a home where literature and artistic interest were very prominent. His father, Ole Bøgh (1810-1872), was a judge in North Hordaland (a county north of Bergen) and his mother, Anna Dorothea Sagen (1805-1850), was the daughter of the well-known literary man and teacher, Lyder Sagen (1777-1850), whose saying "Your speech should be beautiful, clear and dignified" is well known by all people of Bergen and is an expression which people who speak in public and first and foremost in broadcasting, should also remember and follow today.

Johan Bøgh was a personality who spread himself broadly, both when it concerned his interests and his profession. In turn he was a bookseller, a staff member of "Bergens Tidende" (The Bergen Times), theater manager of the National Stage, literary man and journalist. With the establishment of the West Norway Applied Arts Museum he became curator in 1889 and from 1894 was the Director of this museum. He was a member of the Board of Directors of a number of cultural institutions in Bergen and a member of the Science Association in Christiania.

> Johan Bøgh, as leader of the West Norway Applied Arts Museum has from the beginning earned much appreciation and respect within the country and abroad, and he has had the pleasure of seeing his museum grow from a modest beginning to the respect and magnitude it has now assumed.
>
> With his distinctive literary and artistic interests, Johan Bøgh has had a great influence on Bergen's cultural life . . . .

The next youngest of Hanne Armauer Hansen's brothers, Gerhard von der Lippe Gran (1856-1925) is probably the best known. He was a teacher at Hambro's School in Bergen from 1881 and from 1885 was a teacher at the Bergen Cathedral School. In 1900 he was appointed Professor of Norwegian Literature at the Royal Frederik's University.

In 1890 Gerhard Gran established "Samtiden" (Modern Times), a periodical for politics, literature and community matters, which developed into the leading cultural magazine in Norway. He edited this periodical for 35 years and his activity here must be regarded as a remarkable achievement in Norwegian cultural life.

Several other members of this family were also noteworthy people. Some of them were wealthy men with an aristocratic appearance but they were far from being reactionary in their ideas about life. They had a liberal view of life and some of them worked for radical advances for the Norwegian people. Armauer Hansen got along well in this milieu. He acquired a circle of acquaintances who were in accordance with his own philosophy of life and a number of the members of this family, especially the two aforementioned brothers-in-law, were his good friends throughout his life.

Armauer Hansen's second marriage began very happily. The birth of their first and only child drew them closer together and in the first years of their marriage they had a good time

being husband and wife. But, as time went on their behavior changed and Mrs. Armauer Hansen was increasingly difficult to please. She was not satisfied with her husband who she insisted neglected her by being more interested in his research than in his home. She had a sharp tongue and could use words and expressions that hurt people. It was clearly her Bergen tongue that ran away with her. I have this information from letters written by Armauer Hansen to different friends who knew of the situation. But, there are two parts to a marriage. What did Mrs. Armauer Hansen have to say?

It was not so easy to be married to a man who, as time went on, became more and more famous and celebrated. We have only the best impressions of Armauer Hansen when it concerns his work and perseverance as a scientist but how was he as a husband in the little family? Had Mrs. Armauer Hansen reason to be dissatisfied with her husband? The only letter from Mrs. Armauer Hansen which I have read is a short greeting to Karoline Bjørnson in 1883 which does not say much. She thanks her for "En Handske" (a book entitled "The Glove") in that she indicates that "Mrs. Bjørnson has played a role in the fact that such a book came into the world." Armauer Hansen liked "A Visit by Brandes better than The Glove".

One thing which does not speak in her favor is that for a long time her family felt that she was difficult to please and therefore sympathized with Armauer Hansen whom they all praised. For many years her own family would not visit them and when they gave parties they often invited Armauer Hansen alone without his wife. This did not improve the relationship. For several years their only companions were the composer Edvard Grieg and his wife Nina and the composer Iver Holter. They were loyal friends throughout their whole lives.

As time went by and the Armauer Hansens grew older, the relationship between them improved and in their older days they lived a peaceful family life without great conflict. In a letter written in 1900, Armauer Hansen says that he had confidence that their married life was going to be smoother and they became more and more attached to each other as time passed. Thea Hanssen, wife of Klaus Hanssen, spent quite a bit of time with her sister-in-law and, despite the fact that she was aware of her flaws, was impressed by her charm.

South of Bergen, on one of the islands with an entrance to the Hardanger Fjord, Godesund, there now stands an elegant hotel. However, in my youth there was a typical family hotel or inn where families with children and also a large number of youths would spend their summer holidays. It was here that I met Mrs. Armauer Hansen during the first summer after she had lost her husband and also during the following two summers. She was very gracious to me, was always in good humor and each day we had a little conversation. One summer my room was next to Mrs. Armauer Hansen's room and I well remember that she was afraid whenever there was a thunderstorm. A couple of times there was thunder and lightning during the night and Mrs. Armauer Hansen would come into my room in her night clothes with a white cape over her shoulders and ask me to accompany her to her room. She would then go to bed with the eider-down quilt while I sat on a chair beside her bed, holding her hand until the storm was over. At the time I thought this was quite thrilling and that's probably why I remember it.

PERSONALITY

Armauer Hansen was a prominent personality with great intelligence and an impressive working ability combined with tremendous energy and determination. He was a respected man with brilliant powers of observation but he also had a great deal of patience. He was a born natural scientist with pronounced common sense with regard to the realities of life. He lived in a world of palpable forms and it satisfied him. His soul was clear and simple, without mysticism, incapable of artistic refinement, without religious ability yet very sensitive to moral values. Philosophical speculations were beyond his realm of thought and he was a typical representative of what especially the American scientists insist on today: "Facts, only facts." But he believed in mankind and in progress in the world and although everything in the world was not as one wished, life was rich enough. Improvement had taken place and

would continue, thanks to science which had taught us to recognize the truths and which would teach us how to conquer evil. However there were still many unsolved problems and there was much progress yet to be made through continuous scientific efforts.

Earlier we heard that as a boy Armauer Hansen always used the expression "Right is right" and that this expression could be regarded as his motto throughout his life. He was, to a very high degree, of a truth-seeking nature. He felt that he must further that which he considered right and true, either in an oral or written form. Armauer Hansen's first visit to his chief, D. C. Danielssen, has also been previously referred to. It was certainly not a modest young man who made his entrance but, on the other hand, it was also not a case of misplaced arrogance. It was quite simply that he could not keep what he regarded as true to himself. He felt that he had to tell his beliefs to people who he encountered and then either meet with their approval or their indignation. He had no ulterior motives in this but he was exposed to opportunity. He said that it was solely because he believed that the facts of a case should be known and he, therefore, felt impelled to confide the truth to others, rather than keeping it to himself. In his written discussions and in his speeches he could be rather sharp with his opponents when he was forced to defend what he believed to be true and sometimes used extremely harsh expressions. His reply to Chief Physician Wulfsberg after his attack on the amended Leprosy Act has been referred to and here Armauer Hansen used such a strong, perhaps one could call it defamatory, expression as "irresponsible". However, when he was indirectly corrected by the editorial staff he insisted that his designation was justified because his opinion was completely correct since there was evidence to back it up.

It is clear that a man with such a brusque nature would have his opponents and enemies. One does not blurt out an apostolic declaration of the truth which one intends to support and has a compulsion to convince others to accept, without being challenged. There are few people who are as superior as Danielssen was when, after his anger had abated, he overlooked the impertinence. Therefore, especially in his younger days, Armauer Hansen heard many malicious remarks about his radical attitude but such things did not interest him very much. He did not feel like a martyr and overlooked the insults. He had plenty of things to do and felt that what others thought of him was their business.

When he learned about Darwin's doctrines he felt that this newly acquired knowledge, which had a revolutionary effect on his own philosophy of life, must naturally be spread further to others, partly by his book (B23) and partly by numerous articles in the press. This naturally provoked a good deal of controversy, especially among the clergy and religious organizations, and set off many powerful attacks against the blasphemous doctor. Nevertheless, within the local clergy in Bergen there was a single, liberal pastor, Klavenæss, who defended Armauer Hansen, not for his atheism but as a plain, truth-loving soul.

As the years passed by, his tongue and his pen became less sharp and consequently, as happens with so many people in this life and to cite his brother-in-law Gerhard Gran ([19]), "Little by little he conquered all of those he came in touch with by his gentle kindness."

Armauer Hansen was a happy man but he also had some opposition in life and was not completely without worries, but with his talent for the natural sciences he found a field of work which satisfied him and where he obtained invaluable results.

> My personal accomplishment has been to give the regulations rational proof and, to some degree, to widen them on the strength of having found the starting place of the affliction. I am satisfied with having done this much. It leaves me with the knowledge that my life has been of some use and that I have faithfully served my country (B101).

These are the modest words of a man one year before he entered "Nirvana" but at the same time give evidence that he himself was fully conscious of what contributions he had made during his lifetime.

Was Armauer Hansen a one-sided natural scientist who had no other interests in life than his professional duties? From the above we learned that he was also interested in giving common people an impression of science and teaching them about cleanliness and other forms of hygiene. But did he himself, besides his interests in the natural sciences, also have broader interests in music, literature, theater and other forms of art? His chief for several years, D. C. Danielssen, had many interests. He was a member of most of the important cul-

tural societies in Bergen and it was he who encouraged Armauer Hansen, as a young man, to become a member of the Board of the Bergen Museum. Did he also try to get him involved in the leadership of other important societies?

When Armauer Hansen learned to dance, he was very enthusiastic but was told that he was not a good dancer. Undoubtedly one must have an ear for music in order to be able to dance. Perhaps, with his hefty body, he was too clumsy to keep in step with the music. He could hardly have avoided listening to music with close friends like Nina and Edvard Grieg and Iver Holter. It would be inconceivable that there would not be music at social gatherings with them and, although Armauer Hansen himself was not musical, he, like many other less musical people, got pleasure from listening to music. He himself indicated this when in the winter of 1880-1881 he stayed in Paris and visited Notre Dame Cathedral.

> .... I was solemnly affected by the music. The choir sang a hymn accompanied by a small organ, then, at the last line of each verse, the larger organ and the congregation joined in a swelling crescendo. I am not musical but it affected me deeply. I could feel the pulse of it beating in every part of my body (B101).

When he, as an elderly man, visited the Cologne Cathedral in 1906, he was at once drawn inside by the beautiful music in this great church, which alone was enough to put one in a religious mood. During his stay in Vienna he was an enthusiastic theater-goer. Two or three times each week he attended the Viennese Burgtheater to enjoy a good play and in this theater they could really act. He himself says (B101):

> .... Each Sunday was reserved for Shakespeare, a wonderful experience. Less enjoyable was an evening when I saw Goethe's "Faust" after a particularly gay dinner. Before it was over I left thoroughly fed up. Later I decided, though, that I hadn't given Goethe a fair hearing. The champagne I had imbibed beforehand hadn't set the proper mood for the play.

