HISTORY OF SCIENCE OF THE GREEN HEALTH CAMPUS BERLIN-BUCH

CAMPUS art

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Contents

Foreword

The Berlin-Buch health region in northeast Berlin has been known for its clinics, biotechnology companies and research institutions for more than a hundred years. Since the days of the German Empire, employees on the Campus Berlin-Buch have lived through five very different political systems. What has remained constant has been the close connection between research and clinical science, which was part of the original vision of the campus and remains at the heart of work here today.

Most of our current research is basic in nature, aiming to clarify central questions related to basic mechanisms in the areas of molecular medicine, genome research and cell biology in health and disease. Our clinical focus involves cardiovascular and metabolic diseases, cancer, diseases of the nervous system and immunology. The campus hosts several institutes: the Max Delbrück Center for Molecular Medicine in the Helmholtz-Association (MDC), the Leibniz Research Institute for Molecular Pharmacology (FMP), the Experimental and Clinical Research Center (ECRC), the Charité-University Medicine Berlin and the Berlin Institute of Health (BIH). Other partners include a range of institutions and biotechnology companies. In all, the campus is home to three thousand employees who are working on questions relating to the molecular basis of health and disease and new diagnostic and therapeutic procedures.

These individuals are thus part of a long tradition of scientists who have dedicated their lives to the search for knowledge – either by working directly here on campus, or through other close connections between their life and work and the campus. They have received many prestigious honors, buildings on campus bear their names, and in front of the building are busts or panels dedicated to their memory.

Science is made by people. Given its long history, the Campus Berlin-Buch should represent the fact that science and scientists should not only carry out research in a responsible way, but should also concern themselves with ethical issues related to society. This is best served when the history and biographies of the scientists and people who worked here are made transparent, open, and accessible – including when their actions reveal that they were fallible, in light of the times and realities they faced.

With this brochure we would like to introduce some of these personalities, key points of their lives and the contributions they have made to medicine and science and to the Campus Berlin-Buch.

A digital version is also recommended for those who are interested, and you can also enjoy the information in this brochure as an audio guide as you walk around the campus. Corresponding web addresses can be found at the end of this brochure under ”Further reading“.

Please enjoy your stay on campus!

Busts and panels

Friedrich Jung. April 21, 1915 in Friedrichs-hafen – August 5, 1997 in Berlin

Friedrich Jung was a German physician and pharmacologist. Jung's work on the ultrastructure of red blood cells and the effects of blood toxins made significant contributions to modern pharmacology and drug research.

Jung studied medicine between 1934 and 1939, first in Tübingen, later in Königsberg and Berlin. In 1940 he received his doctorate from the University of Tübingen. Subsequently, until 1941, he worked as a scientific assistant at the Pharmacological Institute of the Friedrich-Wilhelms-University in Berlin. During the Second World War, Jung worked in the military medical service. In 1941, while at the Military Medical Academy in Berlin, Jung was one of the first to carry out research using the new technology of electron microscopy. He was one of the first to succeed in imaging the cell membrane of red blood cells (erythrocytes).

In 1945 Jung took on a position as a lecturer in Tübingen, and from 1946 to 1949 served as head of the Institute for Pharmacology at the University of Würzburg. In 1949 the Berlin University, which had just been renamed Humboldt University of Berlin, appointed him to the Chair of Pharmacology and Toxicology, and he became the successor of his teacher Wolfgang Heubner as director of the institute. Here he led the reconstruction of the building housing the institute, which had been destroyed in the war. He created a department for Experimental Pharmacology and Pathology at the newly founded Institute for Medicine and Biology of the German Academy of Sciences in Berlin in Berlin-Buch, and served as its director starting in 1956. In 1961 this was split into several daughter institutes; Jung headed the Institute for Pharmacology. From 1972 to 1980 he was director of the Central Institute for Molecular Biology. Until his death in 1997, Jung lived in the "Torhaus" of the biomedical Campus Berlin-Buch.

In addition to his findings on the ultrastructure of erythrocytes, Friedrich Jung made important contributions to the biochemistry of the red blood pigment hemoglobin. He is also known for work on anti-inflammatory agents and the effects of blood toxins and biologically active peptides.

Beyond his scientific achievements, Jung made outstanding contributions to science and health policy. He was Chairman of the central expert committee for movement of medicines at the GDR Ministry of Health, initiating drug legislation that would be used as an international model. Last but not least, Friedrich Jung was involved in the Geneva negotiations on the ban on biological and chemical weapons and participated in international committees for peace and disarmament.

Marguerite Vogt. February 13, 1913 in Berlin – July 6, 2007 in La Jolla, California, USA

Marguerite Vogt was a German cancer researcher and virologist whose work provided important insights into poliomyelitis and cancer research.

Vogt was the daughter of Oskar and Cécile Vogt and the younger sister of Marthe Louise Vogt. She studied medicine in Berlin, where she graduated in 1937 with a doctorate. The same year she followed her parents to the Institute for Brain Research and General Biology they had founded in Neustadt in the Black Forest. Her first projects dealt with gene mutations in Drosophila. In 1950 she left Germany and went to the California Institute of Technology (Caltech) in the USA, to work with Max Delbrück. Here, in collaboration with Renato Dulbecco, another later recipient of the Nobel Prize, Vogt succeeded in cultivating the polio virus for the first time. This work was crucial in producing and testing vaccines against polio. Marguerite Vogt had an exceptional ability to develop cell cultures, and applied this expertise to the field of carcinogenic (oncogenic) viruses. She succeeded in cultivating other viruses, such as the polyoma virus. In 1963 she followed Renato Dulbecco to the newly founded Salk Institute for Biological Studies, where as a fellow she continued to work on oncogenic viruses and carcinogenesis. She received a professorship in 1973. In the years that followed, she became increasingly concerned with how cancer cells manage to overcome natural limits on the number of divisions cells normally undergo. Her primary focus was the role of telomeres in this type of "cellular immortalization". Telomeres comprise many copies of repeating sequences at the tips of chromosomes and have a crucial role stabilizing their structure. Vogt's investigations made important contributions to understanding the development of tumors. She continued to work in the laboratory even after her retirement, and published her last article in 1998 at the age of 85. She died in California in 2007.

Although Marguerite Vogt was never recognized with a significant prize in her lifetime, today her work is recognized for its fundamental importance regarding questions of developmental genetics in Drosophila, oncogenic viruses, viral transformation and cellular immortalization. Last but not least, her skills in cell culture and her commitment to promoting young researchers made her an important mentor for scientists, including several who went on to win Nobel Prizes.

