Science and Research in Vienna

The foundations for the scientific achievements accomplished in Vienna in the 20th century but particularly in the interwar period were laid down in the late 19th century. In 1926 the Viennese scientist Richard Adolf Zsigmondy was awarded the Nobel Prize in Chemistry for his research in the field of colloid chemistry. He was the second Austrian to receive the Nobel Prize in Chemistry. In 1930 the Nobel Prize in Medicine went to Karl Landsteiner, a professor for pathology at the University of Vienna who discovered the blood groups and the Rhesus factor. In 1938 the biochemist Richard Kuhn was awarded the Nobel Prize in Chemistry for his work on carotenoids and vitamins. Another remarkable Viennese scientist was the physicist Lise Meitner whose research in the field of radioactivity eventually led to the discovery of nuclear fission.[1] When she graduated from university with a doctorate in nuclear physics, she was the second woman in the history of the University of Vienna to earn a doctoral degree.[2] In 1933 the Viennese physicist Erwin Schrödinger received the Nobel Prize in Physics for the development of the atomic theory.[3] He studied at the Vienna University under Prof. Friedrich Hasenöhrl.[4] Another Viennese Nobel Laureate in Physics was Wolfgang Pauli who received the Prize in 1945 for his research of the atomic nucleus.[5] He too had studied in Vienna.[6]

Physics and Philosophy: Ernst Mach and Ludwig Boltzmann

The physicists and philosophers Ernst Mach and Ludwig Boltzmann based their scientific research on empiricism and the dismissal of metaphysics. In 1895 Ernst Mach was appointed Professor of History and Theory of Inductive Sciences, a newly established chair at the Vienna University. Mach's significance in physics is illustrated among other things by the fact that a measuring unit for the speed of an object moving through air was named after him. In 1902 Ludwig Boltzmann succeeded Ernst Mach as Professor of Theoretical Physics. Boltzmann became famous for his methodology for the establishment and critical appraisal of hypotheses.[7] Ernst Mach's research included the exploration of the movement of solid objects subject to supersonic speed.[8] Ludwig Boltzmann investigated the correlation of thermodynamics and mechanics.[9]

Polymers and Computers: Hermann Mark and Gustav Tauschek

Hermann Mark was a chemist born in Vienna who had studied at the Vienna University. Based on his research of natural and synthetic high polymer substances he developed the prerequisites for the production of synthetic fibres and thus of synthetic rubber and plastic. In 1932 he was appointed Professor of Chemistry at the University of Vienna. Because of the events in 1938 Hermann Mark was forced to flee to Canada. Gustav Tauschek, a pioneer in information technology, filed a patent application at the Austrian Patent Office in 1924 for his innovative calculating machine.[10] In 1932, after having developed his machine further, he presented the world's first machine capable of

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[1] Hugo Portisch, Österreich I. Die unterschätzte Republik (Wien 1989), 261 ff.
[2] Walter Kleindel, Das große Buch der Österreicher (Wien 1987), 337.
[3] Hugo Portisch, Österreich I, S. 263 f.
[4] Walter Kleindel, Österreicher, S. 482.
[5] Hugo Portisch, Österreich I, S. 264.
[6] Walter Kleindel, Österreicher, S. 388.
[7] Helmut Rumpler, Eine Chance für Mitteleuropa. Bürgerliche Emanzipation und Staatsverfall in der Habsburgermonarchie. Österreichische Geschichte 1804-1914 (Hg. von Herwig Wolfram, Wien 1997), 528 f.
[8] Walter Kleindel, Österreicher, S. 309 f.
[9] Walter Kleindel, Österreicher, S. 45.
[10] Hugo Portisch, Österreich I, S. 264 f.

reading, writing and calculating. It was the forerunner of the optical character reader, an essential part of early computers.11

