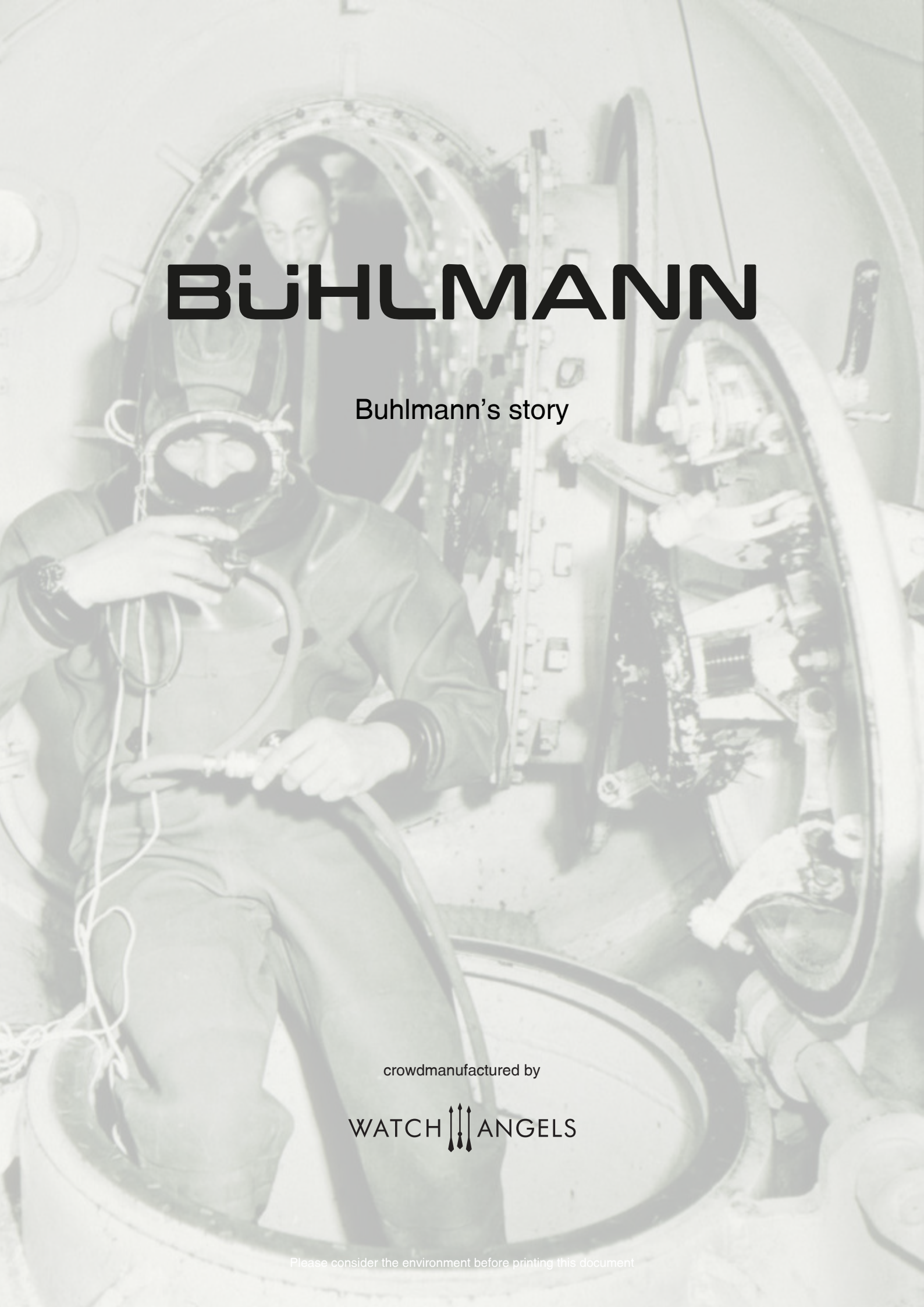

BÜHLMANN

Buhlmann's story

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WATCH ANGELS

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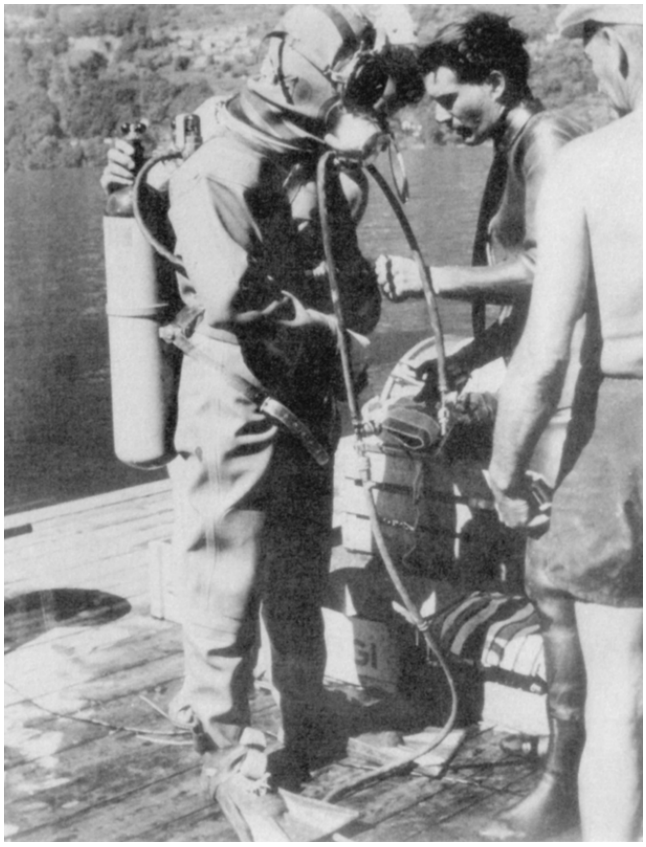
BÜHLMANN



Biography of Albert Alois Bühlmann (1923 - 1994)
Doctor and pioneer of modern diving medicine