Karl Lohmann. April 10, 1898 in Bielefeld – April 22, 1978 in Berlin-Buch

Karl Lohmann was a biochemist and physician. He discovered that all terrestrial organisms draw on a store of energy in the form of adenosine triphosphate (ATP). He also described the "Lohmann reaction", named after him, which refers to the formation of ATP through the reversible transfer of a phosphate group to adenosine diphosphate (ADP).

Lohmann studied chemistry, first in Münster and later in Göttingen, where he received his doctorate in 1924. Between 1924 and 1937 he worked as an employee of Nobel Prize winner Otto Meyerhof at the Kaiser Wilhelm Institute for Biology in Berlin-Dahlem and the KWI for Medical Research in Heidelberg. It was during this period, in 1929, that he discovered ATP. In 1931, Lohmann began studying medicine in Heidelberg, and in 1935 he received his doctorate. In 1937 the Friedrich-Wilhelms-University Berlin appointed him Professor of Physiological Chemistry and Director of the Physiological-Chemical Institute, a position he retained until 1952. In 1947, Lohmann was appointed as a member of the founding board of trustees of the Institute for Medicine and Biology of the German Academy of Sciences in Berlin-Buch. He also temporarily took over the management of the newly founded institute. Between 1951 and 1961, he headed the biochemistry department. This developed into the Institute for Biochemistry, whose director he remained until his retirement in 1964. From 1957 to 1964 he served as President of the Institute for Nutrition in Potsdam-Rehbrücke. Lohmann died in 1978 and is buried in the protestant cemetery at the Schlosskirche in Berlin-Buch.

In addition to his discoveries on the processes and sequence of reactions by which cells derive energy, Lohmann also described a number of intermediate products and enzymes in the glycolysis chain, such as aldolase, partly in collaboration with Otto Meyerhof. Another of his accomplishments was to describe the action of vitamin B1.

Otto Warburg. October 8, 1883 in Freiburg – August 1, 1970 in Berlin

Otto Warburg was a German biochemist and physician. His scientific work dealt with questions of cell metabolism, photosynthesis and carcinogenesis. Warburg counts among the most important biochemists of the first half of the 20th century. In 1931 he received the Nobel Prize in Physiology or Medicine for "the discovery of the nature and function of the respiratory enzyme".

Otto Warburg began studies of chemistry in Freiburg in 1901. In 1903 he switched to Berlin, where he continued his studies until graduation in 1905. From 1905 to 1911 he studied medicine in Berlin, Munich and Heidelberg. In 1906 Warburg received his PhD in Berlin. He was awarded his Dr. med. in 1911 in Heidelberg, and he habilitated in physiology just one year later. In 1914 the Friedrich-Wilhelms-University Berlin gave him a teaching position in physical chemistry and biology; starting that year he also headed the Department of Physiology at the Kaiser Wilhelm Institute for Biology in Berlin-Dahlem, a position he held until 1930. From 1921 to 1923 he also held an extraordinary Professorship in Physiology at the medical faculty of Berlin University. In 1931 Warburg became the founding director of the Kaiser-Wilhelm-Institute for Cell Physiology in Berlin-Dahlem, which became the Max-Planck-Institute for Cell Physiology in 1952.

Because Otto Warburg was of Jewish descent, starting in 1939 the Reich Ministry for Science, Education and Popular Education put pressure on him to step down as head of the KWI. The general secretary of the Kaiser Wilhelm Society, Ernst Telschow, also ordered Warburg to resign from office in 1941, but Warburg never tendered his resignation. Somehow he managed to remain in the position until the end of the war, and headed the Institute for Cell Physiology until his death in 1970.

In 1947 Warburg was appointed to the founding board of trustees of the Institute for Medicine and Biology of the German Academy of Sciences in Berlin-Buch.

Warburg worked on enzymes of cell respiration. He received the Nobel Prize for his discovery and description of the respiratory enzyme cytochrome oxidase, later called "Warburg's respiratory ferment", as well as coenzymes such as pyridine nucleotides involved in the mitochondrial respiratory chain. This work led Warburg to the theme of the metabolism of tumors. Warburg discovered that tumors have an increased concentration of lactate, a substance formed during anaerobic glycolysis. However, Warburg found that the tissue contained enough oxygen for the mitochondria to aerobically metabolize sugar, which led to his formulation of the "Warburg hypothesis". This proposed that the main reason for the development of cancer cells is a disruption in the function of mitochondria, an assumption that is now considered obsolete. Finally, Warburg made important contributions to explaining photosynthesis in plant cells.

He also developed new experimental methods for research. To quantitatively measure gas conversions during metabolic processes, he developed a new manometric device called the Warburg apparatus. To measure chemical processes, he used the optical bench, an early type of spectrophotometer. Both devices are on display in the Campus Museum.

Otto Warburg died in Berlin in 1970. His findings continue to have an influence on today's medicine. In particular, Warburg's discovery that many tumors exhibit an increase in sugar metabolism led to the development of diagnostic imaging methods such as positron emission tomography.

More information on the optical bench and the Warburg apparatus can be found in the Campus Museum brochure or at www.campusart.berlin

Arnold Graffi. June 19, 1910 in Bistritz, Romania – January 30, 2006 in Berlin

Arnold Graffi was a Romanian-German physician and cancer researcher. His work yielded important insights into how chemical substances can cause cancer and how tumors form.

Graffi studied medicine between 1930 and 1935, first in Marburg and later in Leipzig and Tübingen. Initially most of his work was clinical in nature; he moved to the Charité, where he worked from 1937 to 1939 for Ferdinand Sauerbruch and others. Graffi's next position was for a year at the Paul-Ehrlich-Institute in Frankfurt am Main, until he received his doctorate at the Charité. His next stops were Prague and Budapest, for research. In 1943 he returned to Berlin, where he first worked at Schering AG and then for Nobel Prize winner Otto Warburg, at the KWI for Cell Physiology. In 1948 he was appointed to a professorship at the Friedrich-Wilhelms-University in Berlin. That same year Graffi began working at the Academy Institute for Medicine and Biology in Berlin-Buch, where he set up the department for experimental cancer research. There he discovered that not only chemical compounds but also viruses – oncogenic viruses – could cause cancer. One of them went down in the specialist literature as the "Graffi virus". Further work produced insights into the relationship between the structures and dosages of substances and viruses and their carcinogenic effects.