During several stays in Dusseldorf he had been diligent in finding art exhibits until he finally realized that he had no understanding of nor aptitude for enjoying the art of painting. Therefore, when he later stayed in other cities he made no attempt to visit the art galleries but when he came to Venice he got quite a different outlook on the noble, classical figure paintings (B101):

> .... Here in Venice, however, I not only appreciated but marvelled at the paintings in the palaces and the Academy of Fine Arts. The religious subjects I had previously seen had only bored me. They were physically unnatural and the halos around Christ and the saints were less than appealing. In Venice, though, such paintings contained people as they actually were, their facial expressions natural and alive. Little attempt was made to create an image that was schematic or aimed at being supernatural....

One could hardly have been brother-in-law and companion to Gerhard Gran, the well-known Norwegian Professor of Nordic Literature, without gaining an insight into the literature. In his youth, Armauer Hansen read Stuart Mill's works on feminism and he was inspired by Camilla Collett's "The District Governor's Daughter". At that time Norway had a golden luster in literature with many prominent poets. Perhaps the best known of them is Henrik Ibsen. Throughout his whole life, Armauer Hansen never personally appreciated Ibsen but he was inspired by another great Norwegian poet, Bjørnstjerne Bjørnson. They were good friends and often exchanged ideas but they could have highly different conceptions of problems. In the years 1894-1896 they carried on a lengthy dispute in two Norwegian periodicals (NYT TIDSSKRIFT and KRINGSJAA) concerning the inheritance of acquired characteristics. Bjørnson adduced several examples but Armauer Hansen opposed him (B63, B64). The discussion ended when Armauer Hansen refused to discuss the theory of heredity with Bjørnson "since he has committed himself to the occult which believes in mystical forces."

Georg Brandes had, as Danish doctor of philosophy, the right to hold lectures at the University of Copenhagen and he was usually also able to do this in other Scandinavian universities. When an auditorium at the University of Christiania was being sought in 1876, the Executive Committee refused to allow Brandes to set foot in the *Domus academica*. However, four years later he received three votes for and two against his admission to the University's auditorium. The fact that this great cynic and revolutionary man with his terrible opinions had been admitted created a great uprising.

The editor of "Dagbladet", Bergen citizen Lars Holst, suggested that Director Johan Bøgh invite Brandes to Bergen. He was enthusiastic but Brandes stipulated that 200 seats should be booked in advance of the lectures. This was regarded as impossible but Armauer Hansen and Klaus Hanssen guaranteed the amount and Bøgh telegraphed that all was set. It was, at that time, quite a courageous invitation. Brandes came and held six lectures on French romanticism in the great hall of "The Workmen's Association". The rent was 60 crowns per session, which was not unreasonable. There were considerably fewer than 200 in the audience at one lecture. Brandes noticed this and also that in the afternoon there were several subscribers absent. Bøgh apologized and told him that there were two large weddings in Bergen that same day. The meetings were closed with a lecture on Bjørnson, a topic which drew an audience of around 600 and received hearty applause.

Brandes enjoyed his visit to Bergen, a city which fascinated him with its location. The patriarchal conditions moved and amused him but there was no provincial character. On the contrary, it had a European and international atmosphere. He was constantly invited to parties where he mostly met the same circle of acquaintances. He gave a short characterization of the gentlemen: the editor of "Bergens Tidende", Olaf Lofthus, a good mind and a respectable man; City Health Officer Jacob Sparre, an old warm-hearted radical politician; the two outstanding brothers, Chief Physician Klaus Hanssen and Armauer Hansen, exceptional in scientific research and intelligence; art lover Johan Bøgh; the gracious and wise Dr. Joachim Wiesener, etc. Chief Physician Danielssen: "a very handsome elderly gentleman . . . was with his scientific and artistic initiative, the city's vital guardian spirit. One got the impression that he was much loved by the ladies in his young days, just as now in his older days he was admired by the city's gentlemen." Brandes was of the opinion that all of these gentlemen were individualists who could have taken their place in larger communities ([5]). It was in this circle that Armauer Hansen had his companions and here that he felt comfortable and at home.

Besides his scientific publications, Armauer Hansen wrote a series of articles on popular science in magazines and the daily press. He felt the need to spread up-to-date information and make scientific results accessible to the public. In his book on Bergen, Hjalmar Christensen tells ([10]):

> Over a long period of years Armauer Hansen with his popular scientific articles in the local press, spread modern knowledge. He made scientific results accessible to the public, broadening the scope of our ideas, teaching us the scientific view of life with its faithful affection for the truth, its comprehension and intent to understand, and its humble confession of how little we do understand. He has, in his manner of handling the different topics, initiated us into this fund of thinking and the human mortality with which it is inseparably associated. He is one of the bravest and most nobleminded advocates of a liberal and unprejudiced view of life that Norway has had.
>
> . . . . It is not only as an author that Armauer Hansen is a perfect instrument between science and the public. In his "lectures for everybody" he manages to make even public health so interesting to everyone that the great lecture theater, "The Workmen's Association" has been overcrowded. In fact, in this radical research fellow, Bergen has had one of its best "pillars of society".

It is said that Armauer Hansen could not actually be called eloquent but he had a distinct ability to put forth opinions in such a way that he was able to gain support. His language was clear and precise in his popular works as well as in his scientific publications. He had a critical sense and he understood how to illustrate a topic from different points of view before drawing his conclusions. He not only had a searching spirit but also the power of endurance and the energy which was needed in order to achieve his results. When he had to defend his opinion with regard to science and intellectual freedom, his arguments could be both bold and heavy-handed. He could use strong words and abuse his opponents but it was always the subject and not the person that he attacked. At the same time he had a certain sense of humor and a light and easy temper.

On his inspection trips and other travels, Armauer Hansen came into contact with many people from different strata of society. He had numerous friends, not only around the different parts of the country but also outside the Norwegian borders. In private company he was well-liked and entertaining, gracious and straightforward. A Danish colleague characterized him as a modest and unpretentious gentleman in his behavior and possessing such

endearing characteristics that everybody whom he met immediately felt comfortable in his presence. Once he met and got to know a person, he never forgot him. He could keep one enthralled for hours and hours with his amusing stories, of which he had an inexhaustible supply.

Gradually Armauer Hansen developed into a great traveler. At the numerous international congresses and conferences which he attended, often as an official representative, he assumed a central position as the famous man he was. But such things did not make him arrogant. Throughout his whole life he was a modest man without personal ambitions. Gerhard Gran ([19]) said: "A working place and a pipe—and it would be possible to place him anywhere in the wide world." I am not sure that this is completely correct. At times he was a bit of a cosmopolitan but at the same time he always had much of the Bergen citizen in him. He enjoyed the local conditions and worried about not keeping himself up-to-date on local happenings and picking up the local news. Indeed, he said in a letter: "I can very well understand that people who are discomfitted by the weather leave this place if they can. I would do the same if I had the means." It is easy to write like this on a day when the rain has poured down for a long time but one forgets the whole thing when the sun is shining over the city once again. It was surely not the finances that made Armauer Hansen stay in Bergen.

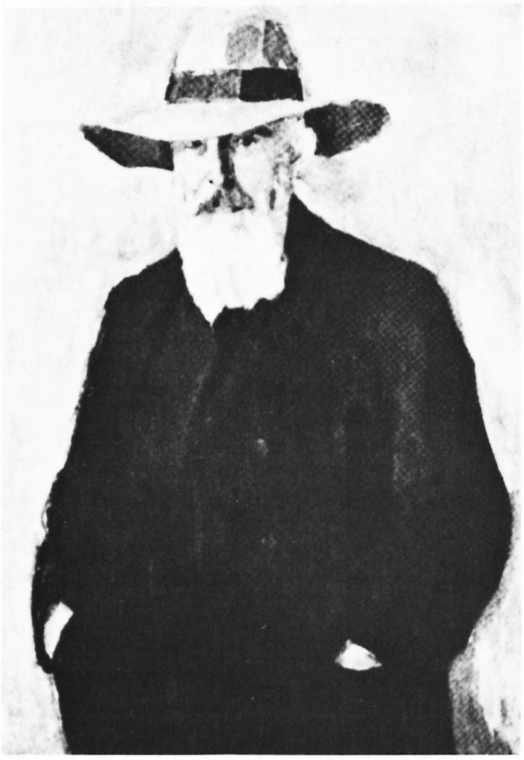
When he finished his work at the Lungegaarden Hospital he went on his daily walk to the Bergen Museum and on the way would visit Johan Bøgh at his office in the West Norway Applied Arts Museum, which lay in the center of the city. Here, as a rule, he received the latest news which he was so glad to get a hold of and then proceeded to the Museum in order to be the first to tell this news to the scientists there. There was something of the cosmopolitan in him but also something of the common man.

Armauer Hansen was undoubtedly somewhat of a joker who liked to play practical jokes but others were also and jokes were sometimes played on him. One day the doctors at Lungegaarden Hospital were the first to discover something or another that had happened in the city. Armauer Hansen hurried to finish at the hospital and left earlier than usual to visit Johan Bøgh. He was very cooly received by Bøgh who asked him why he was so busy telling news that was already known all over the city. What had happened was that one of the doctors at the hospital had telephoned the news to Bøgh as soon as Armauer Hansen had left and he immediately joined in the joke. But, that was not all. Armauer Hansen hurried on further to the Museum to tell the news to the Museum director, Jørgen Brunchorst but Bøgh had, with the help of the telephone, gotten there first. Brunchorst greeted him heartily and immediately said that today he had some news that he thought would really interest Armauer Hansen and he then gave the report. It is said that it was a long time before Armauer Hansen brought news to Bøgh and Brunchorst again.

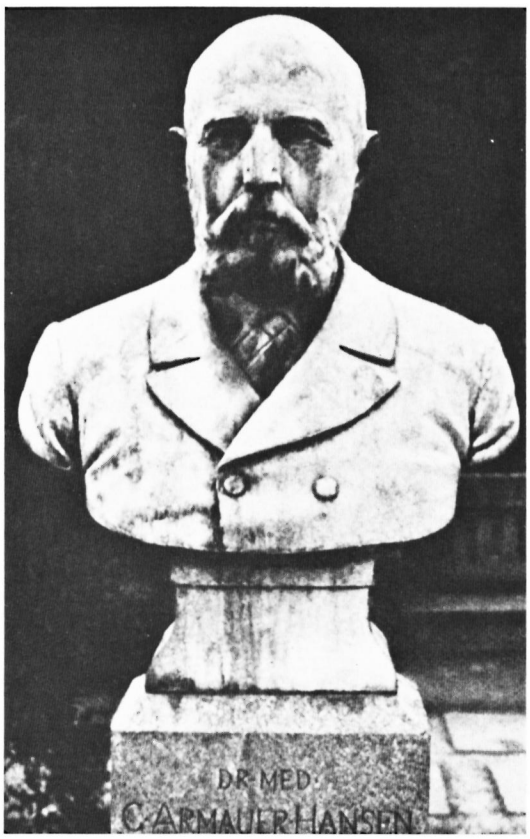
Armauer Hansen was a powerful, well-built man of average height, stocky and broad shouldered, with a strong-featured, attractive face and kind, intelligent eyes. His was a presence which was immediately noticed in even the biggest crowds.