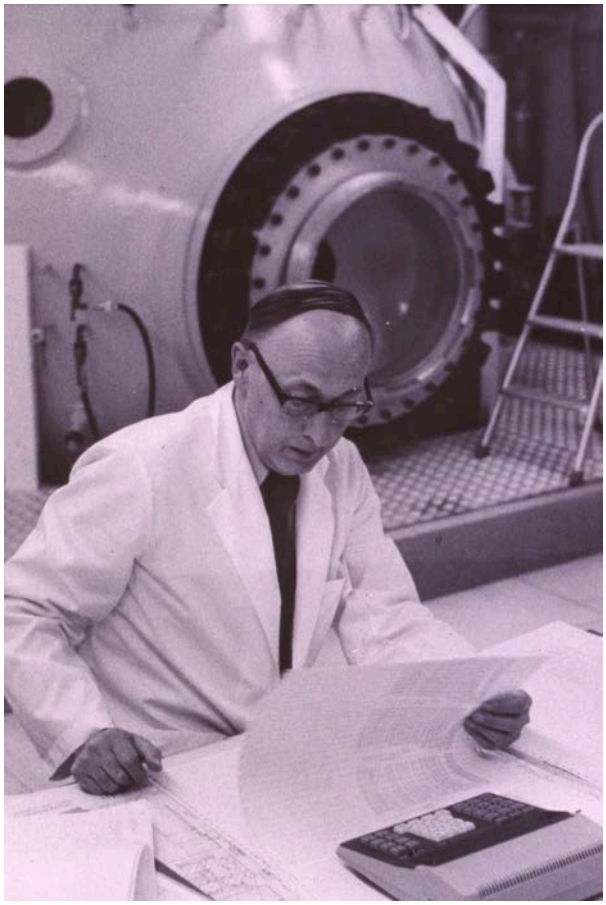
About the author Thomas Albert Bühlmann and his relationship to his father's history as a diving doctor

I was born in 1952 and now live in Zurich. After completing my professional activity as a corporate lawyer and for 18 years as head of a pension fund, I now work as an independent legal and investment advisor.

