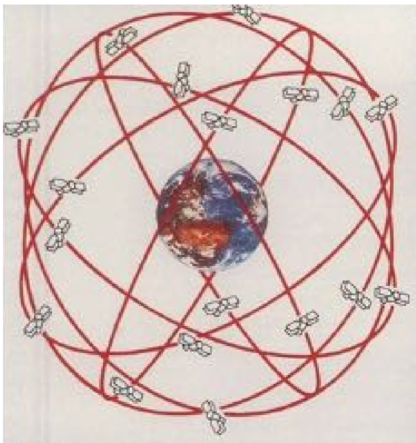
FRITZ STAUDACHER

HEINRICH WILD
ALBERT EINSTEIN

Beginning of two great world careers

At the beginning of the last century – exactly 125 years ago – Heinrich Wild, the first of two experts, came to Bern to begin a global career as a federal official. While Wild, a topographer, revolutionised the surveying of the world, Albert Einstein, who arrived in Bern in 1902, one and a half years younger than Wild, turned physics upside down. Six decades after their time together in Bern, the generation that followed them combined Wild's designs and Einstein's findings in laser surveying stations in a second revolutionary step. This document is a supplement to the article of the same name published in the 11-12/2024 issue, exclusively for readers of the magazine 'Geomatik Schweiz'.

Translation from German into English by Patrick A. Wild

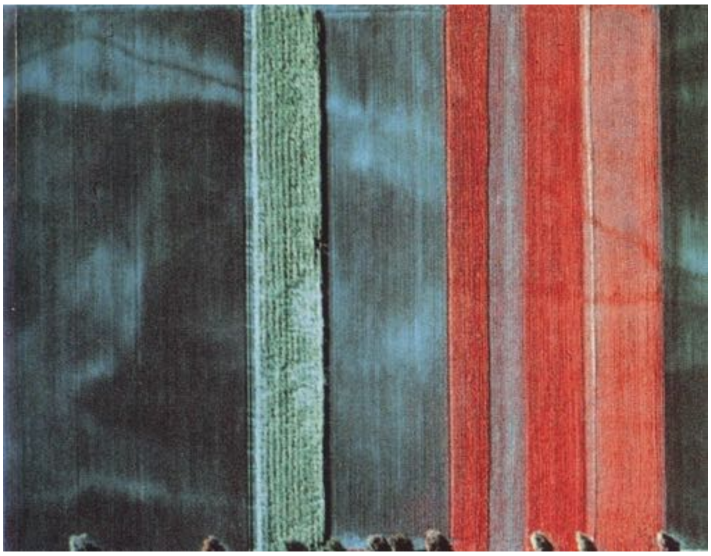


For global navigation systems (such as GPS, Glonass and Galileo) to work correctly, they need correction factors from the special theory of relativity and Einstein's general theory of relativity.

Left: Laser measurement is based on Einstein's theoretical insight from 1916/17. Without it, modern surveying technology would be inconceivable.

Here: dinosaur tracks in Courtedoux, Canton Jura (Switzerland), recorded with millimetre precision using Leica Geoystem's LaserScan.

Right: The digital sensor of the Leica ADS40 from Heerbrugg stores image data like this infrared information according to the principle of Einstein's photo effect from the Bernese wonder year of 1905.



"Einstein"- technologies: Relativistic GPS corrections (top), laser (centre), digital sensor (bottom). All pages with a blue background shown in this article are image pages from the author's text and photo book manuscript "The Einstein-Wild Relation" from 2008. ((STA2))

Heinrich Wild and Albert Einstein: Beginning of two great world careers

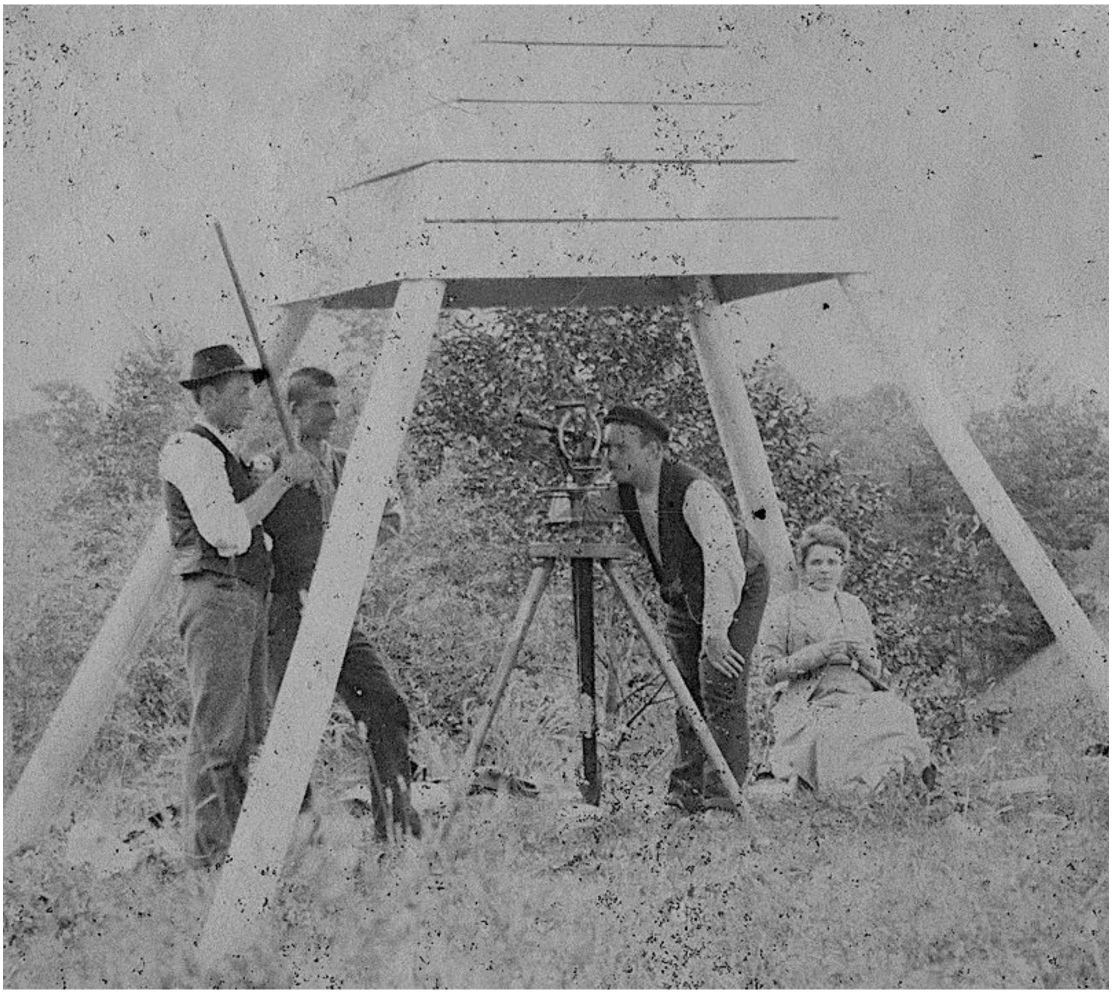
By Fritz Staudacher, Widnau (Switzerland)

Heinrich Wild (1877-1951) *Albert Einstein (1879-1955)*

Two federal civil servants started their global careers in Bern at the beginning of the last century: Heinrich Wild (1877-1951) and Albert Einstein (1879-1955). Swiss topographer, inventor, designer and company founder Heinrich Wild shapes the surveying and mapping of our living space on earth worldwide with completely new geodetic and photogrammetric instruments. The technical expert at the Office for Intellectual Property, physics professor, inventor and Nobel Prize winner Albert Einstein simultaneously revolutionizes the world view of physics with unconventional theories and findings. What was previously unknown was that the path of Heinrich Wild's life ran along the personal gravitational field of Albert Einstein for decades, and that Wild in turn revolutionised the surveying industry.

With his discovery of the photoelectric effect in 1905, Albert Einstein initiated the development of the digital sensor and thus the digital camera. Thanks to his special and general theories of relativity from 1908/1917, he made it possible to calculate the stabilization values for the satellites of the Global Positioning Systems (GPS). With the coefficients of spontaneous and induced emission he discovered in 1916/17, he provided the theoretical basis for the development of the laser.

For both Heinrich Wild and Albert Einstein, the genius loci of the federal capital of Bern proved to be ideal for discovering and developing - or as Einstein put it: "incubating" - his findings and inventions. Heinrich Wild was the first to arrive in Bern in April 1899 and was provisionally employed by the Topographical Bureau as a Topographer II Class. Albert Einstein entered the Bernese stage three years later and worked from June 26, 1902 on a provisional employment contract as a Technical Expert III Class at the Office for Intellectual Property. Half a century later, the successors of Heinrich Wild and Albert Einstein have made a quantum leap in the combined use of these technologies in the construction of Heinrich Wild's instruments.



Pyramid marking a triangulation point at Troistorrents in the Lower Valais. In the late summer of 1901, Heinrich Wild was carrying out forestry surveys in the Lower Valais. He was accompanied by his young wife Lilly, who was knitting, and their son Heiri Jr., who was born at the beginning of March and was in a basket. The equipment used was a classic repeating theodolite of the time. It seems as Heinrich Wild has been the photographer of this picture.

Anyone working today with "multi-stations" - i.e. surveying devices for the simultaneous optoelectronic determination of angles and laser measurement of distance, including the recording of the entire object using 3D laser scan point clouds - documents our living space on earth more precisely and dynamically than ever before. Self-learning robot functions support those responsible around the clock and around the globe.

Surveyors and mathematicians repeatedly influenced Einstein's theories with their knowledge. The work of Henri Poincaré in Zurich and Bern already had a major influence on Einstein's ideas, particularly on the theory of relativity. This physicist and mathematician was director of the world-famous Bureau of Longitude in Sèvres, whose original meter was based on meridian calculations by French surveyors. Einstein succeeded in mathematically formulating the theory of relativity by using approaches from the non-Euclidean theory of curved spaces of the mathematician and surveyor Carl Friedrich Gauss. However, Einstein's connections to surveying went far beyond the theoretical knowledge of a university physicist. As an instrument designer, Albert Einstein was involved in the "Kiel" gyrocompass device

((G260)) designed by the manufacturer Hermann Anschütz-Kaempfe for the navigation of submarines. It was manufactured in Kiel in such large numbers that it generated considerable income for those involved in its construction. ((N51/H90)) Einstein was so fascinated by the development that he not only interrupted his work on the general theory of relativity in 1915, but also used the functional principle of the gyroscope as a model for his atomic description of permanent magnetism.

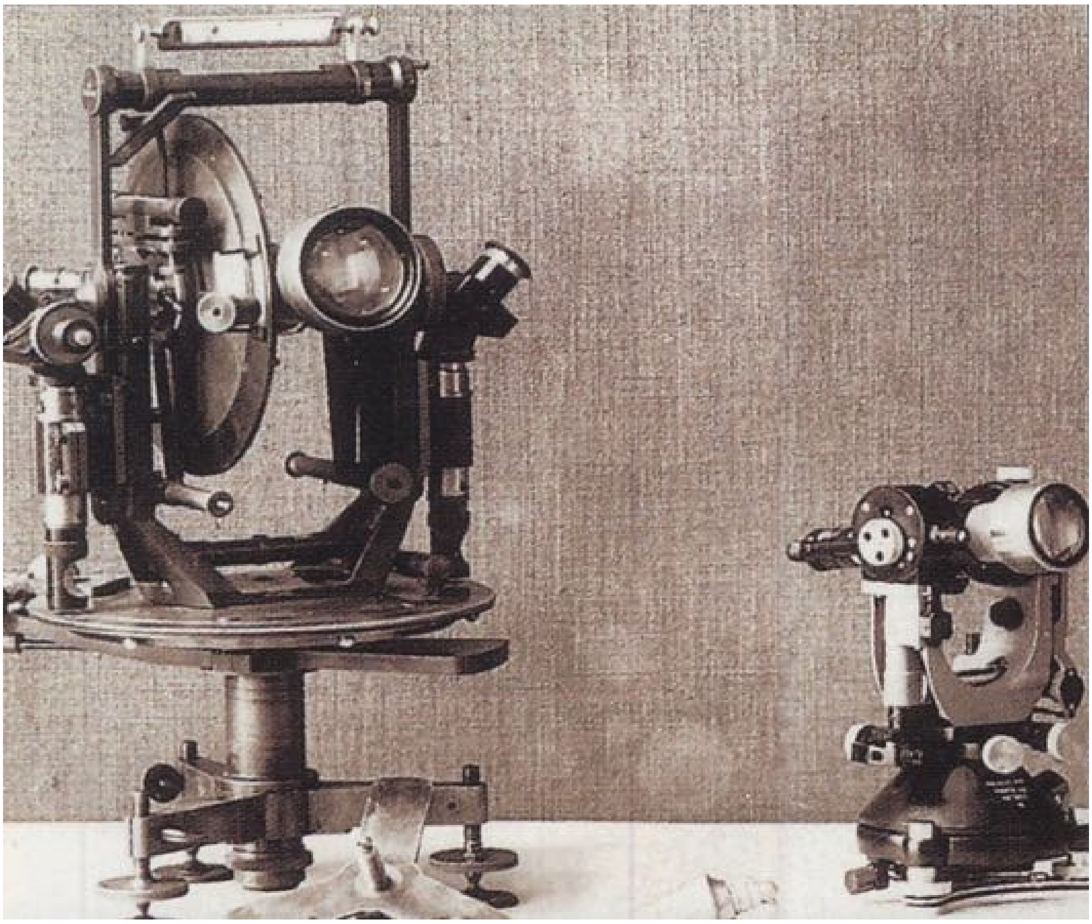
From Albert Einstein's theories to Heinrich Wild's constructions: Compared to Heinrich Wild's inventions, Einstein's theories and discoveries proved to be much more significant, elementary and universal with far-reaching effects in all areas of life. However, they can only be used in surveying after they have been translated into concrete application technologies by other physicists, electronics engineers and engineers - and sometimes even a generation later. For example, the basic theory for the development of LASERS ("Light Amplification by Stimulated Emission of Radiation"), including the coefficients for spontaneous and "induced" (or "stimulated") emission, was described by Albert Einstein as early as 1916/17 in his treatises "On the Quantum Theory of Radiation". Three decades then passed before the laser pioneer Gordon Gould named the "light variant" LASER in the 1950s in reference to the (microwave) MASER. It took another half a decade, following on from C. H. Townes' radar technology experiments in 1954, for Theodore Maiman to produce the first functional laser model in 1960. Interdisciplinary teams of experts are then required to open up a wide range of applications for such new technologies. In the case of laser technology, they proved to be particularly numerous, as gradually became apparent. Today, this technology is standard for laser shows such as those at the opening of the Olympic Games as well as for javelin throwing distance measurement in stadiums; from life-saving cardiological surgery with a laser scalpel to laser cutting of centimetre-thick steel in shipyards; from 3D laser scan documentation of 65 million year old dinosaur footprints to deciphering the building principle of Hagia Sophia; from astronomy with the height measurement of craters on the back of the moon to geodesy with the recording of our habitat Earth and its changes.

Lasers in surveying: This last of the numerous areas of application for lasers is the domain of Heinrich Wild's successors in the St. Gallen valley of the Alpine Rhine. Work on the "pilot application technology" of MASERS for determining distances using microwaves began here at the beginning of the 1960s, when the company teamed up with a Swiss-German electrical engineering firm and presented a prototype - the DI50 distance meter - at the FIG ("Fédération Internationale des Geomètres") congress in 1962, which made it possible for the first time to determine distances of 100 m to 50 km between two stations. At the same time, however, a joint venture was entered into with a French electronics company for the use of laser technology in surveying, which combined the advantages of both partners: the electronics company Sercel in Nantes was able to concentrate fully on laser technology and Leica Geosystems (then still: Wild Heerbrugg) did the same with the implementation in field-ready instruments. In 1968, the "Distomat DI10" from Wild Heerbrugg (and Sercel Nantes) was the first laser distance meter to be launched on the market: a close-range "attachment" to the Wild T2 optical theodolite; with laser distance measurement to one or up to nine reflector prisms at a distance of up to 2 km. Today's solutions from Leica Geosystems in Heerbrugg even integrate 3D laser scanner technology with point clouds in a total station, right up to the "self-learning robotic total station". In between, there are continuous further developments in miniaturization, data processing, GIS synchronization and user software, with constantly decreasing time expenditure and cost minimization.

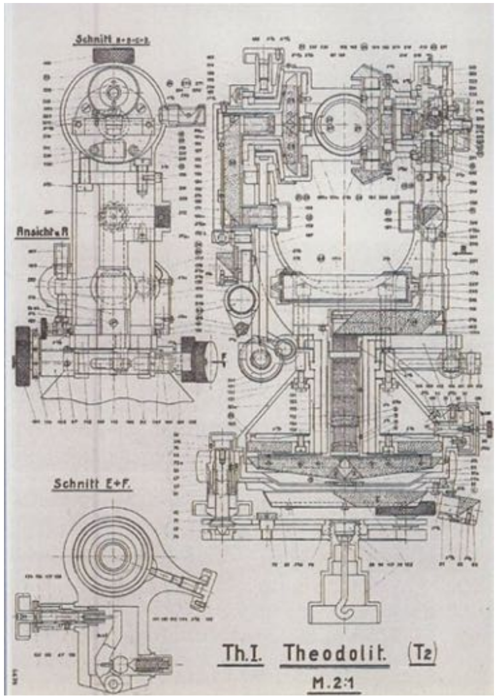
Other sectors, such as the construction industry in particular, seem electrified when Leica Geosystems launches the "electronic laser measuring tape" of the "Disto" in 1993 in the form of a handy single device with this technology, which becomes a million-seller in just a few years.

Heinrich Wild is quite rightly still regarded today as the "most important designer of geodetic instruments who ever lived" ((BE)). And according to the American news magazine "Time", the Nobel Prize winner for physics Albert Einstein is not only world-famous for his discovery of the dual nature of light (photoelectric effect, digital sensor) and the coefficients of spontaneous or induced emissions (lasers), but is also voted "Person of the Century" for his theories of relativity, with "one of the most important, if not the most important statement of human thought".

Heinrich Wild's appointment as a Topographer II Class at the Topographical Bureau is not met with universal approval, but rather astonishment: the 22-year-old surveying expert had left the Geometry School at the Technikum Winterthur after four semesters without a diploma. The reason for this, according to his explanation, was that the lecturers there could no longer teach him anything anyway and that he had already taught himself mathematical subjects beyond the level of his diploma. He fails to mention another important point: namely that he uses the time gained by leaving the Geometry School early to build up a military career, so that when he provisionally joins the Topographical Bureau as a Topographer II Class in the militia army, he already has the rank of lieutenant in the fortified troops. Heinrich Wild was employed in the Topographical Bureau at the suggestion of the topographer Leonz Held by Jean-Jacques Lochmann, who at that time was both Chief of Staff of the Engineers and head of the Topographical Bureau. ((SW2024)) In April 1900, Heinrich Wild's definitive election as a civil servant enabled him to continue his steep rise. Both Lochmann and Held recognized Heinrich Wild's extraordinary abilities and great potential at an early stage.