In 1961 the institute in Berlin-Buch was split into several entities, and Graffi became director of the newly founded Institute for Experimental Cancer Research. In 1964 this merged with the Robert-Rössle-Clinic to form the Institute for Cancer Research; Graffi was named deputy director.

During his time in Buch, Arnold Graffi formulated a DNA-based concept for therapies for cancer and viral and hereditary diseases, an approach based on "nucleic acid anti-matrices". Ultimately this idea formed the basis for today's efforts to create gene therapies. Arnold Graffi remained scientifically active even after his retirement in 1975. In 1979, he received the Paul-Ehrlich-Prize for his work in the field of cancer. He died in Berlin in 2006.

Graffi's findings and his fundamental ideas on gene therapies made him a pioneer in experimental cancer research.

Erwin Negelein. May 15, 1897 in Berlin – February 7, 1979 in Berlin

Erwin Negelein was a biochemist who discovered 1,3-diphosphoglyceric acid, also called the "Negelein ester" – an intermediate product of the breakdown of carbohydrates in the cell. He made contributions to the question of how cells generate energy, worked with Otto Warburg on the metabolism of tumors, and developed biochemical analysis methods.

Negelein initially trained as a mechanic before taking up a position as a laboratory technician with Otto Warburg at the Kaiser Wilhelm Institute for Cell Physiology in Berlin-Dahlem in 1919. In 1927 he managed to complete his high school diploma, then studied chemistry at the Friedrich-Wilhelms-University Berlin parallel to his laboratory work. In 1932 he graduated with a doctorate. He served as a research associate at the KWI in Dahlem, where he worked on the enzymes that produce cellular energy. His work with Warburg gave him insights into the growth and metabolism of tumors.

Negelein succeeded in crystallizing and biochemically characterizing enzymes such as alcohol dehydrogenase and pyruvate kinase. Here he was able to bring his experience as a mechanic and technician to bear, developing methods for biochemical analysis such as the absorption spectrophotometer. The instruments enabled him to make optical measurements of chemical processes. In 1939, he clarified a reaction that is important for energy production in cells through his discovery of the compound 1,3-diphosphoglyceric acid. This intermediate product in the breakdown of carbohydrates has since been known as the "Negelein ester". In 1945 Erwin Negelein moved to Berlin-Buch, where he became deputy head of Karl Lohmann's Biochemistry Department at the Institute for Medicine and Biology of the German Academy of Sciences. He later headed the Department of Cell Physiology at the same institute. In 1955 the Humboldt University appointed him Adjunct Professor for Physiological Chemistry. In 1961 the institute in Berlin-Buch was divided into several parts; Negelein was appointed director of the Institute for Cell Physiology, which he remained until his retirement in 1964. Erwin Negelein died in Berlin in 1979.

His discoveries made fundamental contributions to our understanding of the growth and metabolism of tumors, particularly his development of methods to test the effects of Cytostatics.

More information on the optical bench and the Warburg apparatus can be found in the Campus Museum brochure or at www.campusart.berlin

Max Delbrück. September 4, 1906 in Berlin – March 9, 1981 in Pasadena, California, USA

Max Delbrück was a German mathematician, physicist and geneticist. His work provided a foundation for modern genetics. In 1969 he received the Nobel Prize "... for the discoveries concerning the replication mechanism and the genetic structure of viruses".

Delbrück studied physics and mathematics in Tübingen, Bonn, Berlin and Göttingen from 1924 to 1929. He then turned to theoretical physics in Bristol, Copenhagen and Zurich, where he received his doctorate in 1930. In his dissertation he described the way the electromagnetic field of an atomic nucleus scattered a photon, a phenomenon which he called Delbrück-scattering. In 1932 Delbrück became an assistant to Lise Meitner at the Kaiser Wilhelm Institute for Chemistry in Berlin-Dahlem. During this time, he met the Danish physicist and Nobel Prize winner Niels Bohr, who inspired him to apply himself to biological topics such as the nature of life and genes. At the time genes were considered theoretical entities whose physical nature was completely unknown. Between 1932 and 1937 Delbrück worked with the Russian geneticist and biophysicist Nikolai W. Timoféeff-Ressovsky at the KWI for Brain Research in Berlin-Buch. One outcome of their work was a pamphlet entitled "On the nature of gene mutation and gene structure", which became a milestone in the development of modern genetics. In it, for the first time, the authors formulated a model of genes as composed of molecules.

In 1937 Delbrück was awarded a Rockefeller grant, which he used to work at the California Institute of Technology (Caltech) in Pasadena. In 1939 his fellowship expired, but he was able to stay in the U.S., because Vanderbilt University in Nashville appointed him professor of physics. In 1947 Delbrück returned to Caltech as a professor of biology, where he carried out research on bacteriophages (bacterial viruses). They proved to be an excellent model system to study on how the genetic information of a simple organism can be stored, passed on and modified. For this work Delbrück received the Nobel Prize in Physiology or Medicine in 1969, together with the US biologists Alfred Day Hershey and Salvador Edward Luria. Max Delbrück died in California in 1981.

His work is considered fundamental to the establishment of modern molecular biology and genetics. The Max Delbrück Center for Molecular Medicine in the Helmholtz-Association (MDC) on the Campus Berlin-Buch honors his accomplishments by bearing his name.

Hermann von Helmholtz. August 31, 1821 in Potsdam – September 8, 1894 in Berlin

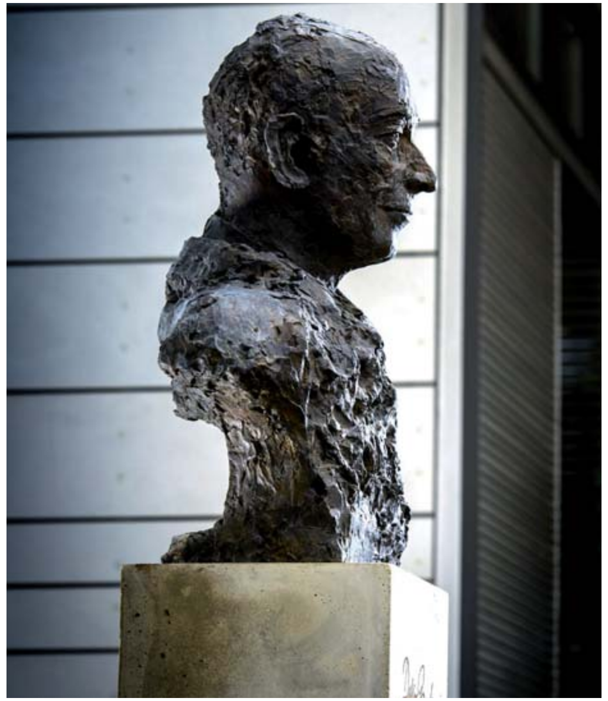
Hermann von Helmholtz was a polymath who was so influential and well-known during his lifetime that he was called the "Chancellor of Physics", a reference to German Chancellor Otto von Bismarck.