In his last years he lived close by my childhood home. I was 15 years old when he died but I remember him well, looking just like the portrait which was painted in 1908 by the Norwegian artist Henrik Lund, with his wide-brimmed hat, his long gray beard and his double-breasted coat. The material of the suit was simple, it being brown Norwegian homespun. When it was raining, which can happen in Bergen, he had his trousers drawn inside his big boots.

The boys in the district often played tricks and teased the adults but they never teased Armauer Hansen. He was respected by us all since we knew that he, whom we at that time regarded as a very old man, was a famous person. When we passed him on the street we saluted him by raising our caps and bowing. He answered this salute by lifting his right hand to the brim of his hat and smiling at us. It is this pleasant smile that I still remember. It gave us boys the feeling that in this old man we had a steadfast friend who only wished us well.



Armauer Hansen. Oil painting by Henrik Lund, 1908.



Armauer Hansen. Bronze bust by Jo Visdal, 1901.

HONORS AND HONORARY POSITIONS

Besides his position as chairman of the Board of the Bergen Museum, Armauer Hansen held many other positions of honor. He was a member of the Board of the "Society for the Development of the Norwegian Fisheries" and chairman of the "Section of Propagation" as well as a member of the editorial committee of NORSK FISKERITIDENDE, the periodical of the Norwegian fisheries. Through several periods he was chairman of the "Medical Society in Bergen". Representing this society in 1907 he was elected as a member of the Board of the Gade Institute (Dr. F. G. Gade's pathologic-anatomic laboratory in Bergen). The Institute, which was established in 1905 with a donation from Dr. F. G. Gade, has made it possible for his hometown to have a modern and well-equipped institute for pathologic anatomy and microbiology which has benefited the medical scientific life in Bergen.

Armauer Hansen was one of the founders of MEDICINSK REVUE (Medical Revue), a publication which was later taken over by "The Medical Society in Bergen" and in 1939 merged with several other Norwegian journals under the name NORDISK MEDICIN (Norwegian Medicine). Armauer Hansen was a member of the editorial staff of this journal for a number of years.

In 1884 he attended the International Medical Congress in Copenhagen and was elected honorary president of the dermatology and syphilis section. In 1894 he was the official Norwegian delegate at the VIII International Hygiene Congress in Budapest where he read a paper on leprosy. Together with his friend of many years, the Danish dermatologist Dr. Edv. Ehlers, and the German professors Robert Koch and O. Lassar, he took the initiative of hold-

ing an international conference to discuss all of the questions concerning the combating of leprosy. The conference was held in Berlin in 1897 on the invitation of the German government and Armauer Hansen was the Norwegian delegate. He was elected honorary chairman of the conference and read a paper on precautions taken against leprosy in Norway.

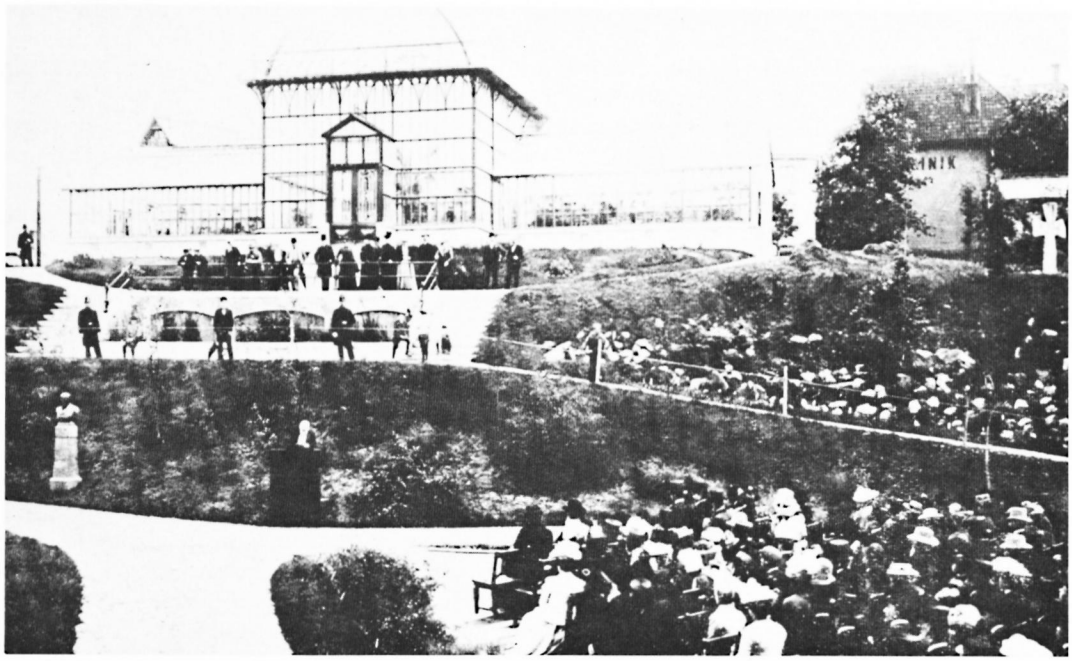
In 1901 he represented Norway's physicians at the 80th birthday of Rudolf Virchow, the central scientific figure in pathologic anatomy. In 1902 he was the representative of the Bergen Museum at the centennial festival of the birth of the famous Norwegian mathematician Niels Henrik Abel (1802-1829). In the same year he was also one of the Norwegian delegates at the inauguration of the new State Serum Institute in Copenhagen, an institute which has developed into one of the most noteworthy in the world. In 1906 he was the official Norwegian delegate at the XV International Congress for Medicine in Lisbon and was elected vice-president of the dermatology section. He read a paper on the prevention of immigration of persons with leprosy. In 1907 he represented the Bergen Museum at the 50th anniversary celebration of the Scientific Society in Christiania and in 1908 he attended the centennial festival of the Swedish Medical Society.

In addition to these honorary positions, Armauer Hansen also received other abundant proof of the position he had earned in the scientific world and a number of manifestations of his fame and recognition gradually began to appear. Already at the First International Scientific Leprosy Conference in Berlin in 1897 he was, without opposition from anyone, declared the discoverer of the leprosy bacillus which was regarded as the etiologic agent of leprosy. The Hansen-Neisser controversy had sunk deep into oblivion.

In 1899 he received an invitation from the Colombian Government to visit Colombia and organize a campaign against leprosy, a disease which was very widespread in that country. Due to internal disturbances, the invitation was later withdrawn. In 1904 the request was repeated but this time without result.

On the occasion of Armauer Hansen's 60th birthday on July 29, 1901, the President and other members of the Board of the Norwegian Medical Association sent out an invitation in 1900 to other representative Norwegians to contribute to a portrait sculpture of Armauer Hansen. The appointed working committee approached Rudolf Virchow who was immediately willing to be chairman of a "Hansen Committee". The invitation was well received and gained general approval. The Norwegian sculptor Jo Visdal was commissioned to model the bust, which was presented to the Bergen Museum and placed in its garden. The formal dedication took place on August 10, 1901 and the commemorative lecture was given by the German dermatologist, Professor O. Lassar. The first part of his speech, translated from the German, follows ([33]):

> Most Honored Hero of the Day; Most Honored Audience!
>
> When the announcement came that Armauer Hansen was 60 years of age everybody was surprised. Some were surprised because they had already known of his great work for such a long time that they thought he must be older. Others, who have had the fortune to know him personally, were surprised that this youthful, healthy and energetic man had already carried six decades on his strong shoulders. His individuality stands forth as if cast of iron. With a clear eye completely free from every prejudice and with broad vision directed toward the great and the whole—so he stands here, a monumental personality. It is exactly in this way that we would like to fix our memory of him at his best age—while he in the autumn of his maturity retains his distinctive characteristics. Not when his early days have passed into memories. No, but now when he is among us, we want to see him as an honored person today and all days. This festival is a personal one, it concerns him alone, this prominent investigator, and is motivated by the empathy that his scientist friends and professional colleagues share with him. His countrymen, with justified pride over the significance of his work, were inspired by the unanimous wish to honor him publicly. They therefore decided to have his characteristic appearance sculpted by a famous artist—Master Visdal has executed this work full of soul and naturalness with perfect artistic hand—and to have his bust located in a special place visible to all.
>
> ....
>
> Our Norwegian friends were right when they believed that this tribute would be more worthy if scientists and friends from other countries joined in. With this in mind we formed the international committee in whose name I have been asked to speak today. The chairman of the committee is Rudolf Virchow who is 20 years older than the man whom we honor today, having his 80th birthday this autumn. He was, as everyone knows, the President of the International Scientific Leprosy Conference in Berlin in 1897 and in this position he has now again gotten in touch with the members and collaborators of this unforgettable assembly for the purpose of honoring our mutual friend, Armauer Hansen. Since other duties have prevented him



Unveiling of the bronze bust in the Museum gardens on August 10, 1901. Professor O. Lassar of Berlin is at the podium and Armauer Hansen and his wife are seated on the first bench to the left.

from being here today, Mr. Geheimer Rath Virchow has entrusted me, as a fellow worker in the same field, to represent him here today. He himself has written the following letter to the man we honor today:

Berlin, 28 July 1901

Most honored friend and colleague!

Unfortunately it is impossible for me to come and personally convey my own tribute and all good wishes from our colleagues. Hopefully Dr. Lassar will be able to do well. I must limit myself to expressing our great fortune that you are still among us and the hope that your working capacity will continue to produce new contributions. May your heart be open for the happy feeling that your work has solved a great and difficult problem forever and that your name is known and celebrated all over the world as a benefactor of the human race.

With cordial greetings of old friendship,
Rudolf Virchow
Also Chairman of the Committee for Your Celebration

After having read this letter from Virchow, Lassar gave a review of the research work carried out in Bergen with regard to both the pathology and histology of leprosy and the discovery of the leprosy bacillus. He regarded Bergen as a college for leprosy research and pointed out that scientists from all parts of the world who wished to pursue leprosy research made the pilgrimage to Bergen.

In addition to the international committee there was also a local committee for the arrangements in Bergen. The Director of the Bergen Municipal Hospital, Jørgen Aal Sandberg (1850-1942), was the chairman of this committee. He was in many ways a distinctive personality, had a good sense of humor and was a bit of a joker. He told me the following story:

When Professor Lassar had returned to Berlin from Bergen he was awarded the Knight's Cross of the Order of St. Olav. Lassar himself was not especially pleased with this decoration. He wrote to Sandberg telling him that several other German scientists had been awarded the Commander's Cross of the same Order and he was of the opinion that he too should be awarded the Commander's Cross.