Above: In 1923, Heinrich Wild finally built the theodolite he had had in mind since 1905. His Wild T2 (on the right) is much lighter and smaller, and all the measuring parts are protected from weather and transport damage for quick measurement. On the left, a repeating theodolite like the one that Heinrich Wild and his team carried up to the 3,257-metre-high Haute Cime of the Dents-du-Midi on 1 September 1902.



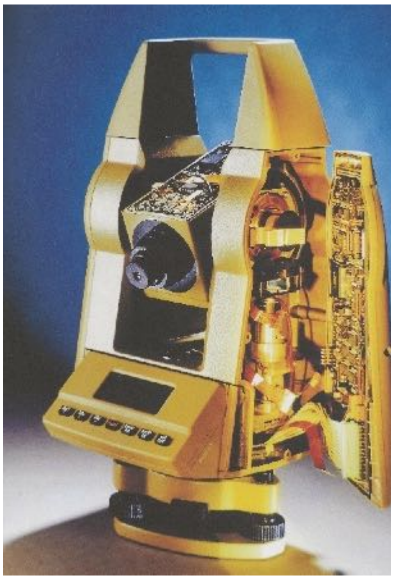
Right: the assembly drawing gives an indication of the complexity of this precision-engineered optical marvel created by Heinrich Wild. Interestingly, the drawing available in Heerbrugg bears the product names Th I and T2.

Between the repetition theodolite of that time (top left) and the Wild T2 universal theodolite from Heerbrugg lie 18 years of development work by Heinrich Wild. It is equally accurate, but more reliable, quicker to measure and lighter. Its equipment weighs only 3 kg, whereas the previous one was ten times heavier. The efficiency gains in use are roughly the same.

At the end of 1901, Albert Einstein's application letter to the Swiss Federal Office for Intellectual Property (see page 25, picture above), written in Schaffhausen's Bahnhofstrasse on December 18, brought the up-and-coming federal capital of Bern to the forefront of Einstein's interest. Without a letter of acceptance from Bern, he had "sailed away" from Schaffhausen to Bern in February 1902 after a dispute with Dr. Jakob Nüesch, head of the boarding school at the Schaffhausen boys' educational institution. Here, the 23-year-old ETH diploma teacher in mathematics - supported by a letter of recommendation from Zurich mathematics professor Marcel Grossmann - was selected from five applicants for a provisional position as Technical Expert III. class by Friedrich Haller (a former national topographer). From June 26, 1902, Albert Einstein worked at the Federal Office for Intellectual Property as a Technical Expert III Class, which he described as "the secular monastery where I hatched my most beautiful thoughts". During their time at the Technikum Winterthur, Albert Einstein and Heinrich Wild very probably did not (knowingly) meet. Heinrich Wild finished his last course IV. at the Geometry School in the winter semester 1897/98 in March 1898. Albert Einstein only taught electrical engineering students as a temporary teacher from May to July in the summer semester of 1901. However, several of Wild's acquaintances were enrolled as students at the Winterthur Technikum when Albert Einstein was teaching there ((H123)); but Einstein also had good acquaintances who were studying or teaching in Winterthur at the time of Wild's presence. ((H17/34)) In 1908, Albert Einstein was even considering whether and how he could apply for a full-time lecturer position at the Technikum Winterthur. ((N175 / S88))

Heinrich Wild: topographer, inventor and company founder

The Swiss Federal Office of Topography, founded by General Guillaume Henri Dufour in Geneva and later relocated to Bern, had a major influence on the identity and integration of the young federal state with its national maps (Dufour map and almost complete Siegfried map), which were unique in the world and covered the entire territory of the Confederation. With their authenticity and plasticity, especially in the depiction of the mountains, they radiate a positive image for Switzerland, the mountain world and tourism, not only nationally but also around the globe. The mountain depiction in the Siegfried Map in particular is the domain of the Glarus cartographer Rudolf Leuzinger - a great-uncle of Heinrich Wild, who lived in nearby Mollis for a time at the time of Heinrich Wild's mapping of the Linth perimeter and from whose knowledge Heinrich Wild may have benefited.



The Leica TC500 electronic total station from Leica Geosystems Heerbrugg from 1998 combines the classic Wild theodolite design with an integrated laser and user software.

The Multistation MS60 from Leica Geosystems Heerbrugg from 2023 combines Heinrich Wild's theodolite structure with a laser developed from Einstein's theory in two ways: firstly for high-precision distance measurement as with a total station and secondly with a LaserScan function for capturing, measuring, evaluating and documenting 3D laser point clouds with millimeter precision.

Heinrich Wild's first patent: a military double-image distance meter: From the very beginning, one of Heinrich Wild's most important special tasks at the Swiss Federal Office of Topography was to be responsible for all the instruments available in the office. This meant not only maintaining and repairing them, but also improving and modernizing them, including contacting their manufacturers or companies that were up-and-coming in the field of instrument construction. Heinrich Wild had always been interested in optics and had a knowledgeable discussion partner in his great-uncle Rudolf Leuzinger. The fifty lessons in the physics subject "Optics" taught in the third technical college geometer class in the summer semester of 1897 awakened and strengthened his interest in this new "high technology of the 19th/20th century". With his permanent employment as a civil servant in the Topographical Bureau on April 1, 1900, the world's most important precision optics company Zeiss in Jena, Thuringia, registers him as a freelance scientific employee who can work together with Zeiss chief designer and chief engineer F. Mayer. ((ZABiography)) This company, which uniquely combined modern scientific methods of glass production (Schott), optical calculation (Abbe) and instrument construction (Zeiss), offered microscopes, telescopes, astronomical equipment, photogrammetry recording and evaluation devices, spectacle lenses, binoculars and military rangefinders, but no geodetic instruments. It is therefore not surprising that Heinrich Wild's first optical work was not immediately concerned with

Topographer II. Class Heinrich Wild (left) around 1902 on a boulder in the Rhone glacier. He observes, measures and documents its development with Leonz Held and Max Rosenmund. It is the first geodetic study of glacier movements. ((SK KF 15/16)).

completely new geodetic instruments to be invented, but initially related to the possibilities for improving existing military optical telemeter designs. This became apparent when he registered his first patent in his name at the Swiss Federal Office of Intellectual Property on February 1, 1904: a correctable double-image distance meter with the patent number 31049, the patent rights to which he sold to Zeiss in the same year. In 1907, he added a further invention for telemeter construction, namely an adjustment device protected by patent specification 216420, which would bring him license income amounting to 6% of sales - or a one-off payment of 80,000 Reichs-Mark (around two million Swiss francs in today's currency and purchasing power!) if Zeiss wanted to buy the patent rights from him in full. However, Zeiss would only decide on this option in the middle of the First World War, after the demand for such artillery equipment had increased enormously. The handsome patent income and royalties, in addition to his increased salary in 1905, made Heinrich Wild a wealthy man and enabled him to move into an upper-class villa at Kirchenfeldstrasse 32 in Bern in 1905 with his family, which had grown to six people with the addition of a boy and three girls. Another task of the topographers, which promoted the coalescence of the young federal state, was the triangulation of the II.-IV. order. It is always carried out in coordination with the cantonal surveyors in the interests of their autonomy in national map updates and forest surveys.

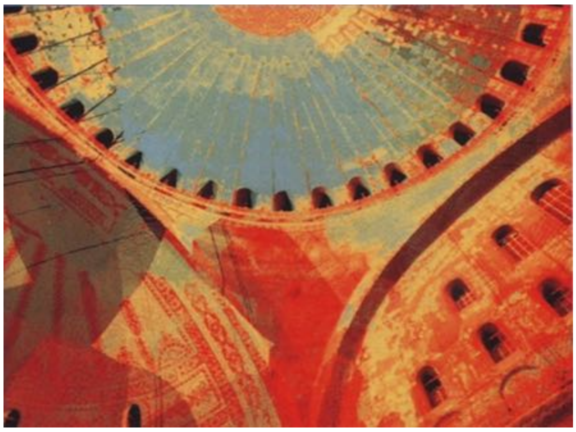
Under the instruction of Dr. Robert Hilfiker, Heinrich Wild carried out the precision levelling of Neuchâtel-Biel in his first job as topographer, as well as the survey of the St. Maurice fortress area with Max Rosenmund, glacier surveys on the Rhone glacier with Leonz Held and independent triangulations and forest surveys in the canton of Valais. This Rhone glacier survey, which was also photogrammetrically documented over decades, was the first study of its kind in the world.

Considerable amounts of fresh snow: Heinrich Wild had a particularly negative, but at the same time very formative experience with a repetition theodolite of the time on September 1, 1902, while triangulating on the summit of the 3257 m high Dents-du-Midi in the Lower Valais, which left him no peace for years. Without mentioning the federal and Valais topographers and surveying assistants who accompanied him on the arduous and dangerous ascent, Heinrich Wild writes: "At the beginning of this century, I triangulated the Lower Valais with a repeater theodolite. On September 1, 1902, I reached the 3257 m high summit of the Dents du Midi early in wonderful weather and hoped to complete the measurements by noon. Instead, I had to 'regulate' the instrument for about 2-3 hours, and when the time came, the first signs of an approaching thunderstorm appeared. In the afternoon we [?] deposited the instrument on the summit in a sheltered spot. As considerable amounts of fresh snow fell, it was only possible to continue the work after a few days. Even if the time in between could be filled with signal points etc., it was still partly lost. With an instrument that would have been ready to measure immediately, I could have completed the measurement in two hours at most. It goes without saying that I was not exactly on good terms with my instrument at the time, which incidentally was the best in the topographical office." ((WH)) Through years of observation and reflection, trial and error and consistent error analysis, he continuously improved the triangulation method and also recognized and eliminated sources of error in land levelling.

Heinrich Wild's "miracle year" 1905: However, the license income is not the only reason for an extremely successful 1905, which becomes the "annus mirabilis" for Einstein and also a wonderful year for Heinrich Wild. In this year in Bern, Heinrich Wild used the knowledge gained from the double-image telemeters to develop his concept of intelligently miniaturizing and combining the functions of geodetic instruments using precision mechanical and precision optical components to create completely new instruments with entirely new qualities. He can now name everything that needs to be changed and improved in a triangulation instrument such as the one on the Dents-du-Midi. At the same time, in conjunction with microscopes, he is able to develop a completely new idea of circle reading from the instrument.

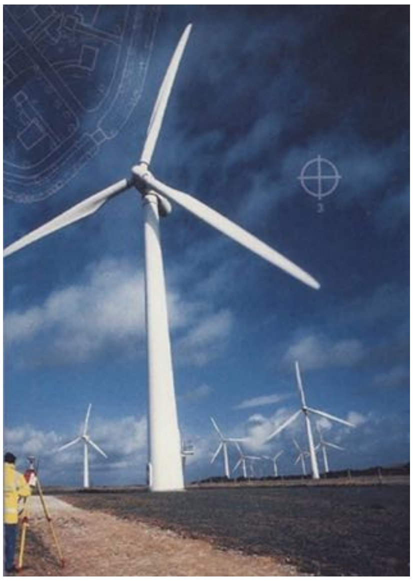
Above: Direction control of the tunnelling machine in the Channel Tunnel in 1987 with Wild T1600 electronic theodolite and Wild DI3 infrared laser distance meter from Heerbrugg.

Localisation of the Lighthouse of Alexandria, the Seventh Wonder of the World, using a Leica 300 GPS.



Discovery of the construction principle of Hagia Sophia in Istanbul in 2004 using an HDS laser scanner from Heerbrugg, Switzerland, by Professor Volker Hofmann of the University of Bern.

Land registry – owner documentation as a basis for economic development. Here in Budapest with theodolite laser stations and mapping software from Heerbrugg.



In the tradition of Heinrich Wild and Albert Einstein: land surveying and control measurements with GPS surveying systems in 2001 by Ordnance Survey, UK.

The technology spectrum of modern surveying instruments is used for important tasks around the globe. Top right: in 1987, the Wild DI3 top-mounted distance meter together with the Wild T1600 electronic theodolite formed a fully automated total station.

He also tried to achieve a breakthrough by replacing the large metal measuring circles with much smaller ones made of glass and doubling the accuracy of readings by coinciding opposite lines. He summarized this in a specification for an ideal theodolite: it had to be quicker to measure and easier to read, as well as smaller, lighter and more reliable than the thirty kilogram theodolite equipment commonly used at the time. At the same time, he prepares his large 152-page set of tables with "Tables for the rapid determination of height differences from horizontal distance and elevation angle" for publication the following year, which will facilitate the work of topographers in the future. The occasion is justified and the joy is great when Director Leonz Held promotes Heinrich Wild to the rank of Topographer First Class. In addition, Heinrich Wild was appointed first lieutenant in the military and honorably appointed to the Swiss Military Commission for Optical Rangefinders. Heinrich Wild's main interest continued to be the very complex triangulation instrument theodolite, the perfect realization of which would take him 18 more years, despite his already quite concrete ideas in 1905, until he held the instrument in his hands that fulfilled his ambitious goals: it was the Wild T2 seconds universal theodolite, which he brought onto the market at the end of 1923 and manufactured in Heerbrugg - the world's best-known geodesy instrument for decades, of which the 50,000th unit was delivered in 1974 and in addition 150’000 othr models from T0 to T4. But it was still a steep and rocky road to get there in 1905, leading from the Swiss Federal Office of Topography in Bern to Zeiss in Jena and from there to Wild in Heerbrugg and even to Kern + Co AG in Aarau in 1935. Heinrich Wild was granted his first patent (patent specification 38603) for an essential design element of his theodolite in 1907 for his invention of a diametric glass circle reading using a microscope, which he had already considered in 1905. But he only trusted Zeiss in Jena to build such a device with field suitability - and he had tested this in vain with experimental projects at Kern in Aarau and Wandschaff in Berlin. And he had the best contacts there from his optical double-image rangefinder!

The Zeiss management and board of trustees were interested in a collaboration, as it was in line with Ernst Abbe's demand "to enter new business fields of practical optics only with products that had emerged from our own work, had not been manufactured at all or had not been manufactured in the same way by others". ((SF231)). This was also intended to counter a decline in sales and employment in the demand for military instruments. ((ZA189)) In the summer of 1905, after the end of the Russo-Japanese War - both warring parties were Zeiss customers - ((WR69)) hardly anyone could imagine a major military conflict with comparable or even higher demand for military optics. The misjudgement of future demand by Wild's industrial partners is comparable to that of Einstein's field of activity: Max Planck had heard from the physics professor during his studies in Munich: "Physics is a branch of knowledge that is now almost complete. The important discoveries have all been made. It is hardly worth penetrating the field of physics any more." ((CdT 352)) And in 1899, the head of the US Patent Office in New York wrote a letter to his superiors asking them to close his office, as everything had already been invented. ((CdT348))

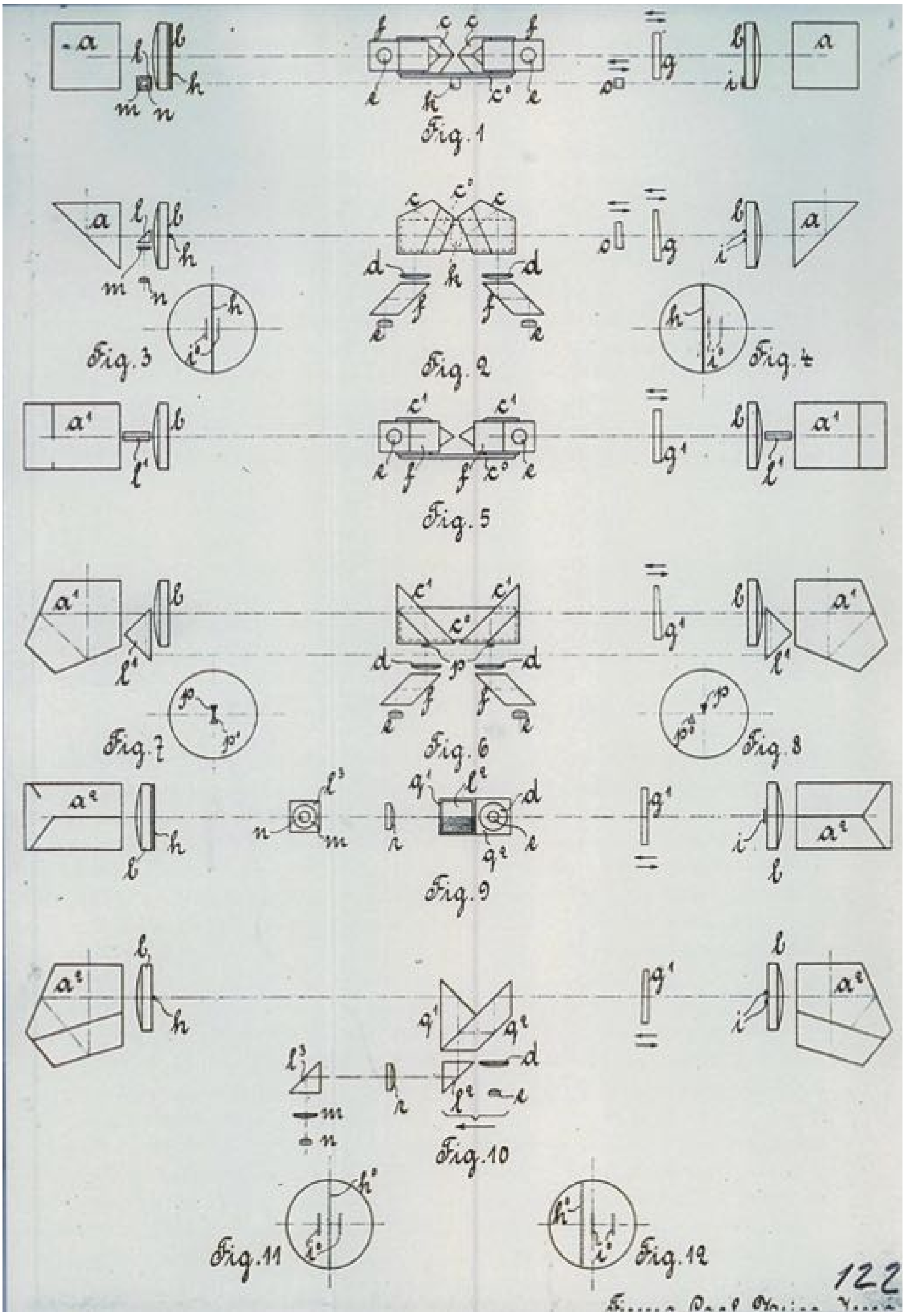
Thus, the noticeable loss of the telemeter business at the end of the Japanese-Russian war prompted the socially-minded management and foundation board of the Zeiss company on the one hand, and the land topographer Heinrich Wild on the other, to consider a combination of both competencies: Wild's brilliant ideas for the development of new geodetic instruments and Zeiss' unique mastery of optical precision mechanical manufacturing processes. Heinrich Wild and the Zeiss management had already negotiated such a collaboration, including Heinrich Wild's later joining Zeiss to set up a geodetic department, at the beginning of March 1906 during talks on the acquisition and execution of Wild's rangefinder patents. At the beginning of 1907, both parties decided to seize this opportunity, so that Heinrich Wild resigned from his secure civil servant position in September 1907 in order to set up the new geodesy department at Zeiss in Jena with the rank of senior engineer. Between September 1907 and the move to Jena on 14 February 1908, he worked as a representative of the Zeiss company with the Swiss federal authorities from his base in Airolo. This marks the end of a very successful professional chapter in the life of the outstanding topographer Heinrich Wild – and the beginning of a new, no less successful one. In retrospect, ETH Professor Fritz Kobold described the great significance for Switzerland of the thirty-year-old Wild: ((SK KF20))

"When Heinrich Wild left the Swiss Federal Office of Topography in Bern at the end of 1907, the Swiss National Survey lost the man to whom it primarily owed its upswing at the beginning of the century."