He was born in Potsdam on August 31, 1821 with the name Hermann Helmholtz – the "von" came with his knighthood, in 1882. In 1838 Helmholtz began his studies at the medical-surgical Friedrich-Wilhelm-Institute, a so-called "Pépinière", a military medical academy. Alongside the Charité, it served as the second surgical school in Berlin. He was a student of Johannes Müller and received his doctorate in 1842 for a thesis on the comparative anatomy of the nervous system of insects, crabs and other invertebrates. Helmholtz performed his military service then took up a teaching position in anatomy at the Berlin Art Academy in 1848, upon the recommendation of Alexander von Humboldt. A mere one year later he was appointed to the Chair of Anatomy and Physiology in Königsberg, then in 1855 to the Chair of the same name in Bonn. In 1858 the University of Heidelberg appointed him to the Chair of Physiology, then Helmholtz received a call from the Friedrich-Wilhelms-University of Berlin to take up the Chair of Physics. Helmholtz remained in Berlin until his death. In 1887 he became the first president of the newly founded Physical-Technical Reich Institute in Charlottenburg.

Helmholtz made contributions to numerous scientific disciplines throughout his lifetime. Among the subjects of his work were questions of energy in chemical reactions and in living beings; he formulated the law of conservation of energy. In theoretical physics, he made contributions to hydrodynamics and electrodynamics. In mathematics his focus was problems of geometry. As a physician, he carried out the first precise measurements of the speed of conduction in nerves and studied the physiology of hearing and vision. He developed the resonance theory of hearing, which states that the fibers of the basilar membrane in the ear are triggered to resonate by waves with the same natural oscillation period as the fibers. Helmholtz developed the three-color theory for perception in the human eye, which states that any color can be obtained by mixing light consisting of three primary colors. He proposed that there are three types of receptors in the eye, each of which responds to one of the primary colors. Helmholtz designed a number of instruments for his research. These included the Helmholtz resonator, a device to analyze sound, and the ophthalmometer, to measure the curvature of the cornea. Helmholtz described the ophthalmoscope, an instrument to examine the retina at the back of the eye, as his "most important invention".

The influence of his work extends far beyond the examples mentioned here. In honor of his great breadth of activity and his many findings, the Helmholtz-Association of German Research Centers bears his name.

Detlev Ganten. March 28, 1941 in Lüneburg



Detlev Ganten is a German physician and pharmacologist. His scientific achievements include fundamental insights into the evolution of hormonal systems and molecular genetics, diagnostics, therapies for and the prevention of cardiovascular diseases, particularly high blood pressure. Ganten has also made very important contributions to the reorientation of the Health sciences after German reunification, as Chairman of the Helmholtz-Association of German Research Centers, as founding director of the Max Delbrück Center for Molecular Medicine (MDC), as Chairman of the board of the new Charité-University Medicine Berlin, and as president of the World Health Summit.

Ganten first completed an education as an agricultural assistant in 1957. He began his medical studies in Würzburg in 1962, which he continued from 1964 in Montpellier (France) and in Tübingen starting in 1966. He completed his doctorate there in 1968 and married Dr. med. Ursula Ganten, with whom he has researched and published throughout his career. After carrying out clinical work in Tübingen and Emden, he received his license to practice medicine in 1970. Between 1969 and 1973, Ganten worked as a scientist in Montréal, Canada, and received his Philosophical Doctorate (PhD) from McGill University. Ganten returned to Germany and worked until 1991 at the Pharmacological Institute of the University of Heidelberg, which appointed him professor in 1975.

In 1991, after German reunification, Ganten was commissioned by the federal government to reorganize the central institutes of the GDR Academy of Sciences in Berlin-Buch. He became the founding director of the Max Delbrück Center for Molecular Medicine (MDC) and since 1993 has also been a professor at the Freie Universität Berlin, in the Chair for Clinical Pharmacology. From 1997 to 2001 he was Chairman of the Helmholtz-Association of German Research Centers. In 2004, the Senate of the City of Berlin appointed Ganten Chairman of the Board of Charité-University Medicine Berlin. During this time, Ganten merged the medical faculties in the former west (Free University) and east of Berlin (Humboldt University) to form the new Charité-University Medicine Berlin while retaining its sites in Steglitz, Wedding, Mitte and Buch. The University Medicine Act of 2005 established a new structure for medicine in Berlin and created a privileged partnership between the Charité-University Medicine Berlin and the MDC.

Since his retirement in 2008, Ganten has remained active in numerous functions and offices. To mark the 300th anniversary of the Charité in 2009, he initiated the World Health Summit, an international conference on global health issues that has been held annually ever since. He remained President until 2020. In 2021 he was one of the initiators of the "Virchow Foundation for Global Health". Ganten lives in Berlin.

His scientific work has served as a basis for understanding and preventing high blood pressure and other cardiovascular diseases and developing new therapies to treat them. Equally important have been his services to the organization of science, the promotion of young people and initiatives on global health issues.

Marthe Louise Vogt. September 8, 1903 in Berlin – September 9, 2003 in San Diego, California, USA

Marthe Louise Vogt was a German pharmacologist and neuroscientist. She made important contributions to our understanding of neurotransmitters, particularly adrenaline, in the brain.

Marthe Vogt was the daughter of Oskar and Cécile Vogt and the older sister of Marguerite Vogt. She studied medicine and chemistry in Berlin from 1922 to 1927. She received her doctorate in medicine in 1928 and a second doctorate in chemistry in 1929. Until 1931 she worked as an assistant with Paul Trendelenburg at the Berlin Pharmacological Institute. After his death, she transferred to the Kaiser Wilhelm Institute for Brain Research in Berlin-Buch, where she headed the neurochemistry department.

She stayed there until her parents retired – officially because of Oskar Vogt's connections to the Soviet Union, but in reality because they refused to dismiss Jewish employees. At that point, in 1935, Marthe Vogt also left the institute and Germany. Her first stop was the National Institute for Medical Research in Hampstead, London, on a Rockefeller grant. There she worked with Nobel Prize winner Henry Hallett Dale. Dale had demonstrated that signals in the autonomic nervous system involved chemical transmission; his work focused on acetylcholine. Vogt, Dale and Feldberg demonstrated that acetylcholine is also used as a neurotransmitter between motor neurons and skeletal muscle.