Sandberg gave him a prompt answer. He drew Lassar's attention to the fact that it was the Norwegian Government who decided if a foreigner was scientifically worthy of being honored with the Order. He said that he personally knew several of the members of the Government and could therefore exert his influence there. On this basis he had easily arranged for Professor Lassar to be awarded the Knight's Cross. However, after Armauer Hansen's celebration in Bergen, there had been a change in the government. Sandberg had

no influence with the new government so it was impossible for him to help Lassar obtain a higher rank in the Order. He must therefore regret that it was now impossible for him to take any further steps in the matter.

Armauer Hansen was the President of the II International Scientific Conference on Leprosy in Bergen in 1909 and was elected as honorary chairman, after Virchow, of the International Leprosy Committee. Together with Hans Peter Lie, who was the secretary general of the conference, Armauer Hansen gave a lecture on the history of leprosy in Norway (A56). The conference was held in Bergen in his honor and was his life's zenith in terms of admiration from his colleagues in the scientific world for the great work he had done. Not only was he the discoverer of the leprosy bacillus but he was also the most eminent scientist in the world with regard to the prophylaxis and combating of this unpleasant disease.

In 1892 Armauer Hansen became a Knight of the Order of St. Olav for scientific merit; in 1894, doctor of medicine *honoris causa* at the University of Copenhagen; in 1901, Commander Second Class of the Order of St. Olav, also for scientific merit; and in the same year he was honored with the same rank in the Danish Order of Danebrog. After the conclusion of the successful leprosy conference in Bergen in 1909 he became Commander First Class of the Order of St. Olav for his work on the combating of epidemic diseases. In addition to these, he was also honored by other foreign orders, including the Prussian Red Eagle Order.

A number of scientific societies honored him by electing him as a member or as an honorary member. He was elected a member of the Scientific Society (Videnskabs-selskabet) in Christiania and of the Norwegian Scientific Society (Kgl. Norske Videnskabers Selskab) in Trondheim; honorary member of the Swedish Society of Physicians (Svenske Läkaresällskapet); corresponding member of the Academy of Medicine (l'Académie de Médecine) in Paris; elected member of the Dermatologic Society (Dermatologische Gesellschaft) in Vienna and of the Society of Anatomy (Société d'Anatomie) in Brussels; honorary member of the "Hufelandische" Society (Die Hufelandische Gesellschaft) in Berlin and also of the Berlin Medical Society (Berliner medizinische Gesellschaft).

As recognition of his scientific and administrative contributions, on April 17, 1901 the Parliament granted him an increase in salary so that his salary would correspond to that of the highest professor.

HIS LAST YEARS

In 1903 when Johan Hjort of Bergen, who was the Norwegian director of fisheries and a member of the Royal Society in London, arranged an expedition to the Arctic Sea, he called a young student to his office and asked him if he would be willing to go along as hydrographer and postmaster. The ship, the "Michael Sars" would have mail for all the seal- and whale-hunters in the seas between Iceland, Jan Mayen and Greenland. The student was overjoyed to have the chance to travel and quickly answered "Yes, thank you" ([22]). This student was Carl Joachim Hambro who later became president of the Norwegian Parliament and the League of Nations and was related to the Hambro family of the Hambro Bank in London. In Norway he is especially remembered for his excellent leadership of the Norwegian people when the Germans invaded Norway in 1940.

When the "Michael Sars" returned to Bergen, Dr. Hjort invited Hambro to an oceanographic banquet at the Hotel Metropole in Bergen where, in addition to the members of the "Michael Sars" expedition, many local celebrities, scientists and the Museum leaders in Bergen were present. Among the guests were the brothers Armauer Hansen and Klaus Hanssen. The young man felt that it was almost as if he had been taken into the Elysian quarters. Hambro was, however, a little surprised by Armauer Hansen who was a great and famous man whom he had looked forward to meeting. The man he met was a kind, talkative and perhaps slightly muddle-headed old gentleman whose stern brother, Klaus Hanssen, kept a close watch on his consumption of alcohol. He therefore rather surprisingly concluded that Klaus, rather than Armauer Hansen, was the brother who was of real significance. Hambro relates that it was the first time he encountered the striking contrast between fame and greatness which would later strike him frequently in life.

When Hambro's "Ungdomserindringer" (Memories of Youth) came out in 1950 ([22]), many in Bergen who knew the two brothers criticized him for what was regarded as a misstatement. When I mention his account here it is because I have intended that this book should not be an ideal, sunny story but rather a critical appraisal of a great man, including both his good points and his faults.

At the time when Dr. Johan Hjort held the above-mentioned dinner party, Armauer Hansen was 62 years old and already a sick man. Three years earlier, at the age of 59, he had shown the first signs of steadily increasing coronary arteriosclerosis. He had consulted his brother, Klaus Hanssen who was a known specialist in internal medicine and had an extensive practice which, if not the largest, was in any case one of the most prestigious in Norway. He was, without doubt, a great personality and a very predominant and active physician. I knew him and know that if his patients did not follow his orders in every detail he was anything but merciful. This was also known, for example, by Alexander L. Kielland. When his weight increased and his heart showed dysfunction, he took a boat from Molde to Bergen but had an excessive dinner in the Hotel Norge before putting himself into the strict regimen in the hospital of Klaus Hanssen.

Klaus Hanssen put his brother on a strict regimen, not allowing him to drink alcohol and strictly limiting his smoking of the pipe which he loved so much. Perhaps Armauer Hansen was not an easy patient and did not take his brother's restrictions as seriously and strictly as his brother intended and, consequently, Klaus Hanssen kept an eye on him and took care of him when they were at parties together.

As a somewhat irrelevant observation it may be noted that D.C. Danielssen had a very large and well-stocked wine cellar. In his will he left half of it to Armauer Hansen and the other half to his brother Klaus who, if not a teetotaler, was at any rate not far from being one. It must, however, be mentioned that in his home he served both wine and brandy to his guests and family.

Little by little, Armauer Hansen's health became more shaky. Already in 1900 he wrote a letter to his good friend, the dermatologist Edv. Ehlers in Copenhagen, in which he stated:

> . . . . I am at the present an unfortunate man with good humor. The reason is that I am not allowed to drink wine and beer, let alone brandy, and am almost not permitted to smoke tobacco because I have begun to show arteriosclerosis. This is hereditary and I have always prophesized that I will die of a cerebral hemorrhage and the devil knows if it isn't more satisfying to drink oneself to death than to live in abstinence perhaps for many years; but life is short and I would like very much to see my son complete his medical studies before I go downwards or upwards since I wish to be cremated. . . .

His son, Daniel Cornelius Armauer-Hansen, passed his medical examinations in 1901.

In the following years he had persistent symptoms of the increasing arteriosclerosis. He had several severe heart attacks which forced him to stay in bed for long periods of time. In between these he traveled, as usual, around the country on his official inspections to keep an eye on the old cases of leprosy and to examine new cases who would eventually be isolated.

As late as August 9, 1911, he wrote a new letter to Edv. Ehlers:

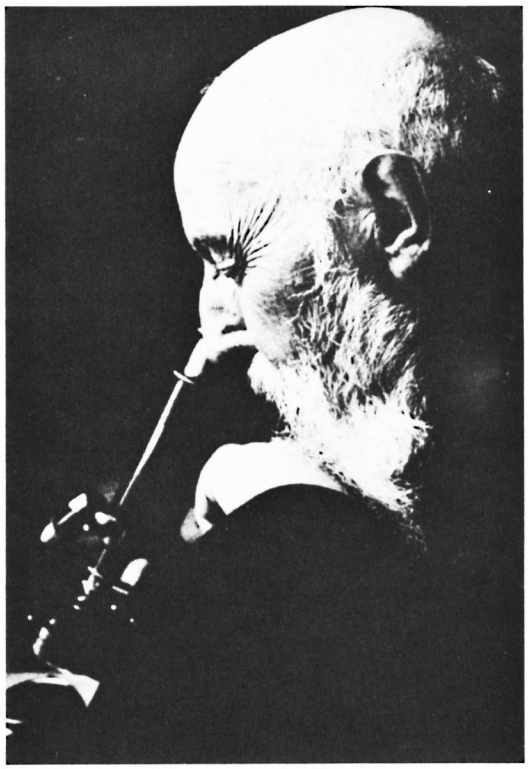
> I think this will be the last time that you will have the opportunity of getting a greeting from me. My heart has now become so arteriosclerotic that it has almost taken my life twice this summer and I feel I may die at any time. However, I still hope to cheat Fate for a few more years.

But this hopeful wish was not to be realized. In February 1912 he made his usual official inspection trip to the districts north of Bergen and on February 11 he visited a good friend in Florø who invited him to stay at his home. Here he was found dead in bed the next morning, February 12, 1912.

He was given the death which he had wished for—coming suddenly while he was still active and not a burden to anyone, and occurring without pain and suffering. A good-natured, kind heart had stopped beating.

COMMEMORATIVE WORDS

The announcement of Armauer Hansen's death came on the same day, February 12, 1912, in Bergen and West Norway's most widely distributed newspaper, "Bergens Tidende".



The last photograph of Armauer Hansen; taken one week before his death.

This is a newspaper which is published in the afternoon. The announcement had the following wording:

> Florø 12 February 1912.
>
> Chief Physician G. Armauer Hansen was found dead in his bed this morning. He was staying as a guest in the house of the administrative official Lind and had spent the night there. Heart failure is presumably the cause of death.
>
> A telegram brought this sad message to Bergen at noon today. On Saturday (February 10) we reported that Chief Physician G. Armauer Hansen was staying in Moldøen. He was to examine the construction of some freshwater wells at several fishing stations. The Chief Physician had just been through a very serious period of illness but now felt well enough that he dared to undertake such a strenuous journey as this in mid-winter.
>
> Now the illustrious scientist is dead and the civilized world will receive these tidings of his death with sadness and will remember with thanks his great work of public service regarding the discovery of the leprosy bacillus. Bergen will feel these tidings of death more heavily than any other town because it was here that he was born, here that he carried out his work and here that he spent his old age.
>
> Most heavy is the loss to his family and his friends who stood closely by him and therefore came to know this great genius. His clear wit and straight, noble character was in close harmony with a warm-hearted personality and a sensitive heart.
>
> The best human being, the best citizen of the country, a benefactor of the human race, has passed away. This inexpressible loss has touched us deeply.

The same evening the Bergen City Council held a meeting. Here the spokesman, shipowner Joh. Ludw. Mowinckel (1870-1943) opened the meeting by telling the members of the Council the sad news that Chief Physician Armauer Hansen had died that day.