Already "most important designer" in Jena in 1909

Immediately after leaving the Swiss Federal Office of Topography, Heinrich Wild presented the Zeiss company with a concept for a new leveling instrument with an artificial horizon and eliminated collimation error. In March 1908, he was finally able to take up the position of chief engineer in Jena, Thuringia, and set up the Zeiss Geodetic Instruments Department (internally: Geo Department), which the Board of Trustees presented to the public on May 18, 1909, together with Wild's first leveling instruments.

Heinrich Wild surprises the astonished experts and competitors with his completely new level with rolling telescope and tilting screw for coincidence adjustment of both ends of the bubble: In quick succession, he launches three leveling instrument models of different accuracy classes for this Wild-Zeiss leveling method. Zeiss supplied a series of 29 precision levels with a temperature-resistant invarband staff to the British Ordnance Survey right at the beginning, which not only brought Great Britain, but later also the entire Commonwealth up to the same level in terms of surveying technology.



The achievements of topographer Heinrich Wild as an optical designer are astounding: in 1907, he submitted a patent for this further development of a double-image telemeter, and resold it to Zeiss in Jena. His cartographic script is also recognizable here. ((ZA))

Example of Wild's design intelligence and drawing precision for the double-image telemeter.

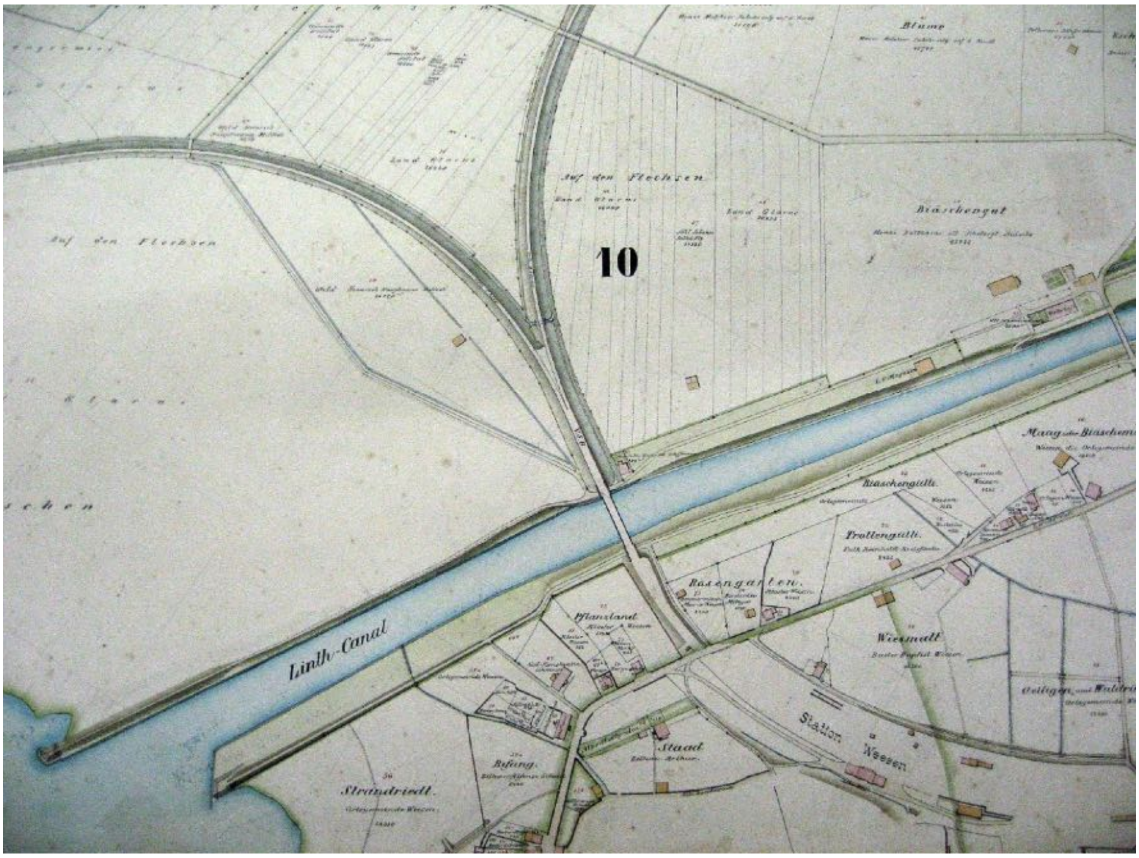
The other customers in these levels were very well received all over the world and developed into a considerable commercial success for the Zeiss company: in the first three years alone, four thousand devices were delivered all over the world! Gradually improved theodolites are added. During his time at Zeiss, the company became the market leader in the field of geodetic instruments, a position that Heinrich Wild soon wanted to take over with his company, which was founded in Heerbrugg in 1921 and named after him. The renowned geodesy professor Fritz Deumlich later confirmed the immense achievements of the young Swiss designer and business field manager: ((WJ DF32))

"Since 1908, Heinrich Wild's inventions - internal focusing, coincidence vial, telescope body and vial carrier made from a single casting, flat-plate micrometer with high accuracy, invar band bar - have become increasingly popular. It led to a standardization of the principles of the instruments."

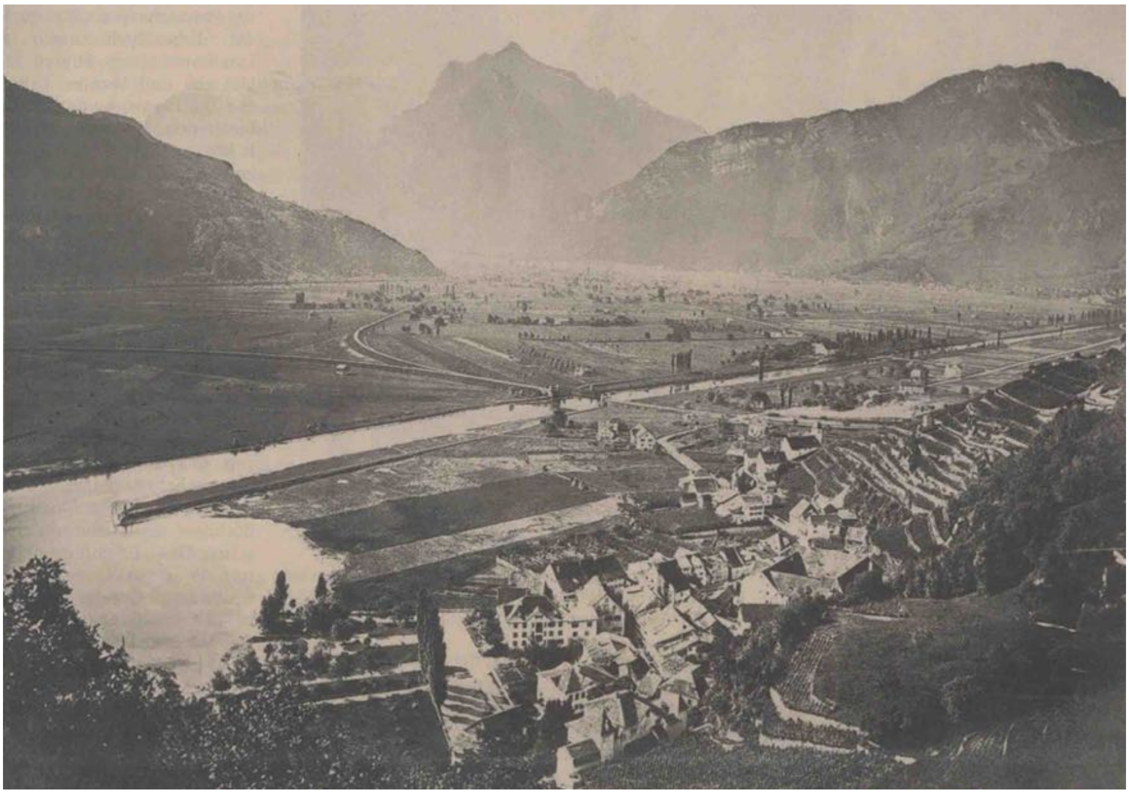
With the inventions listed here by Deumlich alone - others will follow - Heinrich Wild, already highly praised in Switzerland as a topographer, earns himself the reputation of the most important international designer of surveying equipment at a young age after his career change to one of the most respected German industrial companies. In 1920, Heinrich Wild left Jena, which had been ravaged by the First World War and the consequences of the war, including famine. Despite being banned from working and after the end of the war, he persevered with his large family in the form of a generous consultancy contract and supported the population as far as he could.

Heinrich Wild's hidden childhood and youth

While Heinrich Wild's life is relatively well known from his entry into topography, what shaped him and how he got there is only sparsely documented. ((SKW HJ/BJ)) For "Heiri", who became a half-orphan at the age of three following the death of his father, it was a steep climb from Heinrich Wild, who attended the Bilten communal elementary school for only six years, to the renowned Swiss Federal Office of Topography in Bern. Until the age of 12, when he started working for his uncle Heinrich Leuzinger in the Linthwerk project, he was under the supervision of his strict grandmother, who ran a textile dyeing business in Ober-Bilten. However, his personality, characterized by intelligence, perseverance, a critical approach to authority and the traditional, craftsmanship and great care, enabled him to master all challenges, gain recognition from others, strengthen his self-confidence and brilliantly master the difficult childhood and labor-intensive adolescent years. In his perfect construction drawings and cadastral plans, for example, he used a pair of compasses to determine points to the nearest tenth of a millimeter. He only tried to ignore events that were difficult to comprehend and which he could not influence, and to suppress them by looking ahead.



Heinrich Wild's Linthwerk plan (detail from plan 10 of 46) from 1896, shelfmark LIAR F VIII. 19 (10)



Lake Walen with Linth Canal near Weesen at the time Heinrich Wild joined the Linthwerk in 1889.

For example, it is still not known to what extent his mother Elisabeth Wild, née Weber-Leuzinger, accompanied him on his path after the death of his father. His grandson Hans Heinrich Wild (*1947) does not remember her name ever being mentioned within the family, nor does he remember his grandfather Heinrich Wild ever visiting his son Willi, who was cared for at the Pfäfers Neurological Clinic for several years. Albert Einstein was also spared such a family fate: his second son Eduard spent several years in the Burghölzli neurological clinic in Zurich. Heinrich Wild also suffered greatly from having to stand at the graveside of three of his nine children - his youngest son Rudolf died in a snow avalanche while skiing when he was only 16 years old.

During my visits to the archives in Glarus, Mollis, Winterthur, Zurich, Bern, Jena and Heerbrugg, I experience a great surprise in Glarnerland when my colleague H. Nüesch, who used to work at the Niederurn asbestos cement factory Eternit between 1968 and 1971 and now works at the National Archives, takes me into the archive rooms, leads me to a large plan cabinet after opening several heavy civil defense room doors and pulls out one of the numerous drawers. What comes to light for the first time in decades amazes me: plan after plan - 46 in total measuring 70 cm x 70 cm at a scale of 1:2,000 - drawn and hand-colored with the greatest mastery from the years 1883 to 1896, many with the signature "Gezeichnet von [drawn by] Heinrich Wild". Perfect and simply wonderful! Why did Heinrich Wild or those around him never say a word about this treasure and proof of his outstanding skill? According to Gian Knoll from the Glarus State Archives and Linthwerk engineer Ralph Jud, these plans have now been digitized.

The picture that emerges from the accounts of contemporary witnesses is that Heinrich Wild was highly gifted in mathematics and technology, very headstrong and self-confident, extremely critical and quite strict, but also fair - in that order - and that, alongside his professional career, a happy family life was his top priority: an understandable consequence of a childhood and youth in which he had lacked this. His wife and mother of his five boys and four girls, Anne-Katharina "Lilly" Märchy from Schwyz, an attractive and cheerful woman who understood him well, helped him to achieve this. He met her at the age of twenty-two while surveying on the Rigi in Arth. Just one year later, he married her in Bern and they moved into their shared apartment at Thunstrasse 8, in the newly emerging Kirchenfeld district, which would also be Einstein's neighborhood for many years - sometimes even on the same street. Several years of research and discussions with his grandson Hans Heinrich Wild and the Glarus family genealogist Patrick Wild have made it possible to say definitively (!) or with a high degree of probability:

- Where Johann Heinrich Wild, citizen of Mitlödi/GL, was born on November 15, 1877 (=> in Bilten!);
- Where he had lived as a small child with his parents and his two brothers, who were born in November and died in February after three months of early infant death (=> never in Mitlödi: 1878 in Bilten (Fridolin's birthplace), 1879 in Schänis/SG (Rudolf's birthplace); and 1880 in Ober-Bilten (his father's place of death!);

- Why the young "Heiri" missed the security of a family life (=> because he grew up as an only child and, after the death of his father Jost Heinrich Wild, who worked as a master textile dyer, draughtsman and innkeeper in Bilten, Schänis /SG and Ober-Bilten, he was already half-orphaned before his own third birthday and was brought up extremely strictly by his grandmother Regula Leuzinger, née Tschudi, who ran a textile dyeing business). Tschudi, who ran a textile dyeing business, brought him up in an extremely strict manner; but probably above all because his mother Elisabeth Wild-Weber, née Leuzinger, worked abroad - probably in Zurich - and visited him less and less often!)
- Which is why teacher Grünenfelder let him skip two classes at once at the Bilten comprehensive elementary school after only six years of schooling and thus already expelled him (=> due to his math performance, his good comprehension skills and his mastery of the subject matter of the eighth grade; but probably also because the inquisitive and visibly bored "Heiri" had also urged him to do so);
- This is why Heinrich Wild was already on the Linthwerk payroll at the age of twelve (=> because he had to earn money to support himself and his maternal uncle Heinrich Leuzinger, who had trained as a surveying engineer at the Polytechnic ETH and later became a Linth engineer, took him to the Linthwerk construction sites and surveying projects and assigned him increasingly demanding work);
- How, as a fifteen-year-old, he learned far more from Linth engineer Gottlieb Heinrich Legler during his three-year apprenticeship than the curriculum required (=> because his uncle Heinrich Leuzinger had already explained almost everything to him at the age of 13 and 14 and, in Gottlieb Heinrich Legler, he had an internationally renowned hydraulic engineer and honorary member of the Swiss Society of Engineers and Architects SIA as his teacher!)
- Why he had already earned well before he was accepted into the geometry school (=> because he was intelligent and hard-working, had mastered his trade, had himself declared of age early and had set up his own business after buying his own leveling device);
- Why he had already made a name for himself as a highly qualified surveyor and cartographer in 1896 at the age of just nineteen (!) he had already made a name for himself as a highly qualified surveyor and cartographer (=> because in that year the perimeter plans drawn up by engineer Heinrich Leuzinger and Heinrich Wild between 1889-1896 of the properties along the Linth between Lake Walen [Weesen] and Lake Zurich [below Grynau], for which Heinrich Wild had drained marshland for seven years, surveyed and evaluated properties and, together with Heinrich Leuzinger, drawn them in 46 perfect 70 cm x 70 cm plans on a scale of 1:2000 scale (!).
- Which is why he dropped out of the Geometry School in Winterthur after completing the fourth course with top marks and decided not to take a diploma (=> because he had studied mathematics far beyond the subject matter of the Geometry Diploma and had more practical experience than many lecturers - but above all because he expected

more from a military promotion to lieutenant than from two more semesters of Geometry School! - and none other than Jean-Jacques Lochmann himself, the director of topography and fortifications, who had a dual role, agreed with him). Things must have been quite turbulent at that time in Winterthur, where Heinrich Wild was admitted to the IV. course (winter semester 1897/98), Heinrich Wild was not given a grade for the third course he had passed.

In his application for provisional employment as a topographer of the second class at the Topographical Bureau, Heinrich Wild can prove - supported by a letter of recommendation from the renowned Technikum lecturer Johann Jacob Stammbach - that he had completed all the Technikum geometer classes I to IV with the best marks of all his fellow students, that he had already taught himself the material for the two remaining semesters and that he had an excellent command of it: that he had used the time he had gained to complete his military officer training, and that when he joined the "civilian" section of the military department at the age of just 22, he had already shown great ability and responsibility as a lieutenant in the fortress artillery and demonstrated leadership qualities.

Einstein: "I was sitting in a chair in the Bern Patent Office"

Albert Einstein was also fascinated by mathematics as a 12-year-old. As a high school student in Munich, he "devoured" a booklet on Euclid's geometry, which he would later describe as "sacred". ((N59)) He is extremely inquisitive and persistent in activities that require patience, such as building card houses, and is completely absorbed in the subject of his interest. ((N28)) The pupil Albert reads Alexander von Humboldt's "Cosmos" and Ludwig Büchner's "Force and Substance" with the statement that probably best characterizes both Einstein and Wild in their activities and developments: "Simplicity is known to be the hallmark of truth." ((N58/61)) Like Heinrich Wild in Bilten - and later also in Winterthur - Albert Einstein also left school early in Munich after the mathematics teacher had confirmed in writing that he was already at the level of a high school graduate in this subject. ((N36)) With this letter, he registers for the entrance examination at Zurich Polytechnic two years before the official admission age. ((N37)) Due to weaknesses in French and botany, however, he failed this early entrance examination at the age of just sixteen and a half. After a stay with his parents, who had moved to Milan and Pavia, Einstein therefore took his Matura at the cantonal school in Aarau, graduating at the top of his class. Here he asks himself elementary questions such as: "What would happen if I were to run behind a beam of light and finally catch up with it?"

Albert Einstein at the Federal Office for Intellectual Property in Bern around 1904. Here, with the praise of his superior Friedrich Haller, he examined around 1,750 patent applications during his seven years as a technical expert. Among the 13 experts working at the office, he had focused on patent applications that included electrical functions – probably not something that Heinrich Wild had developed.