After stays in Cambridge and London, Marthe Vogt moved to Edinburgh in 1946 to head her first research group at the Department of Pharmacology. There, in 1954, she identified two more neurotransmitters in the central nervous system: noradrenaline and adrenaline. These joined acetylcholine as the first neurotransmitters ever identified.

From 1960 until 1966, Vogt headed the Pharmacology Department of the Agricultural Research Council Institute of Animal Physiology in Babraham near Cambridge. At that point she retired, but her work did not end. In 1974 she became the first woman to receive an honorary doctorate from Cambridge University. She continued to carry out research until finally her eyesight began to fail, and in 1990 she moved to California to live with her sister Marguerite. Marthe Vogt died there in 2003, one day after her 100th birthday.

Vogt's work established an important basis for modern neuropharmacology. The effects of many psychotropic drugs or muscle relaxants could not be explained without the knowledge attained through her research.

Nikolai Wladimirovich Timoféeff-Ressovsky. September 7jul./20greg., 1900 in Kaluga Province, Russia – March 28, 1981 in Obninsk, Russia
Elena Aleksandrovna Timoféeff-Ressovska June 8jul./21greg., 1898 in Moscow, Russia – April 29, 1973 in Obninsk, Russia

Nikolai and Elena Timoféeff-Ressovsky were biologists and geneticists. They published numerous important papers together on mutations and genetics in Drosophila and later on radiobiology and radiation damage in humans. Nikolai W. Timoféeff-Ressovsky initially gained worldwide recognition for his work on the use of X-rays to generate changes in genetic material. With Max Delbrück and Karl Günther Zimmer, he developed a definition of the gene that is largely still considered valid today. In the eyes of the public, Elena Timoféeff-Ressovska was overshadowed by her famous husband, but experts consider her an outstanding geneticist, on equal par with her partner.

Nikolai and Elena Timoféeff-Ressovsky studied biology at Moscow University between 1917 and 1923, where they met and married in 1922. There they began work on mutations in the fruit fly Drosophila, which drew the attention of Oskar Vogt. In 1925 he received the approval of the Soviet government to bring the couple to his institute for brain research in Berlin, what at the time was still located on Magdeburger Strasse. Nikolai W. Timoféeff-Ressovsky set up a department for genetics and worked with Elena on the question of how environmental factors influenced genetics. In 1928, he reported that by irradiating fertilized eggs and larvae, he created flies that exhibited various mutations throughout their bodies. In 1931 he became head of the department for experimental genetics in the newly built Kaiser Wilhelm Institute (KWI) for brain research in Berlin-Buch. There the working conditions were very favorable for women, given the circumstances at the time. Prominent female researchers at the KWI included Elena Timoféeff-Ressovska, Cécile Vogt and their daughters Marguerite and Marthe, and many others. After the National Socialists took power, Elena Timoféeff-Ressovska had to officially stop working; she continued to work in her husband's laboratory nevertheless.

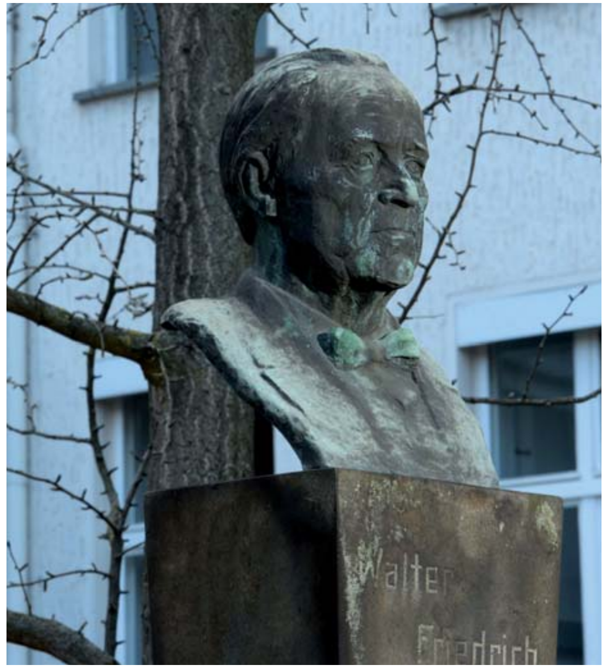
Nikolai stayed at the KWI in Berlin-Buch until he was arrested in 1945 and deported to the Soviet Union. Elena continued working as an assistant at the Zoological Institute in Hans Nachtsheim's department at the Friedrich-Wilhelms-University in Berlin until 1947. It was only then that she was able to travel to the Urals with her son Andrej, where she rejoined her husband. (Their second son, Dimitrij, was murdered shortly before the end of the war in the Mauthausen concentration camp). They continued to work on radiation damage in Sungul. From 1955 to 1964, both carried out research in Sverdlovsk, in the Department of Radiobiology and Biophysics at the Institute of Biology of the USSR Academy of Sciences. Elena Timoféeff-Ressovska habilitated there.

During his time in Berlin-Buch, Nikolai W. Timoféeff-Ressovsky gained worldwide fame for his work on changes in genetic material. He discovered that there was a direct relationship between radiation dosages and mutation rates. He also discovered that a mutation results from a single radiation-related effect, a so-called "one-hit event". In 1934 he published a paper in which the term "genetic engineering" is used for the first time. The extent to which his wife Elena's work contributed to his findings is hard to determine. It is clear that they worked together and Elena Timoféeff-Ressovska was considered to be just as gifted a geneticist as her husband Nikolai.

In a 1935 pamphlet published with Max Delbrück and Karl Günther Zimmer, Nikolai explored his findings and their theoretical implications; "On the nature of gene mutation and gene structure" was considered a landmark publication around the world. Up to that point, the term "gene" has been considered a purely theoretical construct. Whether genes were material at all, what they were made of and how they worked had been the subject of heated debate. In their work, Timoféef-Ressowsky and his co-authors proposed that mutations arise from altered molecules and that these molecules are genes. The definition of a gene as a stable structure made up of atoms provided an essential basis for modern genetics and molecular biology.