> . . . . He has made the name of Norway known over the whole world and has done a favor for his country that has brought happiness and benediction into many homes . . . . He was truly an apostle of light. . . .

The next day the first obituary for Armauer Hansen appeared in "Bergens Tidende" and was written by Hans Peter Lie (1862-1945) who, since 1894, had been the Chief Physician at Lungegaarden Hospital and Pleiestiftelsen for Spedalske Nr. 1 and also physician at St.

Jørgen's Hospital. He had in these years been Armauer Hansen's closest collaborator and had served as secretary general of the Second International Leprosy Conference in Bergen in 1909. He succeeded Armauer Hansen as medical officer of health for leprosy in Norway. Lie first gave a review of Armauer Hansen's *curriculum vitae* and emphasized his discovery of the leprosy bacillus and his persistent work to combat this disease. He finished his article with the following words:

> And we can all say with pride that it is this Norwegian law (the Leprosy Act) which expresses the principles for society's fight against the terrible disease in all countries the world over where these above principles are accepted in the battle against the disease, and this law was the work of Armauer Hansen.
>
> Armauer Hansen has passed away but his life's work is a part of the history of science and has left its mark on intellectual and practical life both here at home and abroad. It will carry his name to coming generations but all who have known him personally will cherish an affectionate memory of his handsome, gracious and sterling personality for the rest of their lives.

During the following days, Mrs. Armauer Hansen received numerous telegrams from individuals and institutions in Norway and in other countries which contained expressions of the warmest sympathy on the loss of her husband. Among these was a telegram from the King of Norway. Numerous medical journals and scientific societies all over the world characterized Armauer Hansen as a benefactor of the human race.

The Norwegian Medical Society in Christiania held a meeting two days after Armauer Hansen's death. The Society's chairman was the Professor of Internal Medicine Peter F. Holst (1861-1935), who in 1889 had been resident physician at Lungegaarden Hospital. The conclusion of his memorial speech, during which the assembly stood, was ([30]):

> Before the Medical Society starts its agenda today, we will remember the bereavement which the Norwegian medical profession has just suffered by the death of Chief Physician Armauer Hansen. I do not need to use many words to this audience to stress the important contribution which Armauer Hansen through his work has made both nationally and internationally.
>
> All of us know the important results of his studies in leprology and all of us know how he utilized his findings practically in combating the spread of leprosy. His predecessors started this campaign but he tirelessly carried it further. We also know how his work, both scientific and administrative, has received appreciation from all over the world in a way which is very rare—if, indeed, it has ever happened to another Norwegian physican. If I in a few worlds should try to describe what especially characterized Armauer Hansen as an investigator and scientist, I think that first and foremost was his indefatigable patience and cleverness as an observer, his common sense with regard to reality which did not leave room for theories and speculations and, finally, the unyielding straightforwardness with which he drew his conclusions, undaunted if they were contrary to popular thought.
>
> Armauer Hansen was of an opinionated nature and it has been said that he could be ruthless and inconsiderate when faced with differing opinions. It is true that he was more a *fortiter in re* than a *svaviter in modo* when it came to defending his opinions but, despite his often provocative comments, he was not an intolerant man. In any case, everyone who has known him personally will know that. He respected an opinion behind which he found a special conviction and, in addition, there was at the bottom of his personality a love of truth, a sweetness of temper and a humor which enabled him to obtain the affection of friends everywhere he went. In the history of Norwegian medical science Armauer Hansen will always be one of the central personalities.

As noted earlier, Armauer Hansen had been one of the initiators of the local medical journal in Bergen, MEDICINSK REVUE, and for many years was one of the editors of this journal. Obituaries for Armauer Hansen appeared in the volume for 1912. The first of these was a memorial speech which Professor Bjørn Helland-Hansen ([25]) gave at the funeral ceremony in the auditorium of the Bergen Museum on February 17, 1912. This speech will be mentioned in the next chapter.

The other obituary was written by the well-known pediatrician, Dr. Carl Looft (1863-1943). In his youth he had been resident physician at Lungegaarden Hospital for four years and at the same time supervisor of its anatomic-bacteriologic laboratory. In 1891 he succeeded in demonstrating acid-fast bacilli in the skin of the anesthetic form of leprosy ([34]). The bacilli's appearance and stainability did not differ from the bacilli which Armauer Hansen had discovered in the nodular type of leprosy. The existence of the same bacillus in both the anesthetic and nodular forms provided the missing link in the chain that joins the causal relationship of the two forms of leprosy. In 1895 Looft, together with Armauer Hansen, published the important work "Leprosy: In its Clinical and Pathological Aspects" (A32, A38).

Carl Looft, who himself was an important medical investigator, admired Armauer Han-

sen. In the obituary he first gave a review of Armauer Hansen's scientific work and administrative ability. He continued with a concentrated characterization of Armauer Hansen's personality. I cite the last passages ([35]):

> All of these great characteristics are understood and recognized by all who have seen him from a distance, but for us who were closer to him, for us who worked together with him and lived with him, his good, kind heart, his friendly hand and companionship, his unostentatious behavior stand in the foreground for others to use and benefit from. And we feel the sorrow of his loss doubly great. These hundreds of small traits which bear witness to his goodness can never be forgotten.
>
> Death has now laid a veil over his outstanding character, but Armauer Hansen's name will shine as one of the country's most illuminating, and Norway's physicians will always remember him with respect and gratitude.

There are many other obituaries which I should have liked to mention but I have concentrated on those written by his closest associates because they not only emphasize his importance as a scientist and administrator but also give us an insight into the considerable human qualities which Armauer Hansen possessed.

In 1900 an international journal of leprosy, LEPRA, was founded. Armauer Hansen was one of the founders and was a member of the editorial staff until his death. This scientific journal did not include biographical data and obituaries, but right after his death his last scientific work was published in this journal (A58).

As pointed out earlier, Armauer Hansen, even before his discovery of the leprosy bacillus, was convinced on the basis of his epidemiologic investigations that leprosy was an infectious disease which did not have anything to do with heredity. After the discovery of the leprosy bacillus he repeatedly tried to show that no hereditary factors existed in this disease. In his last scientific article in LEPRA in 1912 he emphasized his new arguments against this old-fashioned (outdated) point of view and concluded his article with the following words (A58):

> The late Dr. Glück some years ago set forth an idea which he called "paraleprosis" which held that the offspring of leprosy patients should have some symptoms of leprosy, such as thickening of the ulnar nerve and anesthesia, without having leprosy themselves. I have searched for these symptoms in about 250 individuals who are all descendents of leprosy sufferers here in Norway, but I have not found these symptoms in any of them. Consequently I must maintain that in Norway no signs of degeneration in the offspring of leprosy cases is found and I am inclined to believe that they do not occur elsewhere.

THE FUNERAL

After his death, Armauer Hansen's body was immediately transported to Bergen. The Funeral took place here in his hometown on February 17, 1912, five days after his death. He received his last honor by being buried at the State's expense and the ceremony took place in the great hall of the Bergen Museum. On the same day, "Bergen's Tidende" gave a very complete account of the solemn event:

> Bergen had a look of sorrow over itself today. Under the cloudy sky the houses had their flags flying at half-mast — so many flags from both the official buildings and the private homes that they threw a shroud of mourning over the city.
>
> The Museum, where the funeral took place, also had its main flag flying at half-mast and the national colored banners hung perpendicular downward from the roof's moulding. Spruce needles were scattered along the long front of the Museum.
>
> The coffin of the deceased was placed in the great hall and was covered with an unusual abundance of flowers. The pillars were covered only with black drapery. The windows and cornices were similarly covered with black. Palms, myrtles, and garlands of spruce needles brought harmony and bound together the different sections of the great hall. In the niches and around the coffin were placed pillars draped in mourning and on top of them were candelabras with lighted candles.
>
> The coffin was placed in the center of the hall with the head near the bust of Danielssen in the central niche. A half-down-turned flame of gas and the candles flickered in the room. Banners draped in mourning were suspended from the ceiling over the coffin.
>
> The funeral service began at noon. In the preceding half hour the hall filled little by little with a multitude of mourners. The family and relatives were seated around the coffin; the rest of the hall was filled with an assembly of prominent persons, representing all social classes, institutions, associations, science and art, civilian and military authorities — in all about 200 persons.

The theatre orchestra under conductor Heide played Grieg's moving "Vaaren" (Spring).

School principal Bendixen, the Museum's vice-president, opened the ceremony by placing a silver wreath from the Museum with a short, heartfelt speech, in which he gave an expression of the Museum's thanks to the famous investigator, the sharp thinker, and the always benevolent and amiable colleague.

The main speech of the ceremony was not given by a clergyman but by the well-known oceanographer, Professor Bjørn Helland-Hansen. The speech is printed in its entirety in MEDICINSK REVUE [25]. Professor Helland-Hansen began his memorial speech with the following words:

There are many today who wish to bestow upon Armauer Hansen "the last honor". A good way to do this is to think about his life and that which he achieved. A great man as he, with far-reaching significance for the present and future, is best honored by holding before our eyes what he accomplished with his life and this we will now briefly attempt.

Helland-Hansen then gave a short review of Armauer Hansen's life and work and ended his speech with the following words:

He trusted in the goodness of human beings and was happy to know that this also moved forward. He said so often that he hoped he would never become so old that he would not understand that the youth owned the future and would build it. Up until his death he had kept youths nearby and was happy to have youngsters around him. He acquired a large circle of friends among the young people, as he had steadfast friends of all ages, because he himself was steadfast. Therefore, there are many who now feel a personal loss.

But all his greatness—as a professional man and as a human being—has sowed a seed in many minds and will continue to grow even now after he has left us.

Honor his memory for he has been so much to many!

After this speech came the beautiful cantata by Armauer Hansen's brother-in-law, Johan Bøgh, sung by the Craftsmen and Industrial Association Choir under the direction of Ingolf Schjøtt. The melody was composed by Edvard Grieg.

Be Silent Now!
In peace the master sleeps,
he whom the wide world keeps
within its heart.
In peace of death he lies,
now closed his seeking eyes
forever now!

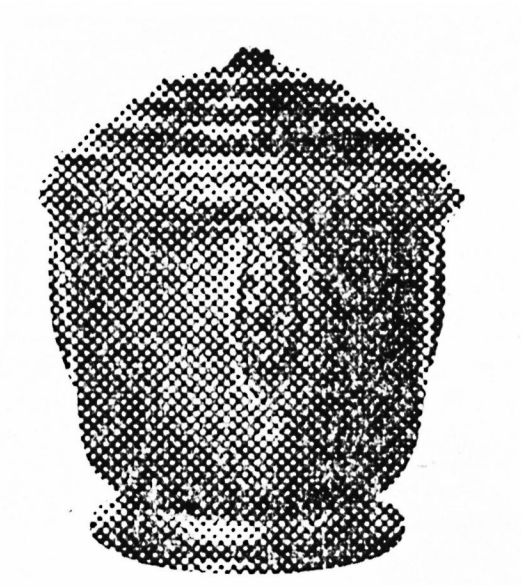
Upright and strong
—beneath the shaded light
or in the thick of strife
Ever upright!
Where'er his mind did seek
he faith and trust did keep
so straight and strong!