"How would physical processes change in a behave like a free-falling elevator?" ((W32)) In the physics laboratory, he also experimented again with a magnetic compass needle, the object of his early childhood "wonder of wonder". ((W 32)) On a rainy day in June 1896, his Matura trip takes him to the Alpstein summit of Säntis and almost costs him his life: Einstein, equipped with unsuitable shoes, suddenly starts to slip on a steep slope and is just able to hold on to his companion Biland's mountain pole at the last moment. ((S17)) A quarter of a century later, Heinrich Wild would also have this mountain of Einstein's destiny in his sights when he spent a good decade in Heerbrugg setting up his workshop named after him.

Wild and Einstein in Bern as federal civil servants

Many of the Confederation's offices in Bern are still in the start-up phase and offer young, qualified specialists interesting tasks and secure jobs. Wild and Einstein were just 22 (Wild) or 23 (Einstein) years old when they started their new jobs. Still bachelors, the two initially lived as lodgers in Bern's old town: Heinrich Wild at Aarbergergasse 22, ((ZM)) Albert Einstein at Gerechtigkeitsgasse 32 ((H9)) Einstein's superior Friedrich Haller had worked at the Swiss Federal Office of Topography before his appointment as head of the newly founded Office of Intellectual Property (now the Federal Institute of Intellectual Property), where Heinrich Wild is now employed as a topographer. ((CP182)) With the renaming of the Topographical Bureau as the "Swiss Federal Office of Topography" in

January 1902, Heinrich Wild's boss after Jean-Jacques Lochmann is now Leonz Held, who, like Wild, had also worked his way up as a twenty-year-old without any higher education but having passed the surveyor's examination. ((SK KF15 / CP184)) Einstein and Wild were thus each subordinate to a superior who himself had many years of experience at the Swiss Federal Office of Topography.

The marital status of the two young federal civil servants also changed relatively quickly after their arrival in Bern: Heinrich Wild will take his Anna Katharina "Lilly" Märchy down the aisle in 1900, with whom he had fallen in love during surveying work on the Rigi in Arth; ((SK WHJ9)) Albert Einstein marries his former fellow student Mileva Maric, whom he got to know better during his ETH studies in Zurich. ((H12)) It should be noted about Albert Einstein's daughter, whom she gave birth to in 1902, that Albert Einstein behaved ignorantly and outrageously; she was probably born in Mileva's native Serbia and was given up for adoption. Wild and Einstein soon became fathers in Bern, with their first-born sons taking on the surname and both later entering the engineering profession. This parallelism also extends to the fact that a younger son - Eduard Einstein, born in 1910, and Willi Wild, born in 1907 - required years of neurological care in a clinic (Burghölzli Zurich and Pfäfers).

Joint commute across Bern's Kirchenfeld Bridge: The workplaces of Heinrich Wild (east wing of the Bundeshaus) and Albert Einstein (Speichergasse 6) are located in newly constructed office buildings on the edge of the old town on Bern's Aare peninsula, now a Unesco World Heritage Site. After their stays as lodgers in the alleyways of the Old Town, the future fathers of the family, Heinrich Wild and Albert Einstein, look for apartments beyond the Aare peninsula in the rapidly developing Kirchenfeld quarter; in Thunstrasse, the Wilds, Albert Einstein and his fiancée Mileva Maric even live just a few houses away from each other at times. In order to get to their offices and back home again punctually at the specified office hours, both Albert Einstein and Heinrich Wild cross the Kirchenfeld Bridge at roughly the same time every six days of the week on their way to work.

Between Albert-Einstein-Strasse and Wild-Strasse: During their years in Bern, Wild and Einstein also changed addresses several times also with their families. The Wild family remained loyal to the Kirchenfeld quarter as their place of residence ((ZM)). After two moves in the following three years to the Old Town (Kramgasse 24) and then to the Mattenhof quarter (Tscharnerstrasse 28), the Einsteins also returned to one of the then fashionable Wilhelminian-style houses in Bern's sparsely populated Kirchenfeld quarter (Aegertenstrasse 53) in 1906 ((H11)). Heinrich Wild's workplace even came in handy in 1904: the Swiss Federal Office of Topography moved from the east wing of the Bundeshaus to the Kirchenfeld quarter in a new building at Hallwylstrasse 4.

Wild und Einstein in Berns Kirchenfeldquartier 1900–1909

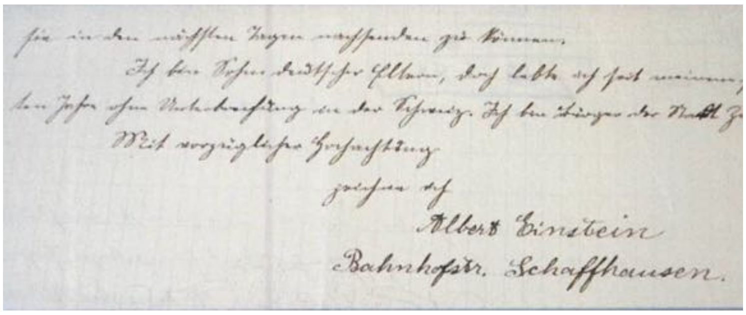
Wild-Wohnung		*Jahr*		*Einstein-Wohnung* (von/bis)
Thunstrasse 8	1	1900		
Thunstrasse 8	1	1901		
Thunstrasse 8	1	1902	1 2	Thunstrasse 43a (06-08) Archivstrasse 8 (v: 08) *Mileva:* Thunstr.24 (06-07) *Mileva:* Mottastr.3 (08-12)
Thunstrasse 8 Thunstrasse 6	1 2	1903	2 3	Archivstrasse 8 (b: 01) Tillierstrasse 18 (01-10)
Thunstrasse 6	2	1904		*(Einsteins wohnen von Nov 1903 bis März 1906 in Kramgasse 24 und Tscharnerstrasse 28)*
Thunstrasse 6 Kirchenfeldstrasse 32	2 3	1905		
Kirchenfeldstrasse 32	3	1906	4	Aegertenstrasse 53 (v: 04/1906)
Kirchenfeldstrasse 32	3	1907	4	Aegertenstrasse 53
Kirchenfeldstrasse 32	3	1908	4	Aegertenstrasse 53
		1909	4	Aegertenstrasse 53 (b:10/1909)

The Geodesy and Triangulation Department relocated to the building between 1912 and 1914 of the Office of Weights and Measures on the later Albert-Einstein-Strasse and Wild-Strasse. This Wild-Strasse is named after Johannes Wild (1814-1894), a professor of geodesy at the ETH who was two generations older and equally well-known. Einstein does not seem to have maintained many private contacts after the early years of his "Akademie Olympia" in Bern, because after his friend Michele Besso moved house, Einstein wrote to his friend Solovine in 1906: "Since you left, I no longer socialize with anyone in private. Now even the conversations with Besso on the way home have stopped." ((H24)) Heinrich Wild is often away from Bern because of his surveys.

Einstein's miracle year 1905: Albert Einstein, a "specialist teacher in mathematics" working as a technical expert III class at the Office for Intellectual Property, dealt with a total of around 1750 patent applications during his years at the Bern Patent Office to the complete satisfaction of his superior Friedrich Berchtold Haller. ((H51)) Since Henrich Wild submitted four patents during his years in Bern, it is possible that one of them could have been examined by Albert Einstein. However, all searches in this regard were unsuccessful. Among the thirteen examiners, Albert Einstein had specialized in patent applications with an electrical theme - this only became an issue with surveying instruments six decades later. It cannot be ruled out from the outset that they met in the Naturforschende Gesellschaft, but there is no proof. It must also be remembered that Wild was in the field for many months and not present in Bern at all.

In addition to his patent examinations, Albert Einstein also pursued "private" projects of a fundamental nature at work. In an unprecedented firework of ideas, the brilliant Albert Einstein presented a five-stage cascade of work in 1905, which was continued in 1907. Einstein's work broke through the previous barriers of Galileo's and Newton's classical mechanics and overcame the resistance of Maxwell's and Lorentz's electrodynamics. ((H64)) Einstein discovers and describes atomic forces in the Petri dish, the dual nature of light and its light quanta as well as the relationships between energy, mass, speed of light, time and space in the special theory of relativity. Almost incidentally, he completed his doctorate at the University of Zurich with an extremely concise thesis on "A new determination of molecular dimensions". Einstein described the decoding of the equivalence principle he discovered in 1907, which was the first major step towards the general theory of relativity, which was only completed almost a decade later - and which he described as the "happiest thought of his life" ((N234)) - as follows: "I was sitting in a chair in the patent office in Bern. Suddenly the idea dawned on me: 'In free fall, a person should not feel his own weight at all'." ((H39)) For Heinrich Wild, 1905 and 1907 were also decisive years on the road to a new age of measurement. He too had to wait a good decade before the ideas developed during these years could be realized in Germany and 18 years later in his own company in Switzerland!

Farewell to Bern: It was not only the surveying officer Heinrich Wild who succeeded in changing careers when he left Bern at the age of exactly thirty, but also the patent officer Albert Einstein. In March 1908 - at exactly the same time as Heinrich Wild joined Zeiss in Jena - Einstein began his part-time habilitation lecture at the University of Bern. As a private lecturer, he explains the "Theory of Radiation" on Tuesday and Saturday mornings at 7:00 a.m., before rushing to the patent office at Äussere Bollwerk 8 to start work just in time. ((N175)) The patent office and the university are not far apart: Einstein holds his lecture in the Physics Institute of the Tellurian Observatory (Alte Sternwarte) on the Grosse Schanze. This is exactly where the "zero point of measurement" for all astronomical and geodetic measurements in Switzerland is located, which is also central to Heinrich Wild's work. In 1995, it was virtually relocated ten kilometers south to Muri, ((H98)) where Einstein had already received Poincaré's Morse signals in 1908, with the new headquarters of the Swiss Federal Office of Topography (today: swisstopo). ((H33 / G288))

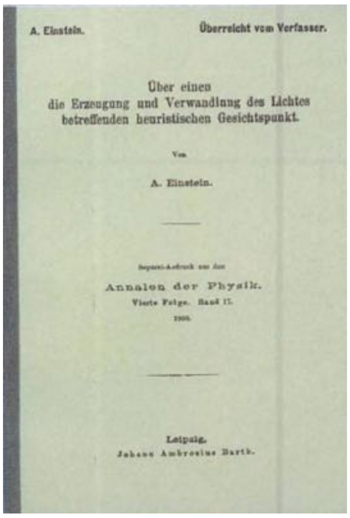

Mit vorzüglicher Hochachtung

Albert Einstein

Bahnhofstr. Schaffhausen.

Above: Second page of Einstein's application to the Federal Office for Intellectual Property in 1901. At the time, he was a teacher at the Dr Nüesch boarding school for boys in Schaffhausen and had previously taught at the Winterthur Technical College on a temporary basis. ((B))

Above: Einstein at the Bern Patent Office ('The worldly cloister where I hatched my most beautiful thoughts.') in his checked suit tailored according to the recommendations of his boss Haller. (Z15)


A. Einstein. Überreicht vom Verfasser.

Über einen die Erzeugung und Verwandlung des Lichtes betreffenden heuristischen Gesichtspunkt.

Von A. Einstein.

Separat-Abdruck aus den Annalen der Physik. Vierte Folge. Band 17. 1905.

Leipzig. Johann Ambrosius Barth.

Photo effect: 1921 Nobel Prizes


Einstein Überreicht vom Verfasser.

Über die von der molekularkinetischen Theorie der Wärme geforderte Bewegung von in ruhenden Flüssigkeiten suspendierten Teilchen.

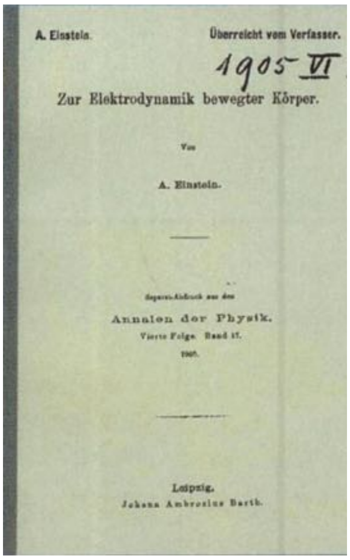
Von A. Einstein.

Separat-Abdruck aus den Annalen der Physik. Vierte Folge. Band 17. 1905.

Leipzig. Johann Ambrosius Barth.

Brownian motion

Below:
Friedrich Haller is Einstein's boss at the patent office. He had previously worked at the Swiss Federal Office of Topography – like Wild's supervisor and Wild himself. ((H41))


A. Einstein. Überreicht vom Verfasser.

1905 VI

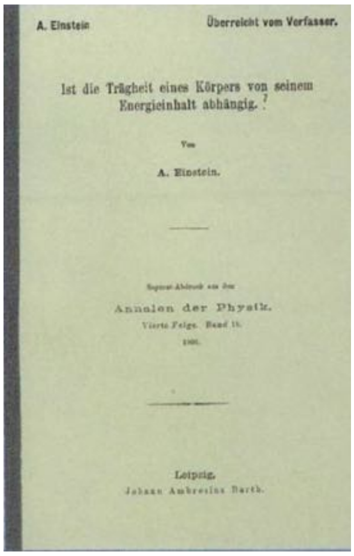
Zur Elektrodynamik bewegter Körper.

Von A. Einstein.

Separat-Abdruck aus den Annalen der Physik. Vierte Folge. Band 17. 1905.

Leipzig. Johann Ambrosius Barth.

Special Theory of Relativity


A. Einstein Überreicht vom Verfasser.

Ist die Trägheit eines Körpers von seinem Energieinhalt abhängig?

Von A. Einstein.

Separat-Abdruck aus den Annalen der Physik. Vierte Folge. Band 18. 1905.

Leipzig. Johann Ambrosius Barth.

Equivalence formula E=mc2

With these four publications (here as separate issues) in his Bernese miracle year of 1905, Albert Einstein changed our view of the world. ((Z))

Today, a memorial stone and a bust of Einstein at the Exact Sciences building (Sidlerstrasse 5) erected on the Grosse Schanze on the site of the old observatory bear witness to the work of the later Nobel Prize winner at this location. In 1908, Jean Perrin in Paris succeeded in proving the atomic hypothesis by confirming Einstein's theoretical statements on Brownian motion. ((R96)) Also in 1908, Alfred Bucherer provided practical proof of the correctness of the special theory of relativity by demonstrating the mass gain of fast electrons in experiments. The mass of electrons depends on their speed. ((CdT 376)) The most precise experimental evidence was provided by Charles-Eugène Guye, at whose suggestion Einstein received his first honorary doctorate from the University of Geneva in 1909.

Albert Einstein as professor in Zurich - Prague - Zurich - Berlin: In May 1909, the thirty-year-old Albert Einstein is appointed Associate Professor of Theoretical Physics at the University of Zurich. He was only given this post because the preferred candidate was terminally ill with tuberculosis. ((N177)) He accepted a call from the German University of Prague as Full Professor of Theoretical Physics in 1911, but did not feel comfortable there due to the Kafkaesque administrative workload (Professor Einstein: "The ink-scraping in office is endless!"). ((N179)) A year later, the ETH brought him back to Zurich to the Chair of Theoretical Physics. And in 1914, Albert Einstein once again moved from Switzerland to where topographer and chief engineer Heinrich Wild was already living with his family: Germany. Albert Einstein arrived at his new workplace in April 1914 and took over the professorship and the directorship of the Kaiser Wilhelm Institute of Physics in October. From the outset, Einstein's good income as a professor was generously doubled by Leopold Koppel from Berlin, ((N122)) an industrialist who also supported military research. ((N282))

Difficult war years for Einstein and Wild in Germany

Albert Einstein had barely arrived in Berlin when what was then considered a short, victorious military campaign began, but which today must be referred to as the First World War. An assassination attempt on the Austro-Hungarian Crown Prince in Sarajevo sparks a wildfire conflict in which the Central Powers – the German Reich ruled by the Prussian Kaiser Wilhelm II, the Austro-Hungarian Empire led by the led Danube Monarchy and the Ottoman Empire – increasingly fight against the powers allied in the 'Entente', especially France, the British Empire and the Russian Tsarist Empire. Einstein, who was working hard on his general theory of relativity and in poor health, had also been a Swiss citizen since 1901, but was classified as unfit for service and extremely critical of the military (Einstein: "The terrible spawn of herd mentality, the military, which I hate!"). ((H148)) "Einstein lives in meagre conditions, eats canned food, immerses himself in science and often works through the night. Every disturbance is one too many. He is on the verge of turning the world of physics upside down once again with his general theory of relativity. In the final weeks, between the end of September and the beginning of November 1915, he experienced the most intensive working phase of his life," writes Jürgen Neffe in his biography of Einstein published in 2005. ((N191)) After separating from his wife Mileva, who had stayed behind in Zurich, Einstein had to spend a large part of his salary as a professor on supporting her and his two sons in Switzerland. He writes to her: "I would have transferred more money to you, but I have nothing left myself, so I can't get by without help." ((N192)) Due to the galloping inflation of the mark, the amount of francs exchanged for this has less and less purchasing power for the family living in Zurich - Mileva, Hans Albert and Eduard.

Because of this double burden, Einstein later received additional financial support in Berlin from his uncle and later father-in-law Rudolph Einstein and, after moving into the house of his cousin and future wife Elsa Einstein-Löwenthal, was cooked Swabian favorite dishes. ((N26)) Compared to the starving German civilian population, Wild and Einstein were nevertheless privileged thanks to their repeated stays in Switzerland as well as their contacts and "food" parcels from the Swiss Confederation. ((N17)) From the beginning of the war, the bourgeois and national-conservative Wild family in Jena campaigned for a better urban organization of the food supply and for humanitarian aid campaigns; the socialist-minded pacifist Einstein would do the same a good decade later for fellow Jews in need. Alexis Schwarzenbach writes about Einstein: "As a pacifist, he opposed the war and was annoyed that the Swiss press, with the exception of the 'Volksrecht', did not share his views. As he considered German militarism to be one of the main causes of the war, he was also disappointed that the Swiss army was led throughout the war by the pro-German General Ulrich Wille, who had reformed the Swiss army along Prussian-German lines." ((NZZ / P113)) No such statements are known of Major Heinrich Wild; he would certainly have vehemently contradicted Einstein. But even in Einstein's hands, a technology that is in itself morally value-free remains a double-edged sword: "One of the many contradictions in the life of the pacifist Einstein is that in the 1930s the navies of almost all countries (except the USA and England) also used the gyrocompass he had helped to construct to orient themselves on the world's oceans," writes Jürgen Neffe. ((N282)) During the war years, Albert Einstein developed, completed and published his general theory of relativity and the field equations of gravitation in Berlin, and in 1917, after introducing a cosmological "lambda", the model of a finite and at the same time unlimited universe in four-dimensional space-time. ((N263)) "The expansion of the cosmos is an expansion of the universe with time. Space expands with the expanding masses without a center. The expanding universe looks the same from every point of view: All galaxies are moving away, at increasing speed with increasing distance from the observer, wherever he is." ((N 265))

Wild wants to build its new theodolite in Switzerland

With the outbreak of the First World War, everything changes abruptly in the life of Heinrich Wild, too. His employment contract is deemed to have been immediately terminated due to 'force majeure' with the declaration of war by the German Reich against the Russian Empire on 1 August 1914, and the successful senior Zeiss engineer and head of the Geo department is denied access to the Zeiss factory and his workplace: there is no longer any room for a foreigner – and, what's more, an officer – of a foreign state in a company that is now fully converting to a war economy and offering products relevant to the war effort. The company discontinues its entire civilian product range and doubles its workforce from 5,200 to over ten thousand during the war years (and shrinks back to the same number at the end of the war). As an artillery major at the Gotthard fortress, Heinrich Wild is immediately drafted into military service, from which he is only provisionally released six months later and returns to his family in Jena. During the next three years of the war, Wild would spend several months each year doing military service in the Gotthard fortress. In Jena, he lived with his family – which had since grown to ten people – in his spacious villa on a hillside above the Zeiss works, living off his savings and the royalties from his patents, of which those for the optical telemeter in particular made his financial prospects tolerable. Until now, the seven per cent turnover tax on the telemeter patent from 1907 had comfortably absorbed his loss of earnings, as demand and prices for these devices rose disproportionately. But with each month of the war, the cost of basic foodstuffs also rose considerably, provided they were still available at all: two years after the start of the war, the Reichs-Mark had lost half its value and now had only the purchasing power of fifty pfennigs. Hunger has become an everyday issue even for people with jobs, and mothers are replacing men in the military at their workplaces. With a weekly wage of just nineteen marks, which a female factory worker receives for a 48-hour week, Schmalhans is the master of the kitchen and meat is a rarity, as this weekly wage is no more than the price of two kilograms of beef, which, if at all, can only be afforded in better-off households at the most on festive days.