More information about Nikolai Wladimirovich Timoféeff-Ressovsky's workplace can be found in the Campus Museum brochure or at www.campusart.berlin

Walter Friedrich. December 25, 1883 in Magdeburg – October 16, 1968 in Berlin



Walter Friedrich was a biophysicist and later director of the Institute for Medicine and Biology of the Academy of Sciences in Berlin-Buch. With his work on clinical applications for X-rays and radium, he laid the foundation for X-ray structural analysis, a method that has become indispensable for modern research in molecular biology.

Walter Friedrich studied music and physics in Geneva from 1905. He broke off his music studies and moved to Munich to complete his studies of physics. In 1911 he received his doctorate for work carried out with Wilhelm Conrad Röntgen, with a dissertation on "Spatial intensity distribution of the X-rays emanating from a Platina anticathode". He next worked as an assistant at the Institute for Theoretical Physics in Munich. There, Max von Laue had suggested that the interference of X-rays on crystals could be demonstrated experimentally. This had been considered impossible by Arnold Sommerfeld, the director of the institute, and Röntgen himself. Nevertheless, Walter Friedrich and Paul Knipping managed to prove it. They published their work with Max von Laue in 1912. Laue received the Nobel Prize for this in 1914, but he emphasized the contributions of Friedrich and Knipping. By proving that X-rays undergo interference while passing through crystals – in other words, are diffracted by them – Friedrich and Knipping proved that X-rays are also electromagnetic waves. In the process, they also proved that crystals consist of atoms arranged in three-dimensional arrays. Today, this method has been turned into a powerful tool to use X-rays to determine the atomic structure of proteins, a crucial step in molecular biological research.

In 1914, Walter Friedrich moved to the University Clinic in Freiburg. Here he worked on clinical applications for X-rays and radium and founded the first center for biophysics research at a German university. In 1917 he qualified as a professor and in 1921, the university appointed him to a professorship in physics. Just one year later, the Humboldt University Berlin appointed him to the Chair of Medical Physics and Director of the Institute for Radiation Research. Friedrich remained in his position during the National Socialist era. He published works in collaboration with Jewish colleagues and was able to prevent the deportation of two Jewish researchers after 1933.

Friedrich's interdisciplinary approach was unusual at the time. Physicists, chemists and biologists work together with physicians at his institute, which was damaged by air raids in 1944 and later destroyed. In 1947, Friedrich turned down a professorship at the University of Marburg and instead took over the management of the Institute for Medicine and Biology at the Academy of Sciences in Berlin-Buch, which he headed until his retirement. Friedrich built the medical-biological institutes in Buch and the tumor clinic, which became known as the Robert-Rössle-Clinic. Today, this building hosts researchers and clinicians of the Experimental and Clinical Research Center (ECRC) of the MDC and Charité. Friedrich also worked in an interdisciplinary way in Buch. The campus became home to departments for biological cancer research and biophysics.

From 1949 to 1952 Walter Friedrich was Rector of the Humboldt University in Berlin, and from 1951 to 1956 President of the Academy of Sciences of the GDR. He died in Berlin in 1968.

The interdisciplinary approach is still being pursued today on the Campus Berlin-Buch, including the use of X-rays in structure analysis, an approach which he pioneered.

Information on X-ray structure analysis can be found on the website of the virtual microscope museum at https://mikroskopmuseum.mdc-berlin.de in the portrait video about the working group of Prof Dr. Oliver Daumke.

Robert Rössle. August 19, 1876 in Augsburg – November 21, 1956 in Berlin

Robert Rössle is considered one of the most important German pathologists of the early twentieth century. His lifetime of scientific achievements led to numerous honors. Today, however, his reputation has come under critical scrutiny, primarily because of his activities during the National Socialist era.

Robert Rössle was born on August 19, 1876 in Augsburg. From 1895 onwards he studied medicine in Munich, Kiel and Strasbourg; In 1900 he received his doctorate in Munich. He then returned to Kiel; starting in 1904 he worked at the Pathological Institute as a lecturer in general pathology and pathological anatomy. In 1906 he returned to head the Pathological Institute in Munich; upon the death of Otto von Bollinger he headed the institute as Professor of Pathology. From 1911 and 1921 he took over the Professorship for General Pathology and Pathological Anatomy at the University of Jena, then at the University of Basel and until 1929.

In that year he was appointed to the Chair of Pathology at the Friedrich-Wilhelms-University in Berlin. He remained as director of the Institute for Pathology at the Charité until his retirement in 1948. Between 1932 and 1942 he was a member of the Board of Trustees of the Kaiser Wilhelm Institute for Brain Research in Berlin-Buch. Robert Rössle was not a member of the NSDAP, so he was able to continue teaching at the Humboldt University in Berlin after the end of the Second World War.

Today it is impossible to say for certain how far Rössle went in adapting to the National Socialism system, and the extent to which he profited from it. It is clear that the Institute of Pathology adapted to political conditions under his leadership, and that Rössle used the dissolution of departments to increase his influence. He had an authoritarian and power-oriented style of leadership that was common at the time, even among self-confessed opponents of National Socialism. But Rössle cannot be counted among them.

Like many of his contemporaries, he never spoke out publicly or took action against the expulsion and persecution of his own colleagues who were German Jews. On the contrary, he carried out the 1933 decree of the Nazi government to dismiss all persons of Jewish faith or Jewish origin from positions in public institutions. In interviews conducted by the Allies after 1945, Rössle described his attitude towards the fascist system as "negative". And it is true that to date, research has turned up no evidence or documents in which Rössle expressed either support or enthusiasm about the seizure of power by the National Socialists or their later policies, as many of his colleagues did. It has been shown that Rössle supported colleagues who were persecuted under the Nazi racial laws.

In his scientific work, originally Rössle mainly dealt with questions of tumor pathology and inflammatory processes. Later he turned his attention to questions of growth, constitutional theory and aging. He also became known for his work on allergies, which he interpreted as a pathological increase of normal cellular processes. He also coined the term "pathergy" for the pathologically increased sensitivity of an organism to subtle external stimuli. The Rössle syndrome is named after him; in this condition, an alteration in sex chromosomes leads to an absence of female germ cells in ovaries.

After the end of the war in 1945, Rössle remained in Berlin, where he tried to reorganize the Pathological Institute and set up a medical-biological institute in Buch. He was a member of the founding board of the Institute for Medicine and Biology of the German Academy of Sciences, which was founded in Buch on July 25, 1947. Robert Rössle made a great contribution to the development of science and clinics on the Campus Berlin-Buch. He died in Berlin in 1956.