In 2020 I completed a course in applied history at the University of Zurich with a master's thesis on my father's research with the title "Diving medicine research at the University of Zurich from 1959 to 1994: 35 years of empirical research in the field of tension between research policy, sponsoring, ethics Law - Prof. Albert A. Bühlmann and his work".

During my youth I was an onlooker at my father's research work on various occasions, for example in 1961 during a dive at 220 meters by Hannes Keller and Damian McLeish in Lake Langensee near Brissago, and in 1966 in Porto San Stefano in Tuscany, both unforgettable experiences.

At that time, long-term dives with numerous divers at depths of 30 to 220 meters were carried out in a pressure chamber built by Shell and Micoperi. The dives were previously tested in the pressure chamber laboratory of the University of Zurich. During the experiments in the hyperbaric chamber, I was always allowed to be there as a spectator. On the occasion of the Bühlmann Memorial Symposium on 29-30. March 2019 at the University Hospital Zurich I summarized his work in the section «Diving Medicine Research in Zurich 1959 to 1994».



The opportunity to collaborate with the companies Cronatec LLC and Watch Angels on the development of the "Bühlmann" diving watch was both an opportunity and a challenge. Exact and reliable timekeeping played an important role in research at the time and today it plays a vital role in the countless dives of sport and professional divers. With the launch of a "Bühlmann" diving watch, there is the opportunity to carry the history of 35 years of diving medicine research in Switzerland beyond the Swiss borders with a unique watch developed and produced in Switzerland.

Who was Albert Alois Bühlmann?

My father was born in Berlin in 1923 and grew up as an only child. My grandfather Alois left the city of Lucerne before the First World War with a diploma from the hotel management school and ended up in Berlin after stays in Paris and London. My grandmother Maria from Appenzell dared to go there after the war. They followed the example of many Swiss who left Switzerland for economic reasons in the second half of the 19th century and at the beginning of the 20th century.

During the golden twenties, my grandparents ran four chocolate shops in a good location in the center of Berlin. The economic crisis required a realignment. Until their grandfather's death on January 2, 1943, they ran a restaurant in the working-class district of Wedding. My grandmother returned to Appenzell in Switzerland after the death of her husband. As a homework embroiderer, she earned a modest income.

In the spring of 1941, my father enrolled at the Charité medical faculty, the Friedrich-Wilhelms-Universität Berlin, today's Humboldt University. In the spring of 1943, he passed the preliminary medical examination. As a result, he took the clinical semester.

At the end of 1944, living conditions in Berlin deteriorated significantly due to the war. The residential tareas were bombed almost every day. The family's small row house in the Tempelhof district - the family's only remaining asset - was badly destroyed. At the end of 1944 my father travelled to Switzerland with the aim of completing his medical degree there. Because his education was not recognized in Switzerland, he was refused admission to the state examination. However, after having passed the Matura supplementary examination, he was able to complete the course with a doctorate. This meant that he was able to work as a doctor at a hospital. In the person of his doctoral supervisor Prof. Dr. P.H. Rossier found a mentor who got him a job at the Polyclinic of the University Hospital Zurich.

From 1952 he headed the research laboratory for cardio-pulmonary function. When in 1956 the monograph «Physiology and Pathophysiology of Respiration» by Prof. Dr. P.H. Rossier and my father appeared, he had already published 50 scientific publications. Dr. Heinrich Mattys, University of Freiburg i.Br., described this book as the first modern book on the physiology of breathing in German on occasion of my Father's appointment as honorary member of the Society for Diving and Hyperbaric Medicine in 1991.

The extreme states of breathing received special attention there. In 1958 my father completed his habilitation. **In mid-1960** he gave his inaugural lecture on the subject of "Extreme Conditions of Breathing". He highlighted individual clinical pictures, such as asthma, and discussed problems with artificial respiration, endurance sports, athletic performance at high altitude, flying and finally diving. In an interview with Kurt Aeschbacher on occasion of a live report in 1986 about a diving expedition to the sunken steamship "Jura" in Lake Constance, my father described diving medicine as his «hobby». He saw it as a personal stroke of luck to be able to pursue his «hobby» as a scientist in addition to his main areas of pneumology, cardiology and intensive care medicine.