Typical Wild: the social hardship and, in his opinion, the uncoordinated distribution of what is available, unnecessarily exacerbating the shortage, leaves him no peace of mind, so that he and his wife 'Lilly' will soon be systematically addressing this issue. It does not take long before he is held in high esteem not only by experts in the field for his outstanding inventions of instruments and is popular with the company management and the foundation board thanks to the economic success of the Geo department, but also with the population of Jena, where he and his wife 'Lilly' set up an exemplary food supply organisation during the hardship of the war. ((BS)). But suddenly his main source of income, patent royalties, began to dry up: in 1916, after ever-increasing sales-share payments, the Zeiss company exercised the option to buy the 1907 patent outright for 80,000 Reichs-Marks.

However, due to galloping inflation, this payment now corresponds to just under half of its original value – and the ongoing devaluation continues to erode it. ‘But he [Heinrich Wild] had already spun threads for a return home in view of the conditions in Germany that had become untenable as a result of the war and his concern for the education of his children in the Swiss way,’ said Prof. Dr. Simon Bertschmann, who was later appointed director of the Swiss Federal Office of Topography, had visited the Wild family in Jena in 1920 and whose daughter Eva Wild's son Hans will marry (BS). One of these threads had already led Heinrich Wild to Major Dr Rudolf Helbling in the Gotthard fortress in 1916.

Construction genius, photogrammetry pioneer and industrial magnate. In his civilian life, Dr Robert Helbling is a geologist, extreme mountaineer, mining engineer and the owner of a surveying and photogrammetry office in Flums in the canton of St. Gallen that operates successfully beyond Switzerland's borders. ((RB)) Like Heinrich Wild, he is an alert contemporary who does not rest on what already exists, but creates something new wherever he goes: be it in the mountains, where he was the first person to conquer the Aconcagua, the highest mountain in the Americas, alone; whether it is photogeology, which he establishes as a scientific method; or whether it is the photogrammetric imaging process, for which he is the first private surveying office to purchase a Zeiss plotting device and offer mapping from stereo photo image pairs on the market. Wild discusses his ideas for new surveying equipment and his possible return to Switzerland with him. ((FP35)) Robert Helbling, for his part, knows the civil engineer Jacob Schmidheiny, a successful brickworks and machine industrialist from Balgach, from his time at the Zurich Polytechnic and from the board of directors of the automotive company Safir AG. Jacob Schmidheiny and his brother Ernst Schmidheiny, who is four years older, are constantly working to modernise the infrastructure in eastern Switzerland in the middle Sankt Gallen valley of the Alpine Rhine, which is currently being forced into dams, and to establish industrial companies that are committed to new technologies. He is the chairman of the board of directors of one of the country's first electric trams, which connects Heerbrugg railway station to the transport hub between the village of Berneck and the small town of Altstätten, and later also to the village of Diepoldsau, and fights against the high unemployment rate with the slogan: ‘Work for the people of the Rhine Valley!’ ((SK SG21)) to fight against the high unemployment. Wild, on the other hand, argues in favour of the Midlands region in Switzerland and the Jura Arc, because skilled workers from the precision engineering and watchmaking industries can be found there; this is in contrast to the 77% of skills and jobs in the Rhine Valley geared to the textile industry, which is experiencing a collapse as a result of the embroidery crisis, with a 90% slump in exports. In terms of expertise, the successful engineering and investment industrialist duo Jacob and Ernst Schmidheiny are in no way inferior in their field to the company founders and captains of industry, the engineering genius Heinrich Wild and the photogrammetry pioneer Dr Robert Helbling. After the Austro-Hungarian Danube Monarchy resigned following its defeat in the war and Kaiser Wilhelm II fled to the Netherlands, parliamentary republics were formed in Austria and Germany for the first time.

In 1918, Heinrich Wild resumed his work at Zeiss on the basis of his old employment contract, pursuing one goal in particular, which he described as follows at the Swiss National Exhibition in 1939: 'At the end of 1918, I took up an idea again that dated back to 1905 but had been dismissed as a pipe dream, namely the principle of circle reading by coincidence of opposing lines (doubling of the measuring interval). A small theodolite with a second division in the reading microscope's field of vision was created and this instrument initiated the actual modernisation of the theodolite design.' ((WH)) In the Zeiss Jena archives, we read: 'On 1 October 1919, the senior engineer Heinrich Wild, who was head of the geodetic instruments department, left the Zeiss company to found his own geodetic company in Switzerland. Since the move to Switzerland initially caused difficulties, Wild initially remained in Jena and signed a contract with the Zeiss company on 1 December 1919, offering to develop designs in the field of geodesy. However, he did not become an employee of the company again.' ((ZA18704)) And a few years later, the Zeiss chronicler noted on an index card: 'Although Wild's departure from the Zeiss company was already certain, he was allowed to continue working in the company until 1921 with the consent of the management.' This situation shows the great respect and trust in the abilities and fairness of the Swiss man, who wants to return home but does not yet seem to have fully convinced the potential business partners Helbling and Schmidheiny. Photogrammetry pioneer Dr Robert Helbling is expecting the range of instruments to include photogrammetry devices for stereophotographic recording – whether from the ground or from an aircraft – and for cartographic restitution. It was only after Wild sent a telegram announcing the construction of a new type of photogrammetric plotting device that the knot seemed to be loosened, allowing Dr Robert Helbling to see the moment for entrepreneurial action and on 3 November 1920 he supported the Rhine Valley industrialist Jacob Schmidheiny in investing in a company foundation. ((SR6)) In the commemorative publication issued by the Swiss Geodetic Commission in 1977 to mark the 100th anniversary of Heinrich Wild's birth, Dr Georg Strasser wrote: 'At the first meeting, Wild suggests improving the theodolite he has just designed in Jena. Furthermore, he [and Robert Helbling!] expected particular success from the construction of a [photogrammetric] autograph. Although the patent office later claimed that this compensation was not mechanically possible, Wild proved the opposite with his plotting autographs.' ((SK SG21))

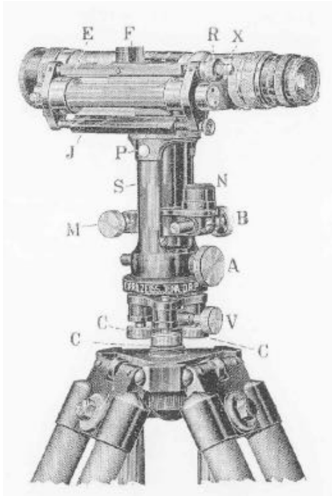
In April 1921, Wild opend his company in Heerbrugg

In accordance with Jacob Schmidheiny's request, Heerbrugg in the middle St. Gallen valley of the Alpine Rhine was chosen as the location: Heinrich Wild, together with Schmidheiny and Dr. Robert Helbling, founded the 'Heinrich Wild, Werkstätte für Feinmechanik und Optik', Heerbrugg as a simple partnership on 26 April 1921, with Wild himself as the sole responsible managing director and the other two as partners. The founding capital of 900,000 francs (equivalent to 22 million Swiss francs at today's purchasing power) is contributed in equal parts by the three partners. The only one of the three founders who has such large financial resources or credit lines at banks is Jacob Schmidheiny. Robert Helbling, who owns a surveying and photogrammetry company in Flums, is loaned the difference between the full capital contribution by his wife Doris Helbling-Spoerry, née Jacob, widow of Heinrich Spoerry, the Flums embroidery industrialist who fell to his death on the Matterhorn. Heinrich Wild, on the other hand, who had not much of his former fortune left after purchasing and secretly transferring special machines that were subject to an export ban in Germany – such as a circle-dividing machine – and paying relocation costs and the running costs of his family of eleven. He contributes his 300,000 francs in the form of patent rights to his current and future patents from his inventive work. For the first few months, the company headquarters is an embroidery shop and a factory building built in the founding year near the Entenbad in the Heerbrugg district of Balgach. His theodolite Th.1, which had already been manufactured in Jena in 1919 and which he had since further developed – and which, because of its similarity to the Jena model, was henceforth referred to as the Wild T2 after the first two examples Wild T2 – is manufactured like the other types of instruments in the Heerbrugger workshop (calculation office, assembly) in an Austrian branch factory (production of optical and mechanical parts) on the other side of the Rhine. At Robert Helbling's insistence, Heinrich Wild has to devote himself primarily to the construction of a phototheodolite and also to a photogrammetric plotting device: both are absolute novelties, and neither of them has any experience in their construction and manufacture. The reasons for and the eventful development of this immense project on the green meadows of Duck Pond will not be discussed in detail here; excellent works published for the company's 100th anniversary in 2021 ((HD, RB, VO)) and manuscripts are prepared. ((STA2, STA4)) But here is just as much in note form: Heinrich Wild had poached 15 highly qualified employees in Jena – but they did not receive a work permit in Switzerland due to the textile crisis and unemployment. So, on the other side of the Rhine in Lustenau, Vorarlberg, an unused gymnasium had to be converted into an optics and metalworking workshop. The finished parts are transported by handcart across the Wiesenrainbrücke border crossing into Switzerland to the new factory building, where the assembly takes place, or rather, should take place. Again and again, parts do not match the plan and have to be returned to Lustenau and reworked or remanufactured. So far, it is not known what the Jena colleagues had to report after Heinrich Wild left. 'Heinrich Wild [on the basis of the production order he had already placed in 1919 for a series of 1000 instruments] was able to gain valuable experience in the construction of the new theodolite, which he later used in his company, Heinrich Wild, Heerbrugg, for the construction of a similar instrument. When he left in 1921, he took with him to Switzerland a number of highly qualified employees from the workshop and the design offices.' ((ZA17116)) A few years later – a large proportion of the 15 Jena employees had since returned to Zeiss – we learn: 'In 1919, Wild arranged for a series of 1000 of his new theodolite to be produced, although the device was not yet ready for production. Many mechanical and optical changes were necessary, so that the first instruments of this new theodolite did not come off the production line in series until 1924.' ((ZA17116)) In addition, the Heerbrugg instrument offered further advantages in terms of application. But at Helbling's insistence, Heinrich Wild in Heerbrugg did not first design and manufacture his Wild T2 universal theodolite, but a photo theodolite, an aerial camera, a photogrammetric restitution device, an artillery theodolite and a level: and all of this much too late and in much too small numbers. The sales plan for the end of 1924 called for the delivery of 720 levels, but only 71 were delivered; the same applied to the theodolites, with 350 planned but only 27 delivered. When everything was a little better coordinated five years later, experts were enthusiastic about the performance, quality, compactness, accuracy and reliability of these new solutions from Heinrich Wild. The Wild T2 theodolite weighs just three kilograms and is very compact – the theodolite used on the Dents-du-Midi took up three times the transport volume and weighed ten times more without the tripod! ((CP150))

Heinrich Wild's young company handles everything: Heinrich Wild works around the clock for his company in a wide variety of roles. He even performs the most demanding optical calculations himself using a method he developed himself, including in particular for his fast and high-resolution C2 aeroplane chamber lens. ((SK WHJ13 / SK SG22)) In 1925, the successor model A2 of the stereoautograph for photogrammetry is ready for use in Helbling's office in Flums – which also serves as a photogrammetry development and test laboratory – and aerial photographs can finally be evaluated for the first time. ((SK SG25))

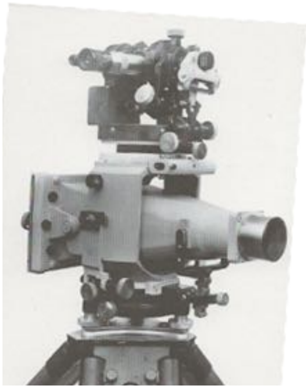
The extraordinary commitment of Heinrich Wild and his family in building up a new company is confirmed by none other than the Dutch professor of cartography and later Dutch Prime Minister Willem Schermerhorn. He follows in the footsteps of the famous inventor and comes to Heerbrugg as early as 1923: 'I came from Jena, where I had first seen the Th I, and met Wild in his new, small workshop. At that time, I also got to know the daughter, Miss Wild, who engraved the divisions on the circles.' ((WJ SW100)) Two of Wild's daughters and a son helped their father in the business. And Hans Härry, who at the time often travelled to Heerbrugg to test prototype applications and worked closely with Heinrich Wild, later wrote as head of the Swiss Surveying Directorate: ((WJ HH49))

"Heinrich Wild's achievements at the time as an inventor, designer, plant manager and sales propagandist - he worked on everything! - and those of his family members in the operation of particularly delicate machine tools, such as the pitch circle machines, demand the highest recognition, even admiration".

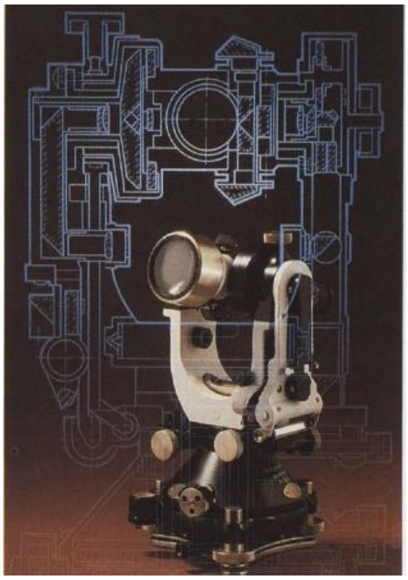


Heinrich Wild's telemeter patent for Zeiss, Jena, 1907

Heinrich Wild's new levelling instrument 1908 at Zeiss



Heinrich Wild's phototheodolite (1923) and aerial camera Wild C2 (1925) in Heerbrugg



Heinrich Wild's theodolite T2 and photogrammetry restitution and plotting unit A2 with customers in Flums.

However, the exceptionally difficult starting conditions had a massive financial impact. In the loss-making initial phase of "Heinrich Wilds Werkstätte für Feinmechanik und Optik", the stuttering business, which was far from the planned target, consumed considerably more capital and patience than budgeted (and available). In order to rescue and take over the company, the "Verkaufs-Aktiengesellschaft Heinrich Wilds geodätische Instrumente, Heerbrugg" was founded on February 28, 1923 - but this company also fell into the red again in the following two years, so that through ongoing capital increases, a share capital of two million Swiss francs was registered just one year later, which corresponds to an investment of around fifty million francs when converted to today's purchasing power ratios.

These reinforcements were provided by Ernst Schmidheiny (Jacob's brother, a cement industrialist) in 1924 and Albert Schmidheini (a brother-in-law and textile industrialist) in 1925; the former with his son Max as the later main shareholder and president of the board of directors; the latter also as a member of the board of directors and as director for the coordination of development, production and sales, and later as managing director and delegate of the board of directors. The missed instrument deliveries due to production difficulties – and the resulting lack of income – necessitated repeated refinancing of the company, which naturally led to tensions. Heinrich Wild was now 'only' responsible for development and construction, and no longer for the entire operation and sales. This role was taken over by Albert Schmidheini, who was also appointed to the board of directors, took a hands-on approach and energetically boosted international sales. Within a decade, the balance of power within this body had shifted so that the capital and voting majorities were in the hands of the Schmidheiny and Schmidheini families – with corresponding consequences for the management and direction of the company. Dr Robert Helbling's shareholding shrank to 15%, and Heinrich Wild's even more so. 'The Schmidheiny family has thus taken full control of Wild Heerbrugg,' states Bernhard Ruez soberly in his Helbling biography. ((RB96)) It is understandable that the ingenious designer Heinrich Wild is annoyed by the new power and leadership constellation and that he no longer wants to see the company with his own name in the hands of his former founding partners, from whom he feels he has been ousted. In 1931, he finally moves to Zurich and decides with a heavy heart to leave Wild Heerbrugg due to ongoing differences. He left the company completely on 7 December 1932, with every mention of the sale of his remaining shares and the handing over of the keys to the villa in Heerbrugg's vineyard to Max Schmidheiny hurting him for the rest of his life. As an independent inventor, however, Heinrich Wild remained committed to the Rhine Valley company until a non-competition clause expired in 1935. The company first turned a profit in 1928 and soon took over the market leadership from Zeiss, which the Thuringian company had conquered during Wild's time in Jena. Since then, the Heerbrugg-based company Leica Geosystems (formerly Wild Heerbrugg) has been the international market leader and has continued to expand this position since 2005, thanks to its affiliation with the Swedish high-tech group Hexagon. In view of the enormous initial problems faced by the young company, the decision of the influential financiers Jacob and Ernst Schmidheiny proved to be a highly risky venture for many years. Max Schmidheiny, who was the decisive figure in this company for half a century between 1933-1983, describes the first one and a half decades as an ‘ongoing struggle for survival’. ((SO80)) As a result of the stock market crash on the New York Stock Exchange and the subsequent global economic crisis, the workforce had to be reduced by half to 135 employees. When Max Schmidheiny's father, Ernst Schmidheiny, died in a plane crash in Egypt in 1935, the banks reacted abruptly by terminating all credit agreements. And what did ‘Sir Max’, as he is known to those who know him, do in response? To ensure his independence in the future, he sets up his own bank after overcoming this enormous challenge. During the run-up to and the Second World War, the company grew by supplying both warring parties, but at the same time it prepared for the end of the war by developing a new business area – microscopy. In the post-war decades, the company was faced with a doubling of demand, not least due to the fact that parts of the Zeiss works and its employees had been destroyed in Germany or deported to Russia. The company further expanded its position in the Rhine Valley with a high level of innovation, product quality and an expanded sales and service network. Five decades after its founding, the company, including the production branches opened in Austria and Singapore, has 4,200 employees on its payroll and, among the ever-increasing number of suppliers, some who dare to take the leap into independence with the know-how of their work at Wild Heerbrugg (such as SFS, Plaston, Zünd Optik and Zünd-Plotter, to name just a few). During this phase, the Rhine Valley developed into a flourishing and cosmopolitan high-tech region. The founding of this company on a greenfield site meant nothing more and nothing less than the implementation and further perfection in Switzerland of the scientific optical-precision mechanical instrument engineering developed by Schott, Abbe and Zeiss in Jena (including the series production introduced by Leitz Wetzlar), and the prelude to its global importance. ((BS))

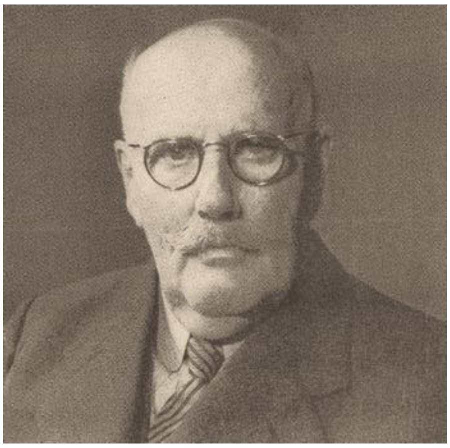
In short, the fact that Heerbrugg has become an international centre for surveying technology over the last century was only possible thanks to the full commitment of all three of its founders, Heinrich Wild, Dr Robert Helbling and Jacob Schmidheiny, who were highly skilled in their own fields of expertise. It was also made possible by the support of three of its early supporters, Ernst Schmidheiny, Max Schmidheiny and Albert Schmidheini, and the three realisers who joined them a little later, Max Kreis, Dr. Arnold Semadeni and Dieter Schmidheini! And all the employees from numerous professional backgrounds who have shaped the company and its industry worldwide! From all cultural backgrounds! At all levels and across all generations. And this with constant innovation and customer orientation to this day... and beyond!