The Austrian School of Economics

The economist Carl Menger studied and taught in Vienna. He was the founder of the Austrian School of Economics and became its most renowned representative. Carl Menger died in Vienna in 1921.12 Friedrich Hayek set up the Austrian Institute for Business Cycle Research where he analysed the reciprocity between the economy and politics. Others who contributed to the international fame of the Austrian School of Economics were Rudolf Mises, Gottfried Haberler, Fritz Machlup and Oscar Morgenstern.13 The Austrian School of Economics opposed classical economics established by David Ricardo and Karl Marx on the one hand and the German Historical School of Economics led by Gustav Schmoller on the other. The Austrians stressed that the essential economic difficulties were created by human needs. Whereas the classical theory since Adam Smith had held that a good's value depended on its exchange value, Carl Menger and Friedrich Wieser related the value of a commodity to the significance of individual needs thereby following William Stanley Jevons from England and Léon Walras from Switzerland. Through this approach economics turned from a theory of cost in which everything revolves around the price of a good to a utility theory.14 In 1974 Friedrich Hayek received the Nobel Prize in Economics for his pioneering work in the theory of money and economic fluctuations.15

Philosophy: The "Wiener Kreis" or Vienna Circle

The scientific community in interwar Vienna was characterised by the creation of scientific networks and their eventual culmination in the famous Viennese Schools of Sciences. Otto Neurath who was born in 1882 and had studied mathematics, physics and German philology became one of the leading scientists and philosophers of the neo-positivist Vienna Circle.16 He was also the founder of the Social and Economic Museum in Vienna, a social reformer and the inventor of Isotype, a system of pictograms designed to communicate information in a simple, non-verbal way. The founding father of the Vienna Circle was Moritz Schlick, Professor of Philosophy at the Vienna University since 1922. Moritz Schlick attracted some of the most outstanding members of the German speaking scientific community to join him in Vienna. The Vienna Circle consisted of approximately 35 scientists, among them physicists, mathematicians, historians, sociologists and philosophers who for instance put mathematics and physics at the service of philosophy and vice versa. They thus created a completely new school of thought calling for a no longer metaphysical but instead a purely scientific conception of the world. This new interdisciplinary approach had a lasting influence on the international schools of thought at the time. The most important representatives of the Vienna Circle were Moritz Schlick, Otto Neurath, Rudolf Carnap, the mathematicians Hans Hahn and Karl Menger, the mathematician and logician Kurt Gödel, the philosopher Friedrich Waismann, the mathematicians Herbert Feigl and Viktor Kraft, the historian of science Edgar Zilsel, the physicist Philip Frank and – as guests – the psychoanalyst Heinz Hartmann and the jurist Felix Kaufmann.

Philosophy of Language: Ludwig Wittgenstein

Ludwig Wittgenstein's scientific treatise was also the subject of intense debates at the Vienna Circle. In his *Tractatus logico-philosophicus* the philosopher Ludwig Wittgenstein articulates the conditions

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[11] Walter Kleindel, Österreicher, S. 538.
[12] Walter Kleindel, Österreicher, S. 340.
[13] Hugo Portisch, Österreich I, S. 266.
[14] Helmut Rumpler, Eine Chance für Mitteleuropa, S. 528.
[15] Walter Kleindel, Österreicher, S. 182.
[16] Walter Kleindel, Österreicher, S. 370.

for a logically perfect language, i.e. a language suited for exact scientific use. Since philosophy is expressed through language, it can be described exactly through language in combination with scientific methods from mathematics and logics. Ludwig Wittgenstein is therefore one of the most significant representatives of analytic philosophy.[17] Ludwig Wittgenstein was born in Vienna on April 26 1889 and died in Cambridge on April 29 1951.[18]

School of Brentano: the Basis of Neo-positivism

The Brentano School of Philosophy provided the basis for the neo-positivism of Josef Popper-Lynkeus, Ernst Mach, Moritz Schlick and Karl Popper but also for the philosophy of language by Ludwig Wittgenstein and Fritz Mauthner. Franz Brentano was a former priest who had lost his professorship at the University of Vienna in 1880 after marrying a baptised Jewish woman. He remained in Vienna and continued to teach as a *Privatdozent* (Adj. Professor). Franz Brentano and his students Alexius Meinong, Edmund Husserl and Christian von Ehrenfels developed an essentially positivist counter-position to transcendental philosophy and the German idealism.[19]

Critic of the Vienna Circle: Karl Popper

Karl Popper, who was critical of the Vienna Circle, nonetheless went on to achieve world fame with his own scientific work. In his confrontation with the Vienna Circle he devised a new conception of the world and became the founder of critical rationalism.[20] Sir Karl Popper was born in Vienna on July 28 1902. He studied mathematics, physics, psychology and philosophy and wrote his doctorate in 1928 under Karl Bühler.[21]