In 1968 my father took over the chair for pathophysiology physical direction at the University of Zurich. In 1990, at the age of 67, he retired. Until his death in 1994 he devoted himself intensively to the further development of dive computers and his journalistic activities. In 1990 and 1993 the 2nd and 3rd editions of his monograph «Diving Medicine - Barotrauma Gas Embolism Decompression Sickness» were published. In January 1994, shortly before his death, he gave a lecture at “Boots” in Düsseldorf on the occasion of the announcement of the Aladin Air X dive computer, which used the latest **Bühlmann ZH-L8 ADT calculation model**.

From 1959 to 1962, the mountain climbers from Switzerland surprised the professional world at home and abroad with low records

When my father and Hannes Keller started the deep hunt in 1959, depths of 80 to 100 meters were the absolute limits for divers. Arne Zetterström, a Swedish marine diver, had already reached a depth of 160 meters with a hydrogen-nitrogen-oxygen mixture in 1945. He had a fatal accident on August 7, 1945 on his sixth dive without being able to prove the correctness of his theory.

Hannes Keller was an intrepid diver who made himself available for self-experiments for the by no means safe tests. His technical knowledge and his ability to gather experts around and get them enthusiastic about the world record vision were important success factors for the world record company. In order to achieve the desired depths, adequate technical solutions had to be newly developed and produced, such as breathing apparatus and diving suits. The story of the intrepid adventurer aroused the interest of the media, which in turn was an important prerequisite for the search for sponsors.

My father, as a respected doctor and scientist at the University of Zurich, opened the doors to research institutions abroad such as the Groupe des études et des recherches sous-marines «GERS» in Toulon and the University of Washington. In 1961, my father received a research assignment from the US Navy, which was a breakthrough.

As early as autumn 1959, a successful dive to a depth of 120 meters was carried out in Lake Zurich with the simplest of technical aids. The mountain people from Switzerland played at the forefront of underwater physiology and oceanography.

In 1960 there were two hyperbaric chambers in the western world that allowed diving depths of 23 ATM and more. One was in the USA, the other was with the Groupe des études et des recherches sous-marine «GERS» in Toulon. The hyperbaric chamber in Toulon was designed for the French Navy by the famous diver and oceanographer Jacque Cousteau. It had an attached high-pressure part that could be filled with water and allowed a pressure of 46 ATM. This enabled the imitation of a diving depth of 450 m to be simulated. In the overpressure chamber, however, no tests with more than 11 ATM i.e., 110 m depth, were carried out until the mountain climbers arrived. Through the mediation of Jacques Cousteau, my father and Hannes Keller were able to conduct a dive in the pressure chamber at 250 m on November 4, 1960. Hannes Keller and the French marine divers started the dive at the same time.

Hannes Keller was in the high-pressure section. The marine divers went with them in an adjoining chamber up to a depth of 60 m. Hannes Keller reached a depth of 250 m. Hannes Keller stayed a few minutes in the pressure area, in which no one had been before. The two Swiss were convinced of the correctness of the method. It was a shock to the French naval doctors and officers.

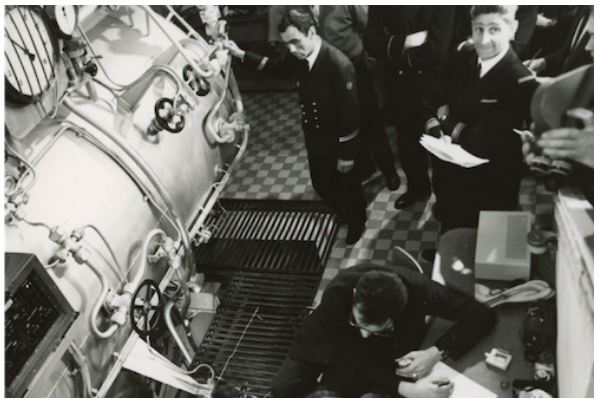
The real challenge was still to come, namely decompression. According to my father's calculations, Hannes Keller decompressed to 60 m within 8,5 minutes. He left the high-pressure section and went to the marine divers' chamber. There the pressure was reduced to 20 m within 6 minutes. Hannes Keller then went into a lock, where normal pressure was reached within 30 minutes. The marine divers could only leave the hyperbaric chamber after another 30 minutes. It was clear to the experts present that a new era in diving medicine had begun.