Heinrich Wild also shapes the company Kern in Aarau

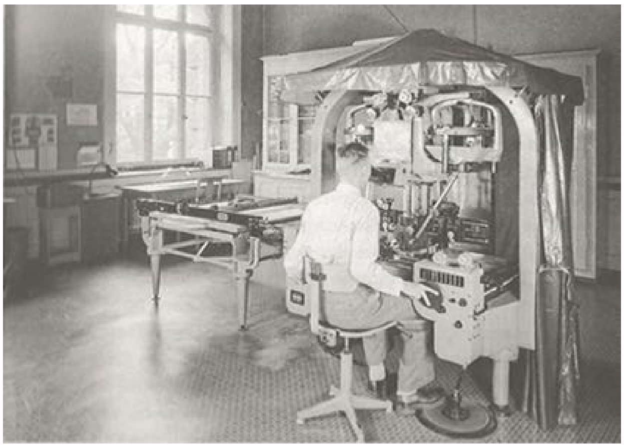
The third company in this industry to benefit from the genius of Heinrich Wild is the long-established and renowned precision instrument manufacturer Kern + Co AG in Aarau. After moving from Heerbrugg to Zurich in 1931, Heinrich Wild continued to work for the 'Verkaufs-Aktiengesellschaft Heinrich Wilds geodätische Instrumente Heerbrugg' from his new base in Zurich. After leaving the company on 8 December 1932 however, he was contractually bound when it came to collaborating with rival companies. It was only after the sale of a patent for a new photogrammetric autograph (Wild A5) to his former Heerbrugg company in 1935 that this non-competition situation came to an end. For the third time in his career, Heinrich Wild is now shaping a world-renowned company, this time with the renowned Aarau-based company Kern, after his development work and management activities at Zeiss in Jena and at Wild in Heerbrugg. However, this time his oldest son Heinrich Wild Jr. – with whom he has been working for ten years – joins Kern as an engineer (and later becomes Director of Research and Development). ((SK HR31)) Heinrich Wild once again succeeds in developing even more compact, accurate and light-gathering theodolites with a higher level of convenience. His Kern double-circle theodolite features a rough horizoning device with a tilting plate tripod and a fine horizoning device on the instrument, a stable standing axis made of two high-precision flat surfaces and precision balls, glass circles with two concentric divisions, as well as short and light-strong telescopes. He then designed another unique photogrammetric restitution device with electrical sensors, for which he was granted a patent on 15 November 1947, his 70th birthday. ((FP BG46)). At Kern, he developed a trench telescope of hitherto unattained optical quality for the Swiss army, as well as a telescopic sight that is permanently installed in the rifle's receiver. ((BS))

We do not know whether Heinrich Wild was aware when he left Heerbrugg that Wild director Albert Schmidheini had met Kern director Rothpletz in St. Gallen in 1929 for a confidential discussion about a possible takeover of the Aarau-based company by the Rhine-valley company; however, this merger did not come about because the Kern owners' price expectations were too high. ((SR80)) After six decades of fierce competition between these two world-renowned Swiss manufacturers of surveying instruments, the takeover by Thomas Schmidheiny's Wild Leitz AG (formed in 1986 after the gradual takeover since 1972 of the microscope and industrial measuring systems and camera manufacturer Ernst Leitz Wetzlar by Wild Heerbrugg AG) occurred after Kern suffered losses in 1988. After the integration of Kern + Co. AG into the Wild Leitz Group, with painful consequences for the Aarau site, its employees and its innovative product lines – as described by Dr Reinhard Gottwald in the E10 project ((GR)) – Dr Stephan Schmidheiny took over the Wild Leitz Group from his brother Thomas in 1989. After a merger and a reversed takeover with the London-listed Cambridge Instruments, in 1990, under the leadership of CEO Dr.-Ing. ETH Markus Rauh, who had joined the company in 1988, a rebranding of Wild Leitz and Cambridge Instruments to 'Leica', which is headquartered in the St. Gallen town hall for a decade. Eight years later, the generation of Jacobs and Ernst Schmidheiny's grandchildren, Dr Stephan Schmidheiny, parted with the company, which had since been structured into three major divisions (Geosystems, Microsystems, and Camera), and led it to its new owners. ((WK))

Leica Geosystems AG Heerbrugg was successfully floated on the Swiss stock exchange in the summer of 2000, shortly after being taken over by the private equity firm Investcorp in 1998. In the summer of 2005, it was acquired by the up-and-coming Swedish Hexagon technology group. This enables it to deepen and broaden its technology base within the Hexagon Geosystems Division, which it leads, and to develop and offer even more comprehensive solutions. The Aargau site for industrial metrology in Unterentfelden becomes part of the Hexagon Metrology Division and has since been successful as the 'Hexagon Metrology Precision Center Aarau-West'.



Heinrich Wild 1949 in Baden/AG



Heinrich Wild's photogrammetric resitution and plotting instrument A5 (ETH Zurich)

Photogrammetric cadastral mapping with Geographic Information System System 9 (1989)

Wild's theodolite Kern DMK3 (1939). Accuracy 0.1 sec.

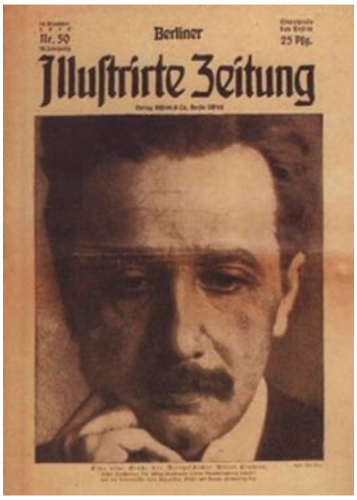
The genius of Henry Wild inspires photogrammetry

The success of Wild's inventions is impressive and benefits three companies at once. After just a few years, experts all over the world were practically only measuring with Wild instruments. Be it from 1909 with Wild/Zeiss instruments (mainly levelling instruments) from the Zeiss company in Jena; from 1921 with Wild Heerbrugg instruments (mainly theodolites and photogrammetry equipment) from the Wild Heerbrugg company in Heerbrugg, or from 1939 with Kern instruments from Aarau designed by Heinrich Wild (mainly Kern-DMK theodolites invented by Heinrich Wild, but without the right to use the Wild name). With the Heerbrugger Wild theodolites, phototheodolites, aerial cameras and stereoautographs, they mastered their most demanding tasks in the Alps as well as in the Andes, the Caucasus and the Himalayas more easily, more accurately and more safely than ever before. The renowned Royal Geographical Society (RGS) London had already acquired a phototheodolite and two aerial photography chambers from Wild in 1926. Their stereo images on coated photographic glass plates were then converted into plans using Wild A2 photogrammetry plotting autographs. Major Kenneth Mason, R.E. Survey of India, is impressed by the quality: "We achieved a perfect stereoscopic view with stereo images of different focal lengths. In these series, the heights of Gasherbrum I and II and K2 matched the triangulated heights to within a few feet. In the autograph, the mountains stood before the viewer in wonderful relief and were easy to map thanks to the excellent lens and the high quality of the images. I don't think any of us had even imagined that the autograph would capture such detail." Colonel Hamilton, Mason's superior, is also impressed: "What impressed me most was the fact that Mason was able to map K2 so well from a distance of 67 kilometers." ((WJ SK SG26)) This extends Heinrich Wild's already legendary reputation as a designer of unique geodetic instruments into the field of photogrammetric instruments, as Arthur Hinks of the Royal Geographical Society writes: ((SK SG26))

"The genius of Mr. Wild managed to build a device that overcomes all difficulties in the smallest of spaces. Wild's instrument is unique and, as far as I know, with its two-chamber part, is only understood by him and no one else."

Globally recognized experts in their fields

On November 9, 1922, Albert Einstein was belatedly awarded the 1921 Nobel Prize in Physics, not for his theories of relativity, but for his March 1905 paper on the photoelectric effect, in which he described light quanta for the first time. Heinrich Wild also increasingly came to the attention of the public beyond specialist circles.

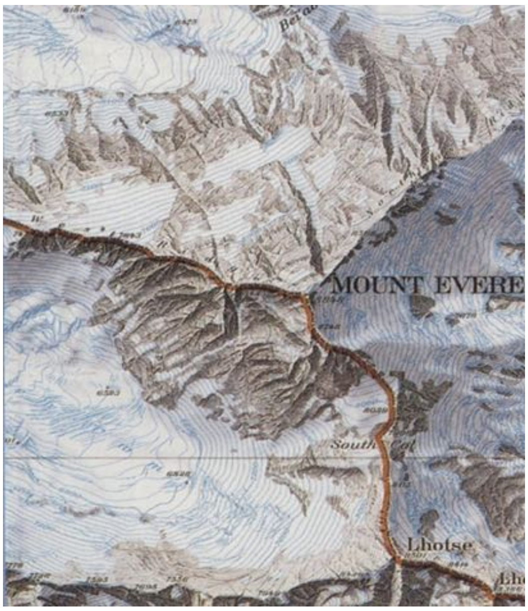


In 1919, Einstein is the 'new force in world history'. ((Z207))

Above: Brad Washburn of National Geographic in 1970 with Wild T3 during the Grand Canyon survey on Dona Butte. In 1983, Washburn also had Swissphoto fly over Mount Everest with a Wild RC10 and in 1987 he had it photogrammetrically restituted and mapped in Switzerland with the stereo plotter Wild A8 by Swisstopo (see map section at bottom left). ((RE))

Below: Elsa and Albert Einstein at the Grand Canyon in 1931. (Z33)

Maps of the world are created on the basis of measurements and mapping with geodetic and photogrammetric Wild instruments: Mount McKinley (top) and Mount Everest (bottom).



A large part of the world is mapped using Heinrich Wild's photogrammetric equipment. But when it comes to mountain top products in the truest sense of the word - such as the maps of Denali (formerly Mount McKinley) or Mt. Everest - mapping is also carried out in Switzerland.

Royal Societies carry Einstein's and Wild's reputation around the world: It is above all the renowned British scientific societies that carry Heinrich Wild's name around the globe. Just as the Royal Astronomical Society brought Albert Einstein's theory of relativity to the attention of the world in 1919 when it proved the deflection of light during a solar eclipse (Time magazine on the following day: "It is one of the most important, if not the most important statement of human thought."), the Royal Geographic Society did the same in 1927 with Heinrich Wild's photogrammetric recording of the high Karakoram giants. ((SK SG26)) More than a decade earlier, the British Ordnance Survey had already started the new land leveling of Great Britain with Wild-Zeiss leveling instruments. ((WH)) This created a successful worldwide position for the Wild or Wild Heerbrugg name brand in Great Britain and the Commonwealth states as well as in many other countries around the world for almost seven decades, which was of course limited to the field of surveying.

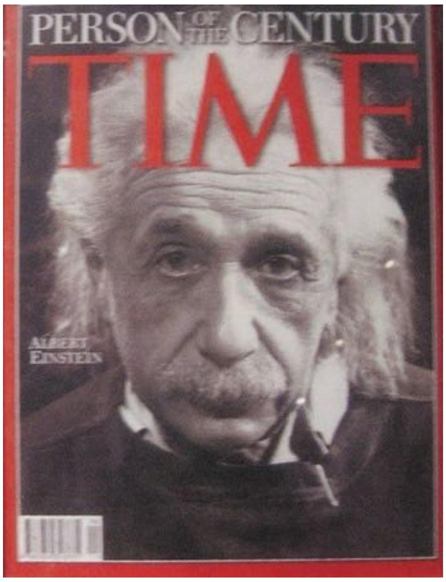
Although the luminaries Einstein and Wild had already achieved an immense amount on their 50th birthdays, they continued to pursue ambitious goals in the decades that followed. Einstein continued to work on the all-inclusive world formula. Heinrich Wild is still working on the integration of the measurement functions in even smaller, even better and even more rational instruments.

Wild and Einstein receive honorary doctorates from ETH in 1930

In 1930, the 75th anniversary year of the Swiss Federal Institute of Technology in Zurich, both Swiss nationals are honored with the title of honorary doctor of the ETH. Heinrich Wild, Chief Engineer and Chief Designer of "Verkaufs-AG Wilds geodätische Instrumente, Heerbrugg", is awarded the degree of Dr. sc. tech. h.c. by the Rector and the Board of the Department of Civil Engineering (Dept. II) awarded him the degree of Dr. sc. tech. h.c.: "The Swiss Federal Institute of Technology hereby confers on Heinrich Wild in Heerbrugg the honorary degree of Doctor of Technical Sciences in recognition of his outstanding achievements in the field of the construction of geodetic and optical instruments." ((ETH)) On November 8, Albert Einstein is also awarded an honorary doctorate by his alma mater ETH Zurich. Prof. Dr. Albert Einstein is awarded an honorary doctorate in natural sciences (Dept. IX) as "the perfecter of classical physics in the theory of relativity and the pioneer of quantum physics, its former student and teacher, in recognition of his outstanding scientific achievements and in grateful memory of the services he has rendered to Switzerland and the university". ((S126)) As the blurred heads in the November 7, 1930 photograph from the Zurich Stadttheater indicate, not all the Doctors had the patience to sit still during the recording. The classical icon Albert Einstein just about manages to hold still in the field of photons probably emitted by burning flash powder, but is already softened by a slight blurring and overexposure; concern for the future of his children also appears to be written all over his face on this Friday morning, as he had had an argument with his divorced wife Mileva the previous evening about the two boys, especially Eduard, who was undergoing treatment at the Burghölzli neurological clinic.

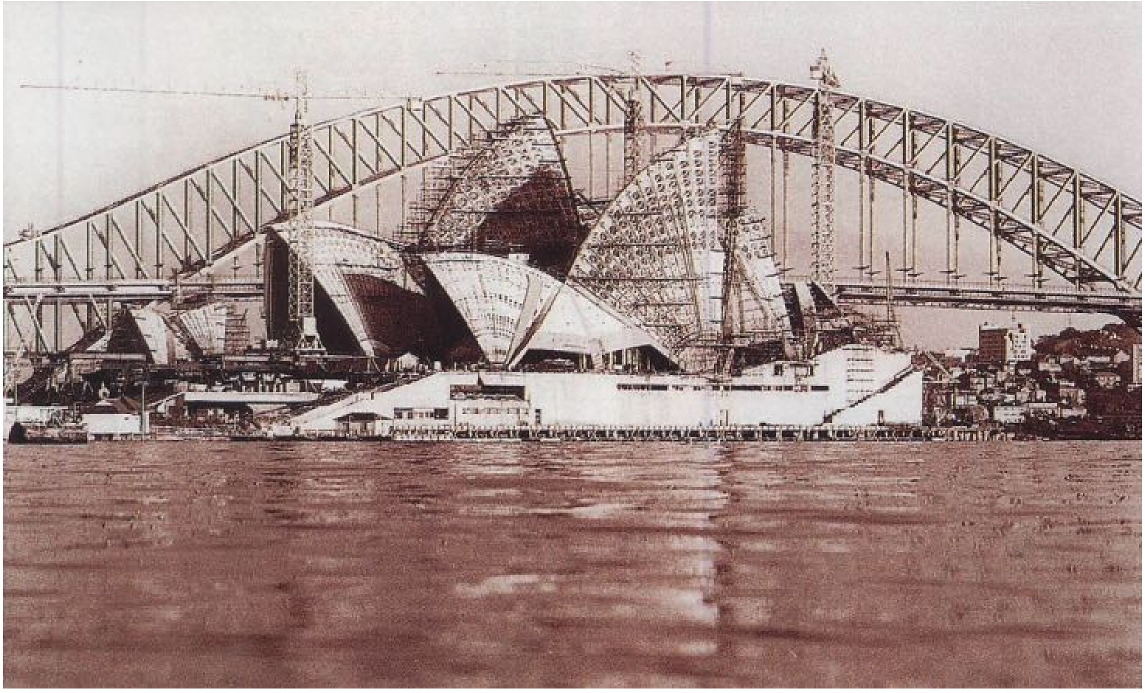
Einstein and Wild together in the picture

This picture shows the Nobel Prize winner Albert Einstein at the age of 51 together with Heinrich Wild, who was also awarded the Dr. h.c. ETH at the age of 53, and other ETH guests. A letter addressed to Einstein was once labelled 'Chief Engineer of the Enterprise': in this detail, the Nobel Prize winner can be seen together with the chief engineer of the surveying world (Wild). Between Albert Einstein (bottom left) and Heinrich Wild (top right), the chief engineer of the George Washington Bridge in New York, Dr. h.c. Othmar Ammann, the chief engineer of the George Washington Bridge in New York, forms a kind of visual 'bridge pillar' between Albert Einstein (bottom left) and Heinrich Wild (top right). It is the only picture that these three world-famous Swiss – Einstein, Ammann and Wild – have in common and is a historical testimony to three great international 'chief engineers'. It was recently discovered in the Ammann estate at the Swiss Federal Institute of Technology (ETH) during research into the Einstein-Wild relationship.



The entire party at the City Theatre in Zurich on 7 November 1930. ((E))

Left: Even at the end of the century, Albert Einstein is still the most recognisable figure of the 20th century.