The Vienna Medical School

In the first half of the 20th century the Vienna Medical School stood for outstanding performances in medicine. This had to do with a long and successful tradition. In Vienna the transition from a science based solely on books to practical work and bedside teaching had already started in the late 18th century and was soon followed by another important step which transferred the scientific focus from the anatomical clinic to the laboratory. Among the important representatives of the Vienna Medical School in the 19th century were Carl von Rokitansky, Josef Škoda and Leopold Auenbrugger.

Modernisation of Nursing: Ignaz Semmelweis and Theodor Billroth

Ignaz Semmelweis, a physician at the Vienna General Hospital, was the first to relate childbed fever to a lack of cleanliness; around 1850 he presented his scientific findings about the infection risks in hospitals. When Theodor Billroth was appointed Professor of Surgery and became the director of the Operating Institute, the Vienna School of Medicine went through a decisive change from diagnostics to therapeutics. Theodor Billroth helped establish a new form of scientifically oriented medicine and he improved the nursing conditions. In 1881 Billroth carried out the world's first successful gastrectomy. The Rudolfinerhaus, a training institution for nurses, was built on his initiative and he also supported the development of a "voluntary ambulance service". After Billroth's death the Vienna Medical School continued to maintain its high standard.[22]

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[17] Hugo Portisch, Österreich I, S. 266 ff.
[18] Walter Kleindel, Österreicher, S. 598.
[19] Helmut Rumpler, Eine Chance für Mitteleuropa, S. 527.
[20] Hugo Portisch, Österreich I, S. 272.
[21] Walter Kleindel, Österreicher, S. 404.
[22] Helmut Rumpler, Eine Chance für Mitteleuropa, S. 529 f.

Modernisation of Surgery: Anton Eiselsberg and Lorenz Böhler

Prof. Anton Eiselsberg, a student of Theodor Billroth, was a pioneer in the field of aseptic surgery. He also developed new methods of gastrointestinal surgery and successfully carried out difficult brain and spinal cord surgery. It was on his initiative that Vienna built the world's first emergency surgery station. Lorenz Böhler became senior consultant and director of this hospital which was located in Webergasse. He developed special techniques in the treatment of bone fractures and treated injuries immediately in order to avoid shortening of the limbs, limited agility and muscular atrophy. The Böhler method is still being applied everywhere. Adolf Lorenz, Director of the Orthopaedic Ambulance at the 1st Surgical University Hospital, developed methods for "dry surgery", i.e. without cutting into skin or tissue, and became renowned for his treatment of dislocated hips and of the spine.

Scientific Dietetics: Clemens Pirquet

Clemens Pirquet discovered the tuberculin reaction which allowed for tremendous progress in the diagnostics of tuberculosis in children. He was also the first to coin the term allergy. As director of the Children's Clinic in Vienna he developed his own dietetics which was based on scientific nutritional norms. The scientifically designed meals helped to successfully nourish sick children.

Neurology: Julius Wagner-Jauregg

The Viennese psychiatrist and neurologist Julius Wagner-Jauregg was the first to successfully treat progressive paralysis caused by syphilis infection. After discovering that a high fever was effective against progressive paralysis, he inoculated patients with malaria parasites thereby curing them from the condition. This extraordinary treatment method earned him the Nobel Prize in Medicine in 1927.

Founding Father of Psychotherapy: Sigmund Freud

Prof. Dr. Sigmund Freud founded the psychoanalytic school of psychology and introduced and pursued a new concept of psychic treatment. The couch at his medical practice in Berggasse 19 has come to symbolise this treatment method. Freud made his patients lie down and then let them talk. His theory gives particular importance to the unconscious and the effects of early childhood experiences. Freud reached access to the unconscious through his patients' dreams. His most important work, *The Interpretation of Dreams*, caused a major sensation and led to harsh controversies. In 1938 Freud was forced into exile and he and his family moved to England.[23]

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roland.preiss@chello.at

[23] Hugo Portisch, Österreich I, S. 272 ff.