Now on this day
the men of distant lands
stretch out their grateful hands
in thanks to him.
Thanks for the hope he sought,
the health his lifework brought
—his lifework long!

O softly now!
as he among us went,
so quiet, so mild, he lent
his strength to us!
His fame in science lay
but first, in every way
he was a man!

In addition to the wreath from the King which had been placed on the coffin in advance, there were wreaths from numerous organizations including the Norwegian Parliament, the City of Bergen, different physicians' associations and a number of scientific and humanitarian institutions. The laying of wreaths was accompanied by short speeches, thanks and commemorative words which, in sum, reflected the great man's far-reaching work in the community and the power of his benevolent personality.

When the laying of the wreaths was finished, the theater orchestra played Tchaikovsky's funeral march. The doors were opened and the coffin was carried out to the waiting hearse. At the head of the funeral procession was the Brigade's Band which played Chopin's funeral march. The Museum Square was blocked by the thousands of bystanders who watched the funeral. A long weaving procession of citizens followed Chief Physician Armauer Hansen on his last journey. His mortal remains were brought to the crematorium.



The bronze urn for Armauer Hansen's ashes made by goldsmith Thorvald Olsen.

At the same time as the ceremony in the Bergen Museum was held, a small funeral ceremony was held at Pleiestiftelsen for Spedalske Nr. 1. A plaster cast of Jo Visdal's bust of Armauer Hansen was decorated with a mourning veil and placed in the large dining room. Here one of the oldest patients in the hospital gave a memorial speech.

On the same day as the funeral was held, his latest popular communication, "Kristendom og Utviklingslære" (Christianity and Evolution) was printed in "Bergens Tidende". This was a topic which, as related earlier, had extremely interested him since his youth when he was staying in Vienna and suddenly learned of "Darwinism".

By royal order of July 12, 1912, and in conformity with the law of June 11, 1898 concerning cremation, paragraph 4, the Bergen Museum was allowed to set up an ash chamber for Chief Physician Armauer Hansen's ashes in the base of his monument in the Museum's garden. This was on the condition that the Museum provide a certificate which was to be legally registered stating that they had bound themselves and future owners of the Museum garden to maintain the ash chamber and the monument.

After the statement was accepted and registered, sculptor Jo Visdal's bust of Armauer Hansen was moved to a better location in the Museum's garden, southwest of the Museum's south wing. A little burial chamber was set up in the subterranean granite base of the monument. On November 12, 1912, the urn was sealed up in this chamber in the presence of the Lord Lieutenant of Bergen, the members of the Board of the Museum and, as a representative for the family—Armauer Hansen's son, Daniel Cornelius Armauer-Hansen. The beautiful urn was made of copper by the goldsmith Thorvald Olsen of Bergen.

When Pleiestiftelsen for Spedalske Nr. 1 was refurbished as a rehabilitation center, a room in memory of Armauer Hansen was set aside. Here are assembled different things from his early office and laboratory at Lungegaarden Hospital and a number of interesting documents are preserved in a showcase. This Armauer Hansen memorial room was dedicated on the 50th anniversary of his death, February 12, 1962.

FINAL REMARKS

I hope that I have given a true picture of Armauer Hansen, his life and his work in the preceding chapters. Like all other human beings, he had his faults but throughout his whole

life he was a distinctive truth-seeker, both in science and elsewhere. It was always the exact, plain truth that he tried to find. With his patient and energetic work he succeeded not only in discovering the leprosy bacillus but he also mapped out the way to combat the disease.

In the time which has passed, there have been extensive scientific studies on the bacteriology and epidemiology of the disease, but today—almost 100 years after Armauer Hansen's discovery of the leprosy bacillus—there is still much lacking in our knowledge. Nobody has succeeded in cultivating *M. leprae* and there are still many unknown factors with respect to leprosy's transmission. However, the precautions that have been taken have proved to be effective and have given good results, not only in Norway but also in other countries where they have followed Armauer Hansen's instructions.

However, even today, there are millions of people, especially in the tropics, who are suffering from leprosy. In the last decades a comprehensive and energetic campaign against the disease has been started in many of these places. Today we have very effective drugs against leprosy and we know how to combat it. Therefore, by continuous, intense work it should be possible—at least within the next 100 years—to eradicate this terrible disease from these places in the world where it continues to plunder and conquer.

Returning, in conclusion, to Armauer Hansen, and thinking of what he achieved in his life, it is easy to understand why he has been called a benefactor of the human race.

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LIST OF NAMES

APPENDIX I

In this appendix Armauer Hansen's publications have been collected with no claim that the lists are complete. His numerous notices, reviews and articles in different newspapers are not included.

A. PUBLICATIONS ON LEPROSY

(A1) Foreløbige Bidrag til Spedalskhedens Karakteristik. (Preliminary contributions to the characterization of leprosy). Nord. med. Arkiv **1** (1869), No. 13, pp 1-12.

(A2) Fortsatte Bidrag til Lepraens (Spedalskhedens) Karakteristik. (Further contributions to the characterization of leprosy). Nord. med. Arkiv **2** (1870) No. 16, pp 1-32; No. 21, pp 1-24.

(A3) Zur Pathologie des Aussatzes. Arch. f. Derm. u. Syph. **3** (1871) 194-211.

(A4) Om vort Kjendskab til Spedalskhedens Aarsager og om vore Forholdsregler mod Sygdommen. (On our knowledge of the etiology of leprosy and our precautions against the disease). Norsk Mag. f. Lægev., 3 series, **2** (1872) No. 2, pp 1-37.

(A5) (With O. B. Bull). *The leprous diseases of the eye.* Christiania, 1873, 27 pp, 6 plates.

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(A15) Om de senere Undersøgelser af Baciller ved Spedalskhed. (On the latest investigations of bacilli concerning leprosy). Norsk Mag. f. Lægev., 3 series **13** (1883) 256-259.

(A16) Die Aetiologie und Pathologie der Lepra. Vierteljahresschr. Derm. u. Syph. **11** (1884) 317-336.

(A17) Tvangslov og Stiftelser mod Spedalskhed. (Coercion act and institutions against leprosy). Med. Revue **2** (1885) 285-290.

(A18) Den nye Lov om Spedalskhed. (The new legislation on leprosy). Med. Revue **2** (1885) 351-364.

(A19) Tvangslov og Stiftelser mod Spedalskhed. (Coercion act and institutions against leprosy). Tidsskr. f. praktisk Med. **5** (1885) 391-397.

(A20) Die Lage der Leprabacillen. Virchow's Archiv **103** (1886) 388-392.

(A21) Die Aetiologie und Pathologie der Lepra. Congrès periodique international des Sciences médicaux, Copenhague, 1886, Vol. III, pp 27-40.

(A22) Die Erblichkeit der Lepra. Virchow's Archiv **114** (1888) 560-562.

(A23) Ist die Lepra eine "im Aussterben begriffene" Infectionskrankheit und ist sie erblich? Virchow's Archiv **120** (1890) 476-486.

(A24) Spedalskhedens Udbredelse. (The distribution of leprosy). Naturen **14** (1890) 38-44.

(A25) Leprøse Testikler. (Leprous testicles). Commemorative publication to Dr. D. C. Danielssen. Med. Revue **8** (1891) 21-28.

(A26) Forholdet mellem Tuberkulose og Lepra. (The relation of tuberculosis to leprosy). Forh. Skandinav. Naturforskeres 14. Møde, København, 1892, pp 509-515.

(A27) On the report of leprosy commission in India 1890-1891. A criticism. Lancet **ii** (1893) 1053-1054.

(A28) Foranstaltninger mod Lepra og Tuberkulose. (Precautions against leprosy and tuberculosis). Med. Revue **11** (1894) 75-78, 144.

(A29) (With C. Looft). Die Lepra von klinischen und Pathol.-anatom. Standpunkte. Bibl. med. int. **2** (1894) No. 2.

(A30) Leprastudiets fremtidige Stilling i vort Land. (The future position of the study of leprosy in our country). Med. Revue **12** (1895) 1-5.

(A31) Spedalskheden paa Island. (Leprosy in Iceland). Med. Revue **12** (1895) 5-6, 365-366.

(A32) (With C. Looft). *Leprosy: In its clinical and pathological Aspects.* Bristol, 1895, 145 pp.
(A33) Om Spedalkskhed. (On leprosy). Hospitalstidende **4** (1896) 103-107.
(A34) Om Spedalskhed. (On leprosy). Ugeskr. f. Læger **4** (1896) 154-155.
(A35) Übertragung der Lepra von Mensch zu Mensch. Mitth. u. Verhandl. d. internat. Wissensch. Lepra-Conf., Berlin, 1897, Vol. 1, Abt. II, pp 1-5.
(A36) Facultative oder obligatorische Isolation der Leprosen. Mitth. u. Verhandl. d. internat. Wissensch. Lepra-Conf., Berlin, 1897, Vol. 1, Abt. III, pp 1-5.
(A37) Nogle Lepraspørgsmaal. (Some leprosy questions). Med. Revue **14** (1897) 324-325.
(A38) (With C. Looft). *Lepra (Spedalskhed). Klinisk og Pat.-anat. fremstillet.* (Leprosy [Spedalskhed]. From a clinical and path.-anat. point of view). Bergen, 1897, 92 pp.
(A39) Leprosy in Norway. Internat. med. Annual, 1897.
(A40) Lidt om Spedalskhed (Lepra). (A few words on leprosy). Naturen **21** (1897) 324-336.
(A41) Spedalskhedens Overførelse. (The transmission of leprosy). Med. Revue **15** (1898) 297-298.
(A42) Lepraens Bekjæmpelse. (The combating of leprosy). Med. Revue **16** (1899) 106-108.
(A43) A rare case of leprosy. Lepra. Bibl. int. **1** (1900) 3.
(A44) On the prevention of emigration and immigration of lepers. Lepra. Bibl. int. **1** (1900) 88-89.
(A45) Dr. Armauer Hansen at a meeting of the leprosy committee in London. Polyclinic, London, 1902. Lepra. Bibl. int. **3** (1903) 260-263.
(A46) Correspondence. Lepra. Bibl. int. **3** (1903) 231.
(A47) *Lepra.* Kolle-Wassermann: Handbuch der path. Mikroorganisnen, Jena, 1903, Vol. II, pp 178-203.
(A48) Fiskespiser som Spedalskhedens Aarsag. (Piscitarianism as the cause of leprosy). Med. Revue **21** (1904) 163-168.
(A49) Paraleprose. Med. Revue **21** (1904) 311-315.
(A50) Paraleprose. Deutsch. med. Wschr. **38** (1904) 1380-1381.
(A51) Abnahme der Lepra in Norwegen. Lepra. Bibl. int. **4** (1904) 235-240.
(A52) Om Paraleprose. Tidsskr. f. d. norske Lægef. **25** (1905) 831-835.
(A53) Spedalskhed. Naturen **30** (1906) 71-84.
(A54) Zu Hutchinsons Fischtheorie. Lepra. Bibl. int. **7** (1907) 27-28.
(A55) Leprosy in Finmarken. Lepra. Bibl. int. **7** (1907) 209-210.
(A56) (With H. P. Lie). Die Geschichte der Lepra in Norwegen. Mitth. u. Verhandl. II Lepra-Conf., Bergen, 1909, Vol. I, pp 52-78.
(A57) Heredity of Leprosy. Commemorative publication to Caesar Boeck. Arch f. Derm. u. Syph. **110** (1911) 225-232.
(A58) Heredity of Leprosy. Lepra. Bibl. int. **12** (1912) 147-154.