This short text cannot adequately reflect the role of Robert Rössle during the National Socialist period. A more detailed version can be found at: https://www.campusart.berlin/de/wh/robert_roessle

In summary, it can be said that Rössle should assume some blame for work carried out from 1933 to 1945, during which he adapted to the National Socialist regime, somewhat opportunistically. Rössle was neither a resistance fighter nor a hero. He made mistakes and took actions or allowed things that we condemn today. As a figure, Robert Rössle should remind us that the border between science and atrocity is not a solid one, but rather a transitional zone into which research and medicine can very easily pass, or at least pave the way for others to carry out barbaric acts.

Oskar Vogt. April 6, 1870 in Husum – July 31, 1959 in Freiburg
Cécile Vogt. March 27, 1875 in Annécy, France – May 4, 1962 in Cambridge, England

Oskar and Cécile Vogt were physicians and brain researchers who worked and published together throughout their lives. They established the theory that a person's abilities can be discerned from the architecture of his or her brain. The couple were renowned for years of accomplishments and honors that they were mostly awarded together. Oskar and Cécile Vogt are considered co-founders of research into brain architecture in the early 20th century.

Oskar Vogt was born on April 6th, 1870 in Husum; Cécile Mugnier on March 27th, 1875 in Annécy in France. Oskar Vogt studied psychology in Kiel starting in 1888 and medicine in Jena from 1890 onwards. Cécile Mugnier also studied medicine, which was considered absolutely revolutionary at the time. In 1893 she was one of very few women to be admitted to the University of Paris to study in the field.

Oskar Vogt initially dealt with neuroanatomical studies. He received his doctorate in 1894 with a dissertation "On fiber systems in the middle and caudal corpus callosum sections". In the same year, to pursue studies in psychology, he sought out the psychiatrist and neurologist August Forel in Rürich-Burghölzli, where he learned the therapeutic use of hypnosis. Vogt then worked as an assistant at Paul Flechsig's psychiatric and mental hospital in Leipzig but was fired because of his use of hypnotic methods in therapy. He departed for Paris, where he worked with the Déjérines, a couple who both worked on neuroanatomy in the Salpêtrière hospital. It was there that Vogt met Cécile Mugnier in 1898. She followed him to Berlin in 1899 and they married in the same year. The young couple founded the private "Neurological Central Station" in an apartment building on Magdeburger Strasse.

In addition to research, Oskar Vogt worked as a neurologist and clinical hypnotist. His patients included wealthy personalities such as the industrial tycoon Friedrich Alfred Krupp and Krupp's wife. In 1902, with their support, Vogt's station was incorporated as a neurobiological laboratory into the Institute for Physiology at the Friedrich-Wilhelms-University in Berlin.

In 1914 the Senate of the Kaiser Wilhelm Society approved the establishment of an institute for brain research. Oskar Vogt was appointed as its founding director. The institute was initially located on Magdeburger Strasse. In the 1920s, with support from the Rockefeller Foundation, a new building for the institute was constructed in Berlin-Buch, near the municipal sanatorium and nursing home (formerly Insane Asylum III). Here, Oskar and Cécile Vogt devoted themselves to studies of the relationship between specific brain structures and the psychological and physical behavior of organisms. To do this, they planned to examine "extreme types" and collect data from the brains of members of elite social classes and criminals, in hopes of identifying the physiological basis of genius and criminal behavior in the brain.

Oskar Vogt gained notoriety after dissecting Vladimir Ilyich Lenin's brain into 30,000 sections between 1925 and 1927. He declared the Russian politician and Marxism theorist an "athlete of associations" due to an extraordinary accumulation of pyramidal cells in the third layer of the cortex. Today this interpretation of brain structure is considered an obsolete overgeneralization. The study would cause problems for Oskar Vogt for the rest of his life, not for scientific reasons, but political ones.

Oskar and Cécile's investigations into the functions of brain centers laid the foundation for an anatomical and functional mapping of the cerebral cortex, which is nearly complete today. At the time, theirs was the world's largest institute for brain research. Oskar and Cécile Vogt headed the "Architectural Brain Research" department, where they searched for histological changes in the brains of patients with neurological diseases. This was a radical approach at a time when mental illnesses were considered disturbances of the soul rather than of the brain. As they searched for physiological explanations for neurological and psychiatric disorders, Oskar and Cécile Vogt were also interested in hereditary influences. In 1937/38 they published the results of their extensive investigations in a work on the "Location and nature of diseases in the light of topistic brain research".

Even though Oskar Vogt had been appointed institute director for life, he only headed the institute until 1937. The official reason given by the National Socialists for his forced retirement was an accusation of connections to the Soviet Union. The real reason, however, was that he employed Jewish employees. The Vogts left Berlin and set up a new research facility in Neustadt in the Black Forest, again with the support of the Krupp family. Here Oskar and Cécile Vogt worked together until old age. Oskar Vogt died on July 31st, 1959 in Freiburg im Breisgau, Cécile Vogt died on May 4th, 1962 in Cambridge, England.

Their discoveries formed the basis for further work on the "mind-body problem". The topical brain research they conducted developed into dynamic localization theory.

Hermann Joseph Muller. December 21, 1890 in Manhattan, New York, USA – April 5, 1967 in Indianapolis, Indiana, USA

The biologist and geneticist Hermann Joseph Muller became the first researcher to generate gene mutations through experimental means. This discovery – that X-rays introduce changes in an organism's genome – led to his receipt of the Nobel Prize in Physiology or Medicine in 1946.

Muller studied biology in New York from 1907 to 1910. He received his doctorate in 1915 from Columbia University, under the supervision of geneticist Thomas H. Morgan, who was also later awarded a Nobel Prize. After stays at various universities, he was appointed to a professorship at the University of Texas at Austin in 1925. It was there, a year later, that Muller observed spontaneous mutations of genes in fruit flies. He could deliberately produce such mutations by irradiating the fruit flies with X-rays, thus proving that high-energy X-rays alter an organism's genes.

An important event occurred at the 5th International Congress of Genetics in Berlin in 1927, when Muller first met Nikolai W. Timoféeff-Ressovsky. This encounter promised fruitful collaborations, so Muller received a Guggenheim Fellowship for a guest stay at the Kaiser Wilhelm Institute for Brain Research in Berlin-Buch from 1932 to 1933. Their work was interrupted in March 1933, when troops from the National Socialist paramilitary Sturmabteilung (SA) stormed the institute and arrested Muller, among others. Upon his release, secured by Gustav Krupp von Bohlen und Halbach, Muller left Germany and stayed in Leningrad and Moscow until 1937. In 1938 Muller went to Edinburgh, where he worked with Charlotte Auerbach, who demonstrated the mutagenic effects of chemicals.