Construction of the Sydney Opera House in 1968 with Wild T2 and Wild DI10 IR laser distance meter / reduction tachymeter.

Construction of Hong Kong's Lap-Chek-Kok Airport in 1996 with the Wild DNA2000 digital level.

Construction of the Viaduc de Millau in 2003 with a laser theodolite.

Left: construction of the Öresund land connection in 2000 with laser theodolite and GPS from Heerbrugg.

One of the first devices of the revolutionary laser distance meter Wild Distomat DI10 – an attachment device for the optical theodolite Wild T2 – was used in 1968 during the construction of the Sydney Opera House. The Öresund bridge and tunnel connection between Copenhagen and Malmö, which opened in 2000, is considered the first major international construction site to be monitored using Leica GPS technology and a laser theodolite.

More than entangled companions: the Einstein-Wild relation

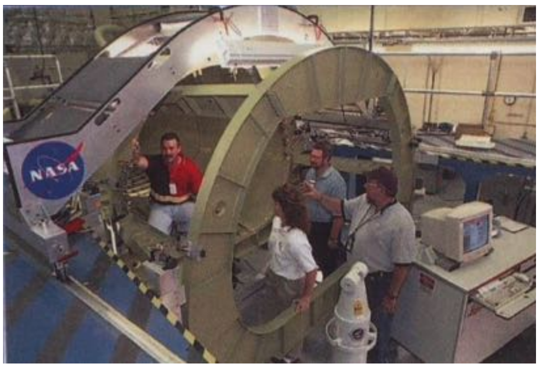
You will have noticed, dear reader: in many cases, the topographer Heinrich Wild set a signal at the new location even before the physicist Albert Einstein. I once referred to this pattern of unintended similarities as the Einstein-Wild relation, because the parallel changes of location and occupation by the two people, which were in no way coordinated, are reminiscent of 'entangled' energy quanta. ((N383)) According to modern quantum mechanics, the random behaviour of the smallest particles was suspect to Einstein. But outside of the quantum, there is the 'spooky action at a distance' postulated by Einstein. ((R141)) Applied to humans, this would mean: If you know where Heinrich Wild currently lives and when he changes jobs, then you can, with a high degree of probability, deduce the whereabouts and a job change of his 'locked-up' companion Albert Einstein over a quarter of a century.

- Like Heinrich Wild, his contemporary Albert Einstein, who was two years younger, left school early, mainly thanks to his achievements in mathematics;
- Like Wild, he enrolled at a Zurich Technical University to study in 1895/96;
- Like Wild, Einstein worked as a federal official in Bern in the first decade of the 20th century;
- Both developed groundbreaking new ideas here, particularly in 1905;
- And both had a superior who was a land surveyor himself;
- Like Wild, Einstein married at the age of 23;
- Lived with his family on Thunstrasse in Bern at the same time as Wild;
- And, like him, changed his residence several times in the Kirchenfeld district;
- And left the federal capital seven years later, one year less than Wild, Federal capital;
- At the age of exactly thirty;
- Followed like Wild and his family before the outbreak of the First World War, a professional call to Germany;
- And also lived there during the war and afterwards;
- Like Heinrich Wild, Albert Einstein is also the father of a son of the same name;
- Both of whom graduated as engineers;
- Einstein's year of winning the Nobel Prize in Physics in 1921 is Wild's year of founding his own company;
- And when ETH Zurich awarded Heinrich Wild the Dr. sc. techn. h.c. in 1930, Dr. Albert Einstein also received an honorary doctorate from his alma mater;
- And much later: when half a century after Albert Einstein's theories such as the laser, digital scan and the relativistic GPS correction values become reality through his successors, it is Heinrich Wild's successors who integrate them into his instrument designs.

What can be seen is that this Einstein-Wild relationship is probably a matter of social processes with patterns that do not appear to be alien to the quantum world either.

Picture right and below: Kennedy Space Center: Monitoring of the launch pads with the digital levelling instrument DNA2000 from Heerbrugg. ((RE42))

The Wild BC-4 station in Greenland in 1968. ((WJSL128))



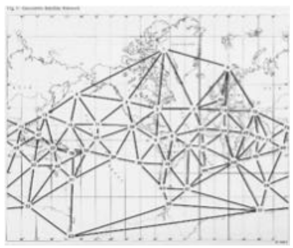
2000: The CRV X-38 rescue vehicle, controlled with a laser scanner from Unterentfelden/AG. ((RE41))

With Wild and Einstein to the moon and into space

Where there are pioneers, Einstein and Wild are not far behind. Einstein's ideas in Bern and Berlin provide the basis for later developments in space travel, GPS correction values, laser distance measurement and electronic data storage for digital aerial mapping. In the process, their successors at the U.S. Coast and Geodetic Survey and NASA, as well as those in Heerbrugg and Aarau, also make impressive contributions to the expansion into space.

21 July 1969, 03:56 CET: NASA's Apollo 11 mission with astronauts Neil Armstrong and Buzz Aldrin is a success.

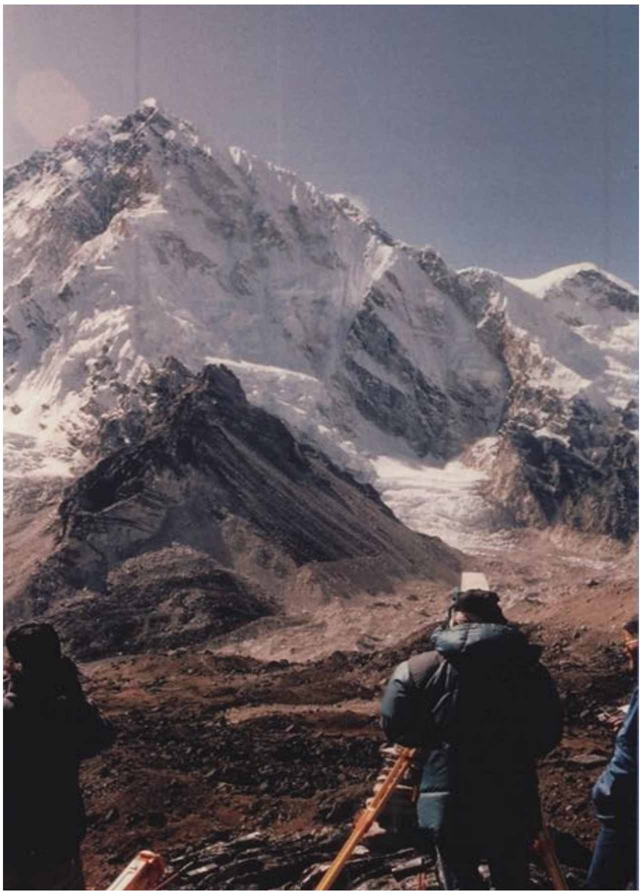
In 1968, their developments contributed, among other things, to the creation of the first geodetic satellite world triangulation network with the Wild BC4 ballistic camera: this is a combination of the highly accurate Wild T4 astronomical universal instrument and a powerful aerial lens from the Wild RC8 photogrammetry camera. For this global project of the U.S. Coast and Geodetic Survey, Wild Heerbrugg is supplying 46 such instruments with a temperature function guarantee down to -75° F. These are used to simultaneously capture the positions of all PAGEOS satellites at all triangulation points. ((WJ SH104 / BV))



Triangulation network from 1968 to determine the positions of the PAGEOS satellites.

The success of the Apollo 11 moon landing programme in 1969 was due in no small part to Wild T3 precision theodolites, which provided the Inertial Guidance Systems with the adjustment values of the rocket gyroscopic systems; and to determine the position of the astronauts on the moon, Neil Armstrong and Buzz Aldrin relied on a sextant lens system from Heerbrugg ((RE OT)).

The moon activities, including the first step on the moon, were filmed using a specially developed, bright f=0.9 core wide-angle lens for the Bolex camera. The calculation of this lens was the responsibility of the Aarau-based optical developer Walter Zürcher under the management of Heinrich Wild jr. Wild laser trackers ((RE42/8)) are used in the construction of precise rocket launch pads, as are Wild DNA2000 digital levels for their exact height determination. Wild's T2 universal theodolite is crucial for the optical alignment of the LEM lunar module and the laser scanners from Unterentfelden are used to check the assembly of the space rescue vehicles. ((RE41/4))



The highest peaks on the continents have been measured with Wild instruments since 1930.

Today, surveying instruments are equipped with lasers.

Left: Everest survey in 1992 with the Kern Mekometer, for decades the most accurate portable laser surveying instrument.

Bottom left: On the summit of K2, which the Royal Society had already measured in 1926 using the first Wild photogrammetry equipment. New measurement campaign in 1996 by Prof. G. Poretti with laser theodolite and GPS.

Bottom right: Aconcagua height determination by Prof. G. Poretti with GPS and laser theodolite from Heerbrugg.

Farewell and conclusion

On Boxing Day 1951, Heinrich Wild died at the age of 74 in the Villa 'Römerburg' in Baden/AG. Albert Einstein had already left Berlin in 1932 due to life-threatening danger and, after his arrival at the Center for Advanced Studies in Princeton near New York, led a quiet life with celebrity status, in which he regretted, after the end of the Second World War, 'as his biggest mistake', having endorsed the construction of an atomic bomb in a letter to US President Roosevelt in 1939. Without ever having discovered his universal world formula, Albert Einstein died on 18 April 1955 at the age of 76. The ideas of the world-famous physicist Einstein naturally have a much more comprehensive significance for our understanding of the micro and macro world than the designs of Heinrich Wild. This in no way diminishes the life's work of the inventor and geodesist, who shaped the last century as the most important designer in the surveying industry. Wild's field of geodesy and precise positioning has been part of astronomy, physics and metaphysics since time immemorial and is still closely interrelated. The last years of Heinrich Wild's life prove to be years of reflection and serenity after a life marked by deeds and successes – but also disappointments. ((BS)) With unbroken mental strength, he remains interested in questions of higher mathematics, especially the number theory founded by Gauss, and the new findings in the natural sciences, especially zoology and biology. But Heinrich Wild would certainly have been a great car designer, just like Louis Chevrolet from Neuchâtel, for example at the Safir AG car factory, which was founded in 1906 by Jacob Schmidheiny, Robert Helbling, Heinrich Spoerry and Adolf Saurer in Rheineck but was liquidated in 1909. We learn the following from Prof. Dr. Samuel Bertschmann, former director of the Swiss Federal Office of Topography: 'After I had provided Heinrich Wild with a technical description of the engine of a car I was planning to buy, he was able to tell me, after a few quick calculations, what gradients the car could manage in the individual gears and what the advantages and disadvantages of the design were. I learned, for example, that Wild had also been working extensively on modernising the car, but had discontinued his work due to the backwardness of the automotive industry, which only moves forward on innovations when related patents have already expired.' The renowned trade journal Allgemeine Vermessungs-Nachrichten wrote in its obituary: "Heinrich Wild, the most important designer of geodetic instruments who ever lived, has passed away." ((BE)) This is a characterisation that still applies seven decades later.

CONCLUSION: It is quite remarkable what developed in parallel in Bern at the beginning of the last century from the activities of two luminaries in their fields, and has been developing together since the 1960s. The creations of Heinrich Wild, with the further developments of Einstein's insights, improved our knowledge and our orientation on Earth, but also on the Moon and in space. Since the last century, the highest peaks on the continents have also borne the measure of the instruments developed from their theories and constructions, such as significant buildings, GPS and land information systems, as well as maps around the globe.

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STA5 Staudacher, Fritz: The beginning of two great world careers. In: Geomatics Switzerland. No.11-12/2024, pages 4-10.

STA6 Staudacher, Fritz: Heinrich Wild and Albert Einstein: The beginning of two great world careers. On: Website Geomatik Schweiz www.geomatik.ch, 64 pages.

Picture credits for publication STA8:

Albert Einstein Archive Collections SMF and SSLB (admin.ch): p.21; Archiv Autor: p.23; ETH Bildarchiv library.ethz.ch: p.1 (Einstein); Hans Heinrich Wild: pp. 1 (Wild), 4, 10; Leica Geosystems: pp. 9, 10; Lintharchiv: p.17; St. Galler Tagblatt: p.17.- ((All other pictures shown in this publication are image pages from the author's 2008 text and photo book manuscript "Die Einstein-Wild-Relation")).

This article is the extended version of the article ‘The beginning of two great world careers’ published in the 11-12/2024 issue of the journal ‘Geomatik Schweiz’ (www.geomatik.ch). It is largely based on the author's studies and the 2008 report. ((STA2))

Two Toggenburgers who measured the world: Universal genius Jost Bürgi (1552-1632) and topographer Heinrich Wild (1877-1951)

Toggenburg in the Canton of St. Gallen is the birthplace of two internationally outstanding personalities in the fields of astronomy and geodesy. In 1603/04, the mathematical and technical genius Jost Bürgi from Lichtensteig made a decisive contribution to the discovery of the elliptical orbit of the planets by his friend Johannes Kepler at the court of Emperor Rudolf II in Prague. And from 1904, the topographer, inventor, designer and entrepreneur Heinrich Wild revolutionised the recording and monitoring of our planet Earth with the invention of new optical surveying instruments. A second revolution began in 1968, when Einstein's theory of spontaneous and induced emission, published in 1916/17, was integrated into surveying instruments for the first time in the form of the laser by Wild's successors, and made usable for distance measurement.

Celestial globe by Jost Bürgi (1594) National Museum Zurich

Jost Bürgi as a mathematician, invented the logarithmic calculation and the golden art of sine determination around 1588; as a watchmaker, he produced the first scientifically used second hand; as an instrument maker, he constructed the most exact metal sextant and a triangulation device for geodesy; and as an astronomer, he determined the most exact positional data of his time through his own celestial observations of the sun/earth, moon, stars and planets – twice as exact as those of Tycho Brahe (!). Burgi needs this data for his uniquely accurate celestial globe machines, but he also makes it available to his friend Johannes Kepler during their eight years of collaboration at the imperial court of Rudolf II in Prague, thus making a decisive contribution to the new astronomy.

Heinrich Wild hree centuries later, would go on to shape the field of surveying as a further genius with Toggenburg roots. However, Heinrich Wild's name is hardly associated with Toggenburg and will only be elucidated by a new Wild family genealogy. According to this, Heinrich Wild's ancestor in the eleventh generation, Claus Wilhelm (family names were just emerging), married Anna Zwingli of Alt St. Johann, the niece of the reformer Ulrich Zwingli, in Wildhaus in 1539, and emigrated with her to the neighbouring canton of Glarus in 1544. In Wildhaus, Claus Wilhelm only has both first names; however, when he registered in Glarus to obtain land rights in 1544, he was given the first part of his place of origin, Wildhaus, as his surname: Thus, Claus Wilhelm in Wildhaus became Claus Wild in Glarus. In 1977, the astronomer Paul Wild of the Bern Observatory in Zimmerwald named an asteroid (2581) Burgi after a woman he had discovered, thus creating a link between these Toggenburg families, who were already acquainted with each other in the days of Ulrich Zwingli. When he signed out of Wildhaus, Claus Wilhelm met Landweibel Lienhard Burgi – Jost's grandfather – who was responsible for issuing citizenship papers. Claus Wilhelm was assured the right to return at any time. But the Wilds remained in the canton of Glarus and founded several family lines in different communities, including the one of Heinrich Wild in Mitlodi, who was born in Bilten in 1877.

Synoptic and chronological overview
biographical data Heinrich Wild and Albert Einstein

Synoptic and chronological overview of Heinrich Wild's and Albert Einstein's biographical data

Johann Heinrich Wild ***Swiss Topographer, inventor, designer, entrepreneur*** *(15.09.1877 Bilten - 26.12.1951 Baden / AG)* 		 ***Albert Einstein*** ***Mathematics teacher with ETH diploma, Swiss Federal Patent Office expert, physics professor, inventor, Nobel laureate*** *(18.03.1879 Ulm - 18.04.1955 Princeton/USA)*
	Year	
Birth in Bilten (Canton Glarus) 15.11.1877 as a citizen of Mitlödi (Canton Glarus) (Parents: Jost Heinrich Wild (1853-1880), master dyer, draughtsman and innkeeper and Elisabeth Wild, née Leuzinger (1853-1917)	**1877**	
Birth and early death of his brother Johann Rudolf in Bilten (1.11.1878-19.2.1879)	**1878**	
Birth and early death of the little brother Fridolin in Schänis / SG (5.11.1879-11.2.1880)	**1879**	Birth in Ulm 14.03.1879 (Bahnhofstrasse) (Parents: Hermann Einstein and Pauline Einstein, née Koch)

HEINRICH WILD		ALBERT EINSTEIN
Death of his father Jost Heinrich Wild (dyer and innkeeper in Bilten, then in Schänis) at the age of 27 on 1.8.1880 in Ober-Bilten; Heinrich and his mother move into the grandmother's household	**1880**	Moves with parents to Munich (as partner in the business of uncle Jakob Einstein, engineer, for modern electrical appliances) (21.6.80)
	1881	Birth of sister Maja (later Winteler) (18.11.81)
Admission to comprehensive class village school Bilten	**1883**	
	1884	Enthusiastic about compass as a 4-5-year-old
	1885	Attends the Catholic elementary school in Munich
Uncle Heinrich Leuzinger, Polytechnic Engineer (ETH) becomes Linth Construction Manager (and Linth Engineer in 1896)	**1888**	Transfer to Luitpoldgymnasium Munich
On the recommendation of his comprehensive school teacher Grünenfelder, he skips two school classes and starts working for the intercantonal drainage project of the Linthwerk in the Linth plain at the age of 12 until 1896. There he learns everything a hydraulic engineering, surveying and cartography specialist needs to know.	**1889**	
	1891	Insights into geometry of the plane (Euclid) as a 12-year-old; fascinated by the similarity of triangles - early introduction to differential and integral calculus by medical student and boarder Max Talmud and uncle Jakob Einstein.
Start of apprenticeship with Linthwerk engineer Gottlieb H. Legler	**1892**	

HEINRICH WILD		ALBERT EINSTEIN
	1894	Parents move with Maja, but without Albert, from Munich to Pavia, then Milan - Albert goes to boarding school in Munich
		Albert leaves Luitpoldgymnasium prematurely in 7th grade without his parents' knowledge and travels to visit family in Italy, followed by a year of self-study.
Declared of legal age prematurely: buys a surveying instrument and carries out surveying assignments and plan mapping as a self-employed person, primarily at Linthwerk.	1895	Failed the entrance exam at the Polytechnic in Zurich at the age of 16 (mainly due to weaknesses in French and botany)
Begins studies at the Geometry School of the Technikum Winterthur (I. course summer semester 16.04.1895-18.08.1895 as best in class of 14 participants).		Enrolled in Aargau cantonal school (28.10.95); lives with the Winteler family in Aarau
Completion of the work begun in 1883 of surveying and mapping the Linth perimeter of municipalities liable to pay contributions between Lake Walen and Lake Zurich together with engineer (and from 1896 new Linth engineer) H. Leuzinger.	1896	Release from Württemberg citizenship (28.1.96)
After missing two semesters at the Geometry School, continued his studies by attending the second course in the winter semester from 4.10.1896-28.02.1897.		Matura trip to the Alpstein - almost crashing on the Säntis (June)
		Matura at Aargauer Kantonsschule in Aarau (3.10.96)
		Enrolls at the Polytechnic in Zurich, Dept. VI: Diploma teacher training in mathematics; acquaintance with fellow student Mileva Maric.
Graduated from the second geometry course at the top of his class of 12 students on 28.02.1897.	1897	
Participation in the third geometry course in the summer semester from 20.04.1897-14.08.1897 with 14 participants. No certificate issued by school management.		