B. Publications Concerning Other Topics

(B1) *Bidrag til Lymphekjertlernes normale og patologiske Anatomi.* (Contributions to the normal and pathological anatomy of lymph nodes). Christiania, 1871, 47 pp, 5 pl.
(B2) Untersuchungen über die entzündlichen Veränderungen der Hornhautkörper. Jahrbücher der Gesellschaft der Aerzte in Wien, 1871.
(B3) (With H. Friele). Bidrag til Kundskaben om de norske Nudibranchier. (A contribution to the knowledge of the Norwegian Nudibranchs). Forhandl. i Videnskabs-Selskabet i Christiania, 1875, pp 69-80, 1 pl.
(B4) Anatomisk Beskrivelse af *Chaetoderma nitidulum,* Lóven (Anatomical description of *Chaetoderma nitidulum,* Loven). Nyt Mag. f. Naturvidensk. **22** (1877) 354-377.
(B5) Oversigt over de norske Serpula-Arter. (A survey of the Norwegian Serpula species). Arch. f. Mathematik og Naturv. **3** (1878) 39-44, 3 autogr. pl.
(B6) Anatomie bon *Leanira tetragona.* Arch. f. Mathematik og Naturv. **3** (1878) 352-374, 10 autogr. pl.
(B7) Om Gjæring og visse Sygdommer. (On fermentation and some diseases). Naturen **2** (1878) 133-137.
(B8) Annelider fra den norske Nordhavsexpedition i 1876. (Annelida from the Norwegian North Sea Expedition in 1876). Nyt Mag. f. Naturvidensk. **24** (1879) 1-17, 10 autogr. pl.
(B9) Annelider fra den norske Nordhavsexpedition i 1877. (Annelida from the Norwegian North Sea Expedition in 1877). Nyt Mag. f. Naturvidensk. **24** (1879) 267-272, 2 autogr. pl.
(B10) Annelider fra den norske Nordhavsexpedition i 1878. (Annelida from the Norwegian North Sea Expedition in 1878). Nyt Mag. f. Naturvidensk. **25** (1880) 224-234, 5 autogr. pl.

(B11) Vore fem Sandser. (Our five senses). Naturen **4** (1880): Inledning (Introduction) 1-8; Følelsen (Feeling) 17-21, 33-38; Lugten (Smell) 38-42; Smagen (Taste) 65-68; Hørselen (Hearing) 113-127; Synet (Sight) 161-171, 178-191.
(B12) Om Nerveenderne i Iglens volontære Muskler. (On the nerve endings in the voluntary muscles of the leech). Arch. f. Mathematik og Naturv. **6** (1881) 460-464, 1 wood engraving.
(B13) *Recherches sur les Annelides*... Bruxelles, 1881, 29 pp, 7 lith. pl.
(B14) *Den norske Nordhavs-Expedition 1876-1878. VII. Annelida.* (The Norwegian North Sea Expedition 1876-1878. VII. Annelida). Christiania, 1882, 54 pp, 7 pl., 1 chart.
(B15) Om Opfatning af Glands med ét Øje. (On the conception of glossiness with one eye). Naturen **6** (1882) 30-31.
(B16) Lidt om sopsygdomme. (Something about fungus diseases). Naturen **7** (1883) 9-13, 17-21.
(B17) Sopsygdomme. (Fungus diseases). Med. Revue **1** (1884) 161-169, 193-199, 225-232.
(B18) Biologiens Betydning for det medicinske Studium. (The importance of biology for medical education). Med. Revue **1** (1884) 321-325.
(B19) *Den norske Nordhavs-Expedition 1876-1878. XIII. Spongiadae.* (The Norwegian North Sea Expedition 1876-1878. XIII. Spongiade). Christiania, 1885, 25 pp, 7 pl., 1 chart.
(B20) Konservator J. Koren. Bergens Museum Aarsberetning, 1885, pp 5-8.
(B21) Bericht über Zoologische Untersuchungen in den Sommern 1884-1885 auf Kosten des Museum vorgenommen. Bergens Museums Aarsberetning, 1885, pp 48-54.
(B22) Kort Oversigt over patogene Soppe. (A short review of the pathogenic fungi). Med. Revue **2** (1885) Suppl., 144-145.
(B23) *Afstamningstheorien eller Darwinismen.* (The Theory of the Descent of Man or Darwinism). Bergen, 1886, 84 pp, 2 pl.
(B24) Den naturvidenskabelige Vantro. (The disbelief in natural science). Nyt Tidsskr. **5** (1886) 283-303.
(B25) Instinkt og Intelligens. (Instinct and intelligence). Nyt Tidsskr. **5** (1886) 833-845.
(B26) Mikrober, ptomainer og leukomainer. (Microbes, ptomains and leucomains). Med. Revue **4** (1887) 14-17.
(B27) Den medicinske Undervisning. (Medical education). Med. Revue **4** (1887) 56-63.
(B28) Hvalfangst ved blodforgiftning. (Whaling with septicemia). Naturen **11** (1887) 1-4.
(B29) Sansning hos Smaabørn. (Perception by small children). Naturen **11** (1887) 80-86.
(B30) Nyt Fund af fossile Mennesker i Belgien. (New findings of fossil men in Belgium). Naturen **11** (1887) 113-116.
(B31) Vakcine mod gul feber. (Vaccine against yellow fever). Naturen **11** (1887) 150-151.
(B32) Skorpioners selvmord. (Suicide of scorpions). Naturen **11** (1887) 153.
(B33) Hypnotismen. (Hypnotism). Naturen **11** (1887) 225-240, 257-270.
(B34) Vakcination og Immunitet. (Vaccination and immunity). Naturen **11** (1887) 326-335.
(B35) Lidt om lægeforholdene i Amerika. (The conditions of physicians in America). Med. Revue **5** (1888) 353-356.
(B36) Vakcination med ptomaïner. (Vaccination with ptomaïns). Naturen **12** (1888) 380-382.
(B37) Om sygdommes arvelighed. (The heredity of diseases). Med. Revue **6** (1889) 38-43.
(B38) Metschnikoffs fagocytteori. (The phagocytal theory of Metschnikoff). Med. Revue **6** (1889) 44-47.
(B39) Lidt om disposition til sygdom. (On the disposition to diseases). Med. Revue **6** (1889) 321-326.
(B40) Om arvelighed. (On heredity). Naturen **13** (1889) 133-135.
(B41) Forebyggelse af tæring. (Prevention of tuberculosis). Naturen **13** (1889) 193-195.
(B42) Dyrs og menneskers faste. (Fasting of animals and man). Naturen **13** (1889) 268-269.
(B43) Stivkrampe. (Tetanus). Naturen **13** (1889) 349-350.
(B44) Vore vigtigste næringsmidlers bestanddele. (The composition of our most important alimentary substances). Naturen **13** (1889) 353-358.
(B45) Om desinfektionsovne. (Disinfectors). Forh. 3. norske lægem. (1889) 68-71.
(B46) Sansning hos lavere dyr. (Perception by lower animals). Naturen **14** (1890) 27-28.
(B47) Bacillenes giftighed. (Poisoning bacilli). Naturen **14** (1890) 125.
(B48) Om Uimodtagelighed for smitsomme sygdomme—immunitet. (On irresistability to contagious diseases—immunity). Naturen **15** (1891) 106-109.
(B49) Om sygdommes arvelighed. (Heredity of diseases). Forh. 4. norske lægem. (1891) 19-25.
(B50) Unitarismen. (Unitarianism). Samtiden **2** (1891) 272-278.
(B51) Nogle bemerkninger om immunitet. (Some remarks on immunity). Med. Revue **8** (1891) 113-114.