Muller later developed the "linear no threshhold" or LNT model. It states that even low doses of radiation are harmful, because radiation dose and cancer cases are linearly related, without a threshold.

In 1940 Muller returned to the USA, taking up a position at Amherst College in Massachusetts until 1945. In 1945, Muller became a professor of zoology at Indiana University in Indianapolis. There he succumbed to congestive heart failure in 1967.

Muller's findings had an impact beyond medicine and science. He frequently warned of the long-term dangers of fallout from nuclear war or nuclear testing, and this led to increased public scrutiny of atomic programs. In 1959, the International Commission on Radiation Protection adopted Muller's LNT model.

More information on the cooperation between Muller, Timoféeff-Ressovsky and Max Delbrück and its importance for genetics can be found in the book "Genetiker in Berlin-Buch/Geneticists in Berlin-Buch", published in German and English by the Max Delbrück Center for Molecular Medicine (MDC).

Minerva

Minerva was patron of the arts and sciences and guardian of knowledge in antiquity.

Unlike all the other busts on campus, this does not show a human being, but the Roman goddess Minerva. She corresponds to the Greek goddess Athena, the daughter of Zeus and Metis. Greek mythology recounts that Zeus devoured the pregnant Metis. Afterwards he suffered from a headache and called upon Hephaestus, blacksmith and the god of fire, to split his head with a hammer. As a god, he survived the procedure, and Athena emerged from his split skull, fully outfitted in armour. Since then, Athena has been regarded as an embodiment of the mind.

Athena/Minerva was considered the goddess of cities, wisdom, strategy and tactical warfare. She was the patron goddess of poets, teachers and craftsmen, of the arts and sciences and guardian of knowledge. In ancient times her image adorned temples, seals and coins. Even after antiquity, her portrait continued to be found on buildings and institutions. It became a symbol of the Kaiser Wilhelm Society, founded in 1911, and its successor organization to the present day, the Max Planck Society.

After the Kaiser Wilhelm Society chose Minerva as its emblem in 1926, sculptor Carl Ebbinghaus was commissioned to create this bust on the building of the new Kaiser Wilhelm Institute (KWI) for brain research. Similar busts also adorn other institutes of the Kaiser Wilhelm Society, in Berlin-Dahlem and elsewhere.

Max Rubner. June 2nd, 1854 in Munich – April 27th, 1932 in Berlin

Max Rubner was a physiologist and hygienist who is considered the founder of nutritional physiology and experimental hygiene.

In 1873 Rubner began studies of medicine in Munich and Leipzig. In 1878 he received his doctorate for a dissertation "On the Utilization of Some Foods in the Human Intestinal Canal". This work laid the foundation for his later research on nutrition. From 1880 to 1885 Rubner worked as an assistant in physiology in Munich, spending one year as an assistant in physiology in Leipzig in 1881. He received his habilitation in 1883 with a thesis devoted to the calorific value of nutrients. In 1885 the University of Marburg appointed him to the Chair of Hygiene. The Friedrich-Wilhelms-University Berlin followed with an appointment to the Chair of Hygiene in 1891, as successor to Robert Koch, then in 1909 to the Chair of Physiology. From 1910 to 1911 Max Rubner served as rector of the University of Berlin. He later co-founded the Institute for Occupational Physiology of the Kaiser Wilhelm Society, becoming its director in 1913.

Rubner's physiological studies dealt with questions of the conservation of energy of the elements of food. He formulated the law of isodynamics, which states that carbohydrates, fats and proteins are interchangeable sources of energy for the body. He also formulated the surface hypothesis, which states that the energy turnover of an organism can be calculated depending on its surface area. In 1902 he published an influential book entitled, "The Laws of Energy Consumption in Nutrition".

As a hygienist, Rubner used his physical and chemical knowledge to study the effects of clothing, climate, air, water and the housing situation on health. One result was his "Textbook of Hygiene", published in 1888; another was his devotion to using hygienic principles in the construction of hospitals.

Afterword

The Berlin-Buch location has a long history of biomedical research and patient care that continues to this day. Today almost 3000 people work in the various institutions on campus. What they share is a passion for the combination of basic research and clinical activity that is necessary to explore the molecular basis of diseases.

Berlin-Buch's scientists and clinicians belong to a long tradition of people who have shaped the institutions situated here for more than a century. The personalities featured here are just a sample of the many men and women who have worked on health issues over the course of five political systems.

For further reading

Heinz Bielka History of the Medical-Biological Institute Berlin-Buch, Springer-Verlag Berlin, Heidelberg, New York, 2nd edition, 2002.

Geneticists in Berlin-Buch, published by the MDC for Molecular Medicine, 2008

Heinz Bielka and Helmut Kettenmann Berlin Medical History, Selected Biographies, 2nd edition, published by the MDC for Molecular Medicine, 2005

Further information on the history of science can be found at www.campusart.berlin, where you will also find information on the Campus Museum and its many historical instruments, which have played a decisive role in the history of laboratory work.

You can find the virtual microscopy museum on https://mikroskopmuseum.mdc-berlin.de which is dedicated to what is probably the most important instrument in modern science and focuses on devices made in Berlin and Brandenburg. The modern section will help you learn how modern microscopy methods work and how they are used in ongoing scientific research.

At www.campusberlinbuch.de you will also find information on guided tours and tours through the exhibitions on campus.

You can find information on current research projects at www.mdc-berlin.de & www.leibniz-fmp.de.

Plan a visit

Directions to the campus can be found at:
www.campusart.berlin
Admission to all exhibitions is free.
Outdoor areas are accessable from sunrise to sunset.
To visit the Jeanne Mammen exhibition, the microscope exhibition and the campus museum, please register at:
info@campusberlinbuch.de

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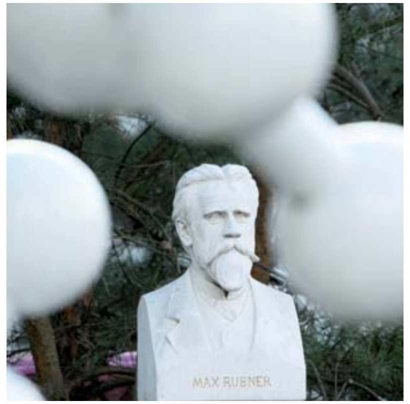

A view at the campus.