HEINRICH WILD		ALBERT EINSTEIN
Participation in the IVth course (despite refusal to issue a certificate in the IIIrd course) with 9 participants in the winter semester 4.10.1897-28.02.1898.		
Completion of the IV geometry school course with 9 participants as ex-aequo best on 28.02.1898. Early termination of studies after 4 instead of 6 courses without a diploma.	**1898**	
Participation in military officer training courses: Promotion to lieutenant of the fortress artillery.		
Provisional appointment as topographer II class at the Topographical Bureau in Bern on March 1, 1899 by director Jean-Jacques Lochmann on the recommendation of Leonz Held.	**1899**	Application for admission to Swiss citizenship in Zurich
Move to Bern to sublet with Mr. Krähenbühl in Aarbergergasse 22 (registration 22.10.99)		
Meets his future wife Anna Katharina "Lilly" Märchi during surveying work on the Rigi in Arth.		
Definitive appointment as civil servant and topographer II class by Jean-Jacques Lochmann from 1.4.1900	**1900**	ETH specialist teacher diploma in mathematics, Zurich (27.7.1900); Mileva Maric narrowly fails the diploma examination
Marriage to Anna Katharina "Lilly" Märchy, of Schwyz daughter of Leopold Dominic &Theresia Elise Bürgi (5.5.00)		
Move to Martigny (deregistration 17.5.00)		
Precision leveling Biel-Neuchâtel		
Responsible for the Landestopo surveying equipment function		
Freelance research assistant for Zeiss Jena (1.4.1900)		
Relocation from Martigny to Thunstrasse 8 in Bern		
Triangulation of the St. Maurice fortress area with M. Rosenmund	**1901**	Swiss citizenship as a citizen of Zurich (21.2.01)
Birth of first son: Heinrich Leopold "Heinrich jr." (4.3.01)		First published scientific paper in "Annalen der Physik"
Forest triangulation Lower Valais		Assistant mathematics teacher at the Technikum Winterthur (16.5.-11.7.1901), place of residence Schaffhauser Strasse, Winterthur.

HEINRICH WILD		ALBERT EINSTEIN
	1901	Tutor at the Dr. J. Nüesch Schaffhausen Teaching and Educational Institute for English students (September 1901 - February 1902)
		Submission of diss. ETH (23.11.01) - subsequent withdrawal
		Evaluation work at the Zurich Observatory
		Letter of application to the Bern Patent Office (18.12.01) from Bahnhofstrasse, Schaffhausen.
Birth of first daughter: Elisa Margheritha (Benz) (25.2.02)	1902	Birth of first daughter (illegitimate): Elisabeth "Lieserl" Maric in southern Hungary (today Serbia), January 1902 (missing - probably given up for adoption)
Surveying Lower Valais: Dents du Midi experience (1.9.02)		Relocation to Gerechtigkeitsgasse 32, Bern (registration 11.2.02)
Rhone glacier survey		Start of the Olympia Bern reading group (April)
		Milena Maric also moves to Thunstrasse 24 in Bern (Note 5.6.02)
		Relocation to Thunstrasse 43a, Bern (registration 7.6.02)
		Appointment as provisionally elected Technical Expert III. class at the Office for Intellectual Property Bern, Speichergasse; superior: Friedrich Haller, formerly Topographical Bureau (23.6.02)
		Crossing the Splügen Pass in the summer of 1902
		Relocation to Archivstrasse 8, Bern (registration 14.8.02)
		Mileva is also moving to Kirchenfeld: to Mottastrasse 3 (September)
Birth of second daughter: Hedwig Alice (Kronauer) (27.6.03)	1903	Wedding with Mileva Maric in Bern (6.1.03)
Move to another terraced house: Thunstrasse 6, Bern		Relocation to Tillierstrasse 18, Bern (registration 10.1.03)
		Registration for membership of the Bern Society of Natural Scientists (2.5.03)
		Relocation to Kramgasse 49, Bern (registration 29.10.03)
		First lecture to the Society of Natural Scientists in Bern (5.12.03)
Birth of third daughter: Gertrud Wilhelmina (Kramer/Zug) (5.11.04)	1904	Birth of first son: Hans Albert (14.5.04) - later studied engineering at ETH - Professor of hydraulics in Berkeley USA
Error analysis theodolite repetition measurement method		Conversion of the provisional position at the Patent Office into a permanent position as Technical Expert III Class (20.9.04)

HEINRICH WILD		ALBERT EINSTEIN
Observation and calculation of higher-order CH network		
Patent 31049 Correctable double image distance meter and sale to Zeiss Jena		
Working location after relocation of the Swiss Federal Office of Topography now at Hallwylstrasse 4, Bern	**1905**	Relocation to Besenscheuerweg 28, Bern (today Tscharnerstrasse 28) (registration 13.5.05)
Private move to Kirchenfeldstrasse 32, Bern		Four publications in the "Annalen der Physik" in Einstein's miracle year 1905 ("Annus mirabilis"):
Formulation of a catalog of requirements for a better theodolite		- "On a heuristic point of view concerning the generation and transformation of light" (18.3.05) - (Discovery of the photoelectric effect: awarded the Nobel Prize in 1921)
Concept for new circular reading of both sides		- "On the motion of particles suspended in liquids at rest as required by the molecular theory of heat" (received 11.5.05) - Brownian motion
Promotion to Topography Engineer I. Class		- "On the Electrodynamics of Moving Bodies" (Special Theory of Relativity) (received 30.6.05)
Promotion to first lieutenant of the fortress troops		- "Is the inertia of a body dependent on its energy content?" (received 7.9.05) - Principle of equivalence (formula $E = mc^2$ 1907)
Member of the Swiss Military Commission for Optical Rangefinders (until 1907)		Dissertation for the University of Zurich "A new determination of the molecular dimension" completed (30.4.05)
Publication of Heinrich Wild's "Tables for the rapid determination of height differences from horizontal distance and elevation angle" (Swiss Federal Office of Topography)	**1906**	Doctorate from the University of Zurich for his dissertation "Eine neue Bestimmung der Moleküldimension" (15.1.06) - publication slightly modified in the Annalen der Physik 1906
Discussion with Zeiss Jena about rangefinder patents and later joining Zeiss (March)		Lecture at Prof. Paul Gruner's seminar in Bern (February)
Death of grandmother Regula Leuzinger (6.2.1828-31.10.1906)	**1906** F	Promotion to Technical Expert II Class at the Patent Office (10.3.06)
		Move to Aegertenstrasse 53, Bern (apartment registration 1.6.06)

HEINRICH WILD		ALBERT EINSTEIN
Birth of second son: Heinrich Konrad Willi (5.4.07)	**1907**	Second lecture to the Society of Natural Scientists in Bern (23.3.07)
Theodolite application according to the concept of H. Wild für Swiss Federal Office of Topography (due to too high technical requirements not usably solved by Wanstorff, Berlin, and unsatisfactory by Kern Aarau)		Discovery of the equivalence principle of mass and space-time form for the general theory of relativity ("I was sitting on a chair in the patent office in Bern. Suddenly the idea dawned on me: In free fall, a person should not feel his own weight at all.")
Patent 38603 Diametral circular reading via microscope		Application for private lecturer at the University of Bern (17.6.07
Patent 216420 Rangefinder Zeiss (2.6.07)		Place of work now: Post and telegraph building at Äusseres Bollwerk 8
Sale of the rights to the rangefinder adjustment device to Zeiss in return for a 6% sales license		Formulation of the equivalence formula (formula $E = mc^2$) for the equivalence of mass and energy in the special theory of relativity 1905
Resignation from Swiss Federal Office of Topography and representative for Zeiss with Swiss federal authorities in Bern (September)		
Approval of the Zeiss Foundation Board to hire Wild (14.2.08) Relocation to Jena	**1908**	Letter to Marcel Grossmann: Einstein wants to become a teacher at the Technikum Winterthur, where he had already taught on a temporary basis in 1901 (January)
Senior engineer at Zeiss Jena / Thuringia and establishment of the Geo department (April)		Submission of the habilitation thesis to the University of Bern (January)
Invention of the Wild-Zeiss leveling method and construction NJ 1		Inaugural lecture as a private lecturer at the University of Bern o the "Theory of Rays" (27.2.08)
Promotion to captain of the fortress troops.		First lecture in theoretical physics at the Alte Sternwarte Bern on the Grosse Schanze (zero point of the national survey) (21.4.08)
		Alfred Bucherer proves the mass gain of fast electrons in an experiment and thus Einstein's special theory of relativity $E=mc^2$
		Einstein erects an antenna in the Blau family's chicken farm in Muri to receive Henri Poincaré's time signals from the transmitte on the Eiffel Tower for land surveying purposes
Wild article "Neue Nivellierinstrumente" in Zeitschrift für Instrumentenkunde, XXIX. vol. 11 (November 1909)	**1909**	Appointment as Associate Professor of Theoretical Physics at the University of Zurich

HEINRICH WILD		ALBERT EINSTEIN
		Termination of patent office employment with the Federal Counci following evaluation of 1750 patent specifications, mainly with electricity topics (6.7.09)
		Honorary doctorate from the University of Geneva (9.7.09)
		Termination of lectureship at the University of Bern (4.8.09)
		First Nobel Prize nomination (for Special Theory of Relativity), but not elected (2.10.09)
		Resignation from the Intellectual Property Office in Bern (15.10.09) Taking up office at the University of Zurich and moving to Zurich
		Inaugural lecture as associate professor at the University of Zurich: On the role of atomic theory in modern physics (1.12.09)
Birth of third son: Jost Erich Leopold (12.3.10)	**1910**	Birth of second son: Eduard (28.7.10)
Construction NJ III level with high-intensity lens, plane parallel plate, invar band bar and first tripod with extendable legs	**1911**	Professorship at the Karl Ferdinand University in Prague (15.4.10)
		Calculation of light deflection in the gravitational field of the sun
	1911	Only personal meeting with Henri Poincaré at the Solvay Congres in Brussels (end of year)
Construction of modernized theodolite for foreign state, but repetition theodolite and estimating microscopes	**1912**	Appointment to Zurich as Full Professor of Theoretical Physics ETH (February) and return to Zurich (August)
Leveling of Switzerland with precision level NJ III, and subsequently of Great Britain by Ordnance Survey	**1913**	Admission to the Royal Prussian Academy of Sciences (end of year); Einstein becomes a Prussian citizen and thus also a Swiss-German dual citizen

HEINRICH WILD		ALBERT EINSTEIN
		Article "Draft of a generalized theory of relativity and a theory of gravitation" with Marcel Grossmann; intensive mathematical study of Friedrich Gauss' geodesic lines and Bernhard Riemann's further developed equations for curved surfaces
Construction of theodolite III with microscope reading and turnable telescope in Jena	**1914**	Moves to Berlin: Professor at Friedrich Wilhelm University Berlin (6.4.14); Mileva stays in Zurich with both sons
Start of the First World War Work ban for foreigners; Heinrich Wild at Zeiss; Wild enters the Gotthard fortress as a major in the Swiss army (August)		
	1915	Gyrocompass report for Hermann Anschütz-Kaempfe (leads Einstein to the idea of an atomic model)
		Creation of three important works: - On the general theory of relativity - Explanation of the perihelion motion of Mercury - Field equations of gravitation
Birth of fourth daughter: Marie Hildegard(-Roth/Spiez) (1.8.16)	**1916**	Publication of the general theory of relativity
Acquaintance with Major Dr. Robert Helbling in the Swiss Gotthard Fortress		Publication: "Zur Quantentheorie der Strahlung" in Mitteilungen der Physikalischen Gesellschaft, Zurich, No. 18 (1916).
Sale of all rights from contracts and patents to Zeiss for 80,000 Reichs-Mark (23.3.16)		
Death of mother Elisabeth Wild Weber (21.1.1853-30.1.1917) in Bilten	**1917**	Various illnesses: Care by cousin Elsa and cure in Bad Tarasp/Engadin
		Einstein's first article on cosmology (introduction of "lambda")
Birth of fourth son: Hans Fridolin (6.8.18) Resumption of work at Zeiss after the end of the war	**1918**	Reassessment of Anschütz-Kämpfe gyroscope and patent

HEINRICH WILD		ALBERT EINSTEIN
Construction Zeiss theodolite with circular reading by coincidence of opposite lines Th I		
Prototype Th I in Jena	1919	Divorce from Mileva in Zurich (14.2.19)
Resignation from permanent position in Jena and negotiation of a consulting contract with Zeiss until April 1921 (1.12.19)		Wedding with divorced cousin Elsa Löwenthal Berlin (2.6.19)
		Solar eclipse measurement: Angular shift 1.75 arc seconds, Brazil and Guinea by Royal Society and Royal Astronomical Society London (19.3.19)
Birth of fifth son: Fritz Rudolf (28.3.1920-1936))	1920	
Start of construction Stereoautograph A1 (March)		
Setting up a small workroom in the embroidery shop in Heerbrugg (November)		
Telegr. to R. Helbling Construction completion A1 (October)		
Discussion Robert Helbling/Jacob Schmidheiny about founding a company in the St.Gallen Rhine Valley (3.11.20)		
Foundation of "Heinrich Wild Werkstätte für Feinmechanik und Optik", Heerbrugg, with Dr. Robert Helbling and Jacob Schmidheiny (26.4.21)	1921	Collaboration with Hermann Anschütz-Kaempfe: Proposal for segment magnets as the "blowing coil" of the spherical gyrocompass (patent 1926) First visit to the USA with Chaim Weizmann USA (April-May)
Relocation of the family of eleven from Jena to Heerbrugg		Nobel Prize in Physics 1921 (see 1922)
Completion (and crash) of the phototheodolite prototype	1922	Reconciliation visit as representative of Germany in Paris (March/April)
		Lecture tour Japan (Oct/Nov)
		Presentation of the 1921 Nobel Prize in Physics for the discovery of the photoelectric effect in 1905 (9.11.22)
Stereo plotter A1, phototheodolite	1923	
Foundation of Verkaufs-A.G. Heinrich Wilds geodetic instruments Heerbrugg as a leading company (26.4.23)		

HEINRICH WILD		ALBERT EINSTEIN
Theodolite T2, level N1, aerial camera C1, artillery theodolite		
Rescue financing of the loss-making company by bringing in Ernst Schmidheiny	**1924**	
Albert Schmidheini also joins the Board of Directors and company director (Nov.)	**1925**	
Stereo restitution instrument A2 (also for aerial photogrammetry), aerial camera C2 with two self-calculated lenscones, tilt rule, telemeter Pdm		
Precision theodolite T3, telescopic sight	**1926**	Patent partner of Hermann Anschütz-Kämpfe for spherical gyrocompass with license revenue share
Enthusiastic report by the Royal Geographical Society on the recording and evaluation quality of the photogrammetric equipment of the "genius" Heinrich Wild using the example of Karakorum images and K2		Article: "The cause of the meandering of river courses and the so-called Baer's law." In: Naturwissenschaften. March 1926, p.223-224.
Award of the honorary doctorate Dr. h.c. ETH on the occasion of the Internat. Photogrammetry Congress ISP in Zurich (6.9.30)	**1930**	Letter to Prof. Meyer-Peter regarding employment of son at EAWAG Zurich (6.11.30)
Participation in the festive event to mark the 75th anniversary of ETH Zurich at the Stadttheater Zurich (7.11.30)		Participation in the festive event to mark the 75th anniversary of ETH Zurich at the Stadttheater Zurich (7.11.30)
Rejection of an offer by Kern director Rothpletz for Wild Heerbrugg to take over the Aargau company.		Award of honorary doctorate Dr. h.c. ETH Zurich (certificate 8.11.30)
Failed attempt to sell Heinrich Wild's company shares to Zeiss and takeover of Wild Heerbrugg by American competitor company		
Relocation to Zurich	**1931**	
Withdrawal from Wild's Heerbrugg sales company with a non-competition clause until 1935 (8.12.32); sale of Heinrich Wild's company shares and Rebhof villa to Max Schmidheiny.	**1932**	Visiting professor at the Institute for Advanced Study in Princeton (October)

HEINRICH WILD		ALBERT EINSTEIN
Entry of Max Kreis (later Director and in 1968 successor to Albert Schmidheini as Delegate of the Board of Directors)		
	1933	Renunciation of Prussian citizenship at the German Consulate General in Brussels (28.3.33) - expatriation in 1934
		Spring and summer mainly abroad (Belgium/Oxford)
		Emigration to Princeton USA (17.10.33)
	1934	Publication "My world view" - non-scientific essays
Patent sale of the design of the A5 stereo plotter to Wild Heerbrugg	**1935**	
Initial developments for Kern Aarau		
Relocation from Zurich to Baden/AG - Villa "Römerhof"	**1936**	Honorary member of the Society of Natural Scientists in Bern (21.11.36)
Construction DKM series double circle theodolites for Kern		
Heinrich Wild jr. joins Kern as an engineer		
Construction of a high-precision circle dividing machine	**1938**	Book with Leopold Infeld: "Physics as an adventure of knowledge
Article by Heinrich Wild on the Swiss National Exhibition Landi: "The recent development of some geodetic instruments" (1.3.39)	**1939**	Letter to President Franklin D. Roosevelt on nuclear research (2.8.39)
Completion of the new powerful and bright DKM double-circle theodolites in five accuracy levels for Kern		
	1940	US citizenship in addition to Swiss citizenship
	1941	Start of the Manhattan Project to develop the atomic bomb
	1943	Consultant to the US Navy (Ammunition and Explosives Research Group)

HEINRICH WILD		ALBERT EINSTEIN
	1946	Chairman of the Emergency Committee of Atomic Scientists
Construction of a stereo restitution instrument with electrical encoders for Kern - but once again too early in terms of production technology	1949	Writing "Autobiographical"
Scope construction for Swiss Army / Core		
	1950	Font "Out of my Later Years"
Death in Baden (26.12.51)	1951	
	1952	Confirmation of the solar eclipse measurements in Khartoum/Sudan(1.7")
	1953	Speaks out in favor of civil disobedience towards Senate committee
	1955	Signing of the Russell-Einstein Manifesto against a nuclear arms race
		Short autobiography "Memories - Souvenirs" for the 100th ETH anniversary
		Death in Princeton (18.4.55)
	1960	First LASER functional model by Theodore Maiman
First DI10 laser distance meter by Wild Heerbrugg-Sercel	1968