(B52) Det menneskelige øre. (The human ear). Naturen **16** (1892) 65-68.
(B53) Moskestrømmen. (The Moske stream [Lofoten]). Naturen **16** (1892) 271-274.
(B54) Kolera. (Cholera). Naturen **16** (1892) 274-275.
(B55) Kjævhændthed. (Left-handedness). Naturen **16** (1892) 324-332.
(B56) Latens af sygdomsgifte. (Latency of morbific toxins). Med. Revue **9** (1892) 171-178.
(B57) Brown-Séquards indsprøitninger. (Brown-Séquard's injections). Naturen **17** (1893) 48-51.
(B58) Oversigt over de nyere studier over immunitet. (Review of the new studies of immunity). Naturen **17** (1893) 172-175.
(B59) Kemotaxi. (Chemotaxis). Naturen **17** (1893) 371-372.
(B60) Tuberkulosespørgsmaalet. (The question of tuberculosis). Med. Revue **10** (1893) 65-68.
(B61) Pasteur og hans betydning for den biologiske videnskab. (Pasteur and his bearing on the biological sciences). Naturen **18** (1894) 12-33.
(B62) Behandling af sygdomme med blodvand—serumtherapien. (Treatment of diseases with serum—serotherapy). Naturen **18** (1894) 310-313.
(B63) Er erhvervede egenskaber arvelig? Bemærkninger til Bjørnsons spørgsmaal. (Are acquired properties hereditary? Remarks to Bjørnson's question). Nyt Tidsskr., new series **3** (1894-1895) 32-36.
(B64) Endnu engang nogle bemærkninger i anledning af Bjørnsons indlæg om arv. (Once more some remarks concerning Bjørnson's pleas for heredity). Nyt Tidsskr., new series **3** (1894-1895) 374-376.
(B65) Om disposition til sygdom. (On disposition to disease). Med. Revue **12** (1895) 321-325.
(B66) En ny hypothese om dyre- og plantearters liv og forsvinden. (A new hypothesis concerning the life and disappearance of a series of animals and herbs). Naturen **19** (1895) 36-38.
(B67) Kampen mod de smitsomme sygdomme. (The campaign against infectious diseases). Samtiden **7** (1896) 135-141.
(B68) Fremdeles om arv af erhvervede egenskaber. (Further on heredity of acquired properties). Kringsjaa **7** (1896) 348-349.
(B69) Verdensopfatning og religion. (World interpretation and religion). Kringsjaa **8** (1896) 673-680.
(B70) Foranstaltninger mod tuberculose. (Measures against tuberculosis). Med. Revue **13** (1896) 29-32, 72.
(B71) Dampskibe for vestlandske distriktslæger. (Steamers for medical officers in Western Norway). Med. Revue **13** (1896) 227-229.
(B72) Theorier om arv. (Theories of heredity). Naturen **20** (1896) 1-13.
(B73) Arv af erhvervede egenskaber. (Heredity of acquired properties). Naturen **20** (1896) 109-115, 169-176.
(B74) Tuberkuloseloven. (The legislation against tuberculosis). Tidsskr. f. d. norske Lægef. **16** (1896) 482-484.
(B75) Hjalmar Heiberg. Med. Revue **14** (1897) 257-259.
(B76) Telegrafering uden traad. (Transmission of telegrams without wire). Naturen **21** (1897) 117-119.
(B77) Tuberculosebekjempelse. (The combating of tuberculosis). Med. Revue **15** (1898) 196-197.
(B78) Mikrobegifte og slangegifte. (Microbial and ophidian toxins). Naturen **22** (1898) 151-154.
(B79) Immunitet. (Immunity). Naturen **22** (1898) 161-164.
(B80) Lægernes lønning. (The physicians' salary). Tidsskr. f. d. norske Lægef. **18** (1898) 407-409.
(B81) Norsk folkepsykologi. (Norwegian demotic psychology). Ringeren, 1899, nr. 38.
(B82) Kan tanken tenkes materiel? (May the thought be reflected substantially?) Med. Revue **16** (1899) 15-17.
(B83) Trænger alle levende væsener surstof? (Do all living beings need oxygen?) Naturen **23** (1899) 29-31.
(B84) Melkens bakterier. (Bacteria in milk). Naturen **23** (1899) 52-57.
(B85) Kræftens aarsagsforhold. (The etiology of cancer). Med. Revue **17** (1900) 293-300.
(B86) Kræftparasiter. (Cancer Parasites). Naturen **24** (1900) 188-191.
(B87) Kampen mod gnavere. (The campaign against rodentia). Naturen **24** (1900) 204-205.
(B88) Nutidens hygiene. (Modern hygiene). Naturen **25** (1901) 19-22.
(B89) Havbunden. (The depth of the ocean). Naturen **25** (1901) 379-386.
(B90) Vor melkeforsyning. (Our distribution of milk). Med. Revue **19** (1902) 11-14.
(B91) Medicinsk skole i Bergen. (Medical school in Bergen). Med. Revue **19** (1902) 289-293.
(B92) Indstilling fra beriberikomitéen. (The report of the beriberi committee). Med. Revue **19** (1902) 298-300.

(B93) Lidt om medicinens udvikling i det 19de aarhundrede. (Some notes on the development of medicine during the 19th century). Naturen **26** (1902) 46-51.
(B94) Rudolf Virchow. Naturen **26** (1902) 289-293.
(B95) Arv eller nydannelse. (Heredity or new development). Naturen **27** (1903) 308-312.
(B96) Den medicinske undervisning. (Medical education). Med. Revue **20** (1903) 193-200.
(B97) Filosofi og akademisk undervisning. (Philosophy and academic teaching). Med. Revue **20** (1903) 295-297.
(B98) Fra vor videns ydergrænser. I. Stof og kraft. (From the outer boundaries of our knowledge. I. Material and power). Naturen **29** (1905) 189-194.
(B99) Medicinsk maalstræv og folkeskolens naturkundskabsundervisning. (Medical struggle for a new enchorial language and the teaching of natural science in public schools). Norsk Mag. f. Lægev. **69** (1908) 477-478.
(B100) *Livserindringer og Betragtninger.* (Memoirs and Contemplations). Christiania, 1910, 142 pp.
(B101) *The Memoirs and Reflections of Dr. Gerhard Armauer Hansen.* Translation by G. A. Hansen. Germany: German Leprosy Relief Association, 1976, 136 pp.

APPENDIX II

C. My Earlier Publications Concerning Armauer Hansen and Leprosy

(C1) Ved Hundreaarsjubileet for Armauer Hansen (1841-1912). Forskeren. (At the centennial jubilee for Armauer Hansen [1841-1912]. The scientist.) Samtiden **52** (1941) 582-594.
(C2) Gerhard Armauer Hansen. The discoverer of the lepra bacillus (1841-1912). Acta Pathol. Microbiol. Scand. **18** (1941) 453-456.
(C3) G. Armauer Hansen. Leprabacillens oppdager. (1841-1912). (G. Armauer Hansen. The discovery of the leprosy bacillus [1841-1912]). Nord. Hyg. Tidsskr. **22** (1941) 353-356.
(C4) G. Armauer Hansen, 1841-1912. *Fra Christie til Nordahl Grieg.* XIII Bergenske Kulturpersonligheter. (From Christie to Nordahl Grieg. XIII Cultural Personalities of Bergen). Bergen, 1945, pp 157-179.
(C5) Lepra i Norge. En kort oversikt over et langt kapitel i Norsk Medisinal-historie. (Leprosy in Norway. A short review of a long chapter in Norwegian medical history). Nord. Med. **57** (1957) 743-747.
(C6) The termination of leprosy in Norway. An important chapter in Norwegian medical history; together with a portrait of Armauer Hansen, ca. 1873. Int. J. Lepr. **25** (1957) 345-350.
(C7) *Om Armauer Hansen og Spedalskhetens historie i Norge.* (Armauer Hansen and the history of leprosy in Norway). Universitetet i Bergen, Smaaskrifter nr. 12, 1962, pp 1-35.
(C8) A serious sentence passed against the discoverer of the leprosy bacillus (Gerhard Armauer Hansen) in 1880. Med. Hist. **7** (1963) 182-186.
(C9) The Hansen-Neisser controversy, 1879-1880. Int. J. Lepr. **31** (1963) 74-80.
(C10) Discovery of leprosy bacillus. J.A.M.A. **184** (1963) 901-902.
(C11) The old leprosy hospitals in Bergen. Int. J. Lepr. **32** (1964) 306-309.
(C12) Hansen's first observation and publication concerning the bacillus of leprosy. Int. J. Lepr. **32** (1964) 330-331.
(C13) Leprosy in Norway. Med. Hist. **9** (1965) 29-35.

APPENDIX III—GENEOLOGY

Johan Conrad Armauer (1733-1805),
master-joiner;
m. Helena Cramer (1736-1818)

Hans Peter Hansen (1763-1824),
shipmaster;
m. Agnethe Wibroe (1770-1825)

Andreas Michelsen Schram (1762-1830),
tanner & master-shoemaker;
m. Henricha Margarethe Armauer (1780-1847)

Claus Hansen (1800-1885)----------*m.* 1831----------Elisabeth (Lise) Concordia Schram
merchant & bank cashier (1812-1883)

15 children

1. Agnes (Agga) Margarethe Hansen (1831-1919).
2. Hans Peter Hansen (1832-1865), shipmaster;
   m. Adelheid Magdalene Eeg, Bremen. Both died in Shanghai in 1865.
3. Andreas Michael Hansen (1834-1901), parish minister;
   m. Simonine Mariane Stephansen (1840-1924); 2 sons: Scott-Hansen.
4. Morten Quist Hansen (1836-1884), merchant;
   m. Julie Constance Schrøder (1845-1918); 4 sons, 4 daughters: Quist-Hansen.
5. Chatharina (Thrine) Elisabeth Hansen (1837-1857);
   m. Jørgen Irgens, merchant.
6. Claudine Concordia Hansen (1839-1869);
   m. Jørgen Irgens, her brother-in-law; 3 sons, 1 daughter.
7. Carl Fredrik Hansen (1840-1913), shipbroker in Cardiff;
   m. Hilma Ulrikke Wolford (1845-1920); 5 sons, 5 daughters: Wolford-Hansen.
8. *Gerhard Henrik Armauer Hansen (1841-1912),* Chief Physician;
   m. I. (1873): Stephanie (Fanny) Marie Danielssen (1846-1873), daughter of Chief Physician Daniel Cornelius Danielssen (1815-1894) and Berthe Marie Olsen (1818-1875).

   *m.*II. (1875): Johanne (Hanne) Margrethe Tidemand, nee Gran (1849-1930), widow of engineer and shibuilder Adolph Tidemand (1845-1873) who was the son of the painter Adolph Tidemand (1814-1876). They had 2 children: Adolph Tidemand, engineer; and Constance (Conny) Tidemand. Her parents: Consul Christen Knagenhjelm Gran (1822-1899) and Constance Mowinckel (1827-1889).

   She and Armauer Hansen had one son:

   a. Daniel Cornelius Armauer-Hansen (1876-1950), Chief Physician;
      m. I. (1908): Ingeborg von Erpecom (1886-1954). Marriage ended in divorce in 1920; They had one son: Gerhard Henrik Armauer-Hansen (1910-), director of a large business, Vancouver, Canada.

      *m.*II. (1922): Agnes (Aggi) Alvilde Bjelland, nee Kaltenborn (1892-1972), widow of the director of the Bjelland Canning Company, Stavanger with whom she had 2 daughters. She and Armauer-Hansen had one daughter: Johanne Margrethe Armauer-Hansen (1923-) who married Georges Patrix, Paris, painter.
9. Ida Charlotte Amalia (Malla) Hansen (1843-1915), head mistress of a girls' school.
10. Klaus Hanssen (1844-1914), Chief Physician;
    m. I. Ida Christine Johannesen (1847-1879); 2 sons, 1 daughter: Fischer-Hanssen.

    *m.*II. Dorothea (Thea) Marstrand Serck (1857-1953); 5 sons, 3 daughters: Serck-Hanssen.
11. Albert Christian Meyer Hansen (1846-1875), architect & master-builder.
12. Otto Folkmar Hansen (1847-1899), shipbroker;
    m. Caroline Georgine Lovise Martens (1849-1912); 2 sons: Martens-Hansen.
13. Lorentz Wesenberg Hansen (1853-1913), ship-owner;
    m. Sophie Marie Wiese (1858-1935); 5 sons, 7 daughters: Wiese-Hansen.
14. Johan Daniel Irgens Hansen (1854-1895), critic and theater-manager;
    m. Marie Bjerke (1870-1928).
15. Elisabeth (Elisa) Concordia Hansen (1857-1885);
    m. Theodor Henrik Lødrup, teacher; 1 son, 2 daughters.