A few months later my father and Hannes Keller were back in Toulon. In advance, they tested a target depth of 210m in a one-person hyperbaric chamber in Zurich. The overpressure chamber only allows a pressure of 8 ATM In order to simulate the pressure difference at 22.5 ATM which corresponds to a depth of 215 m, a combination of overpressure and underpressure was chosen. The experiment with a stay of 10 minutes at the target depth was successful. On April 25, 1961, a dive was first carried out in Toulon with a target depth of 300 m and a dwell time of 10 seconds.

The following day there was a dive at 215 m with a residence time of 10 minutes. At the target depth, Hannes Keller had to lift weights according to my father's clock - he hit the pressure chamber with a hammer. The decompression time calculated by my father was 140 minutes. The higher saturation as a result of work performance was taken into account. The same experimental set-up was demonstrated on May 10, 1961 to representatives of the US Navy and scientists in the hyperbaric chamber at Washington University.

Hannes Keller and Damian McLeish dived in Lake Maggiore off Brissago at 220 m on June 28, 1961. The national press and Life Magazine reported on this sensational dive to the record depth of 220 m in the water worldwide.

With the financial means of CHF 43,000.00 from the research contract with the US Navy, my father was able to push ahead with the "World Record" project. The goal was a dive to a depth of 305 meters in California. My father undertook to give the US Navy experts a transparent insight into the new procedures in two reports.



On December 3, 1962, after delays due to the weather, Hannes Keller and Peter Small made the record dive off the island of Catalina in the Pacific at the last possible point in time with the Atlantis hyperbaric chamber built by Sulzer. In preparation, the same dive with Hannes Keller and Peter Small in the hyperbaric chamber was carried out in Zurich without any problems.

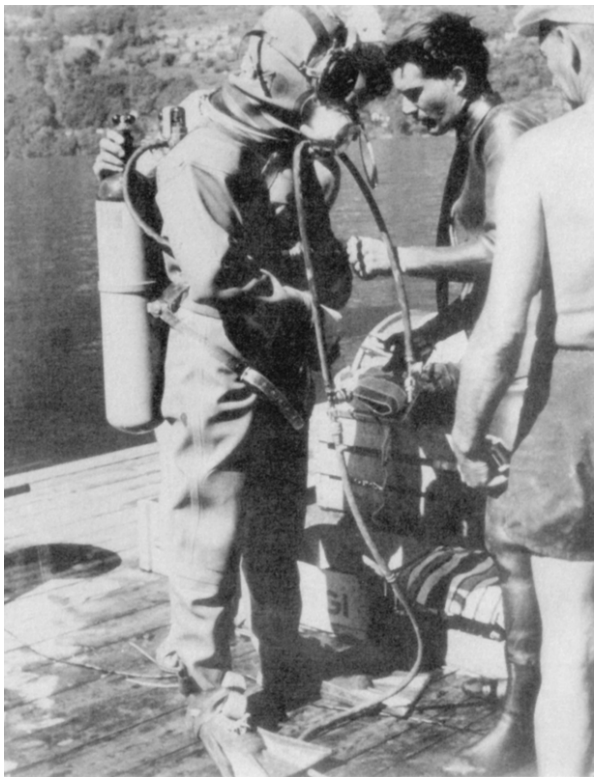
The company was planned as a media hype. The writing press and film crews were present. In addition to the US Navy, the oil company Shell International provided logistical support for the record attempt. As planned, the two divers were released into the overpressure chamber and supplied with the breathing gas mixture adapted to the depth using breathing masks. In the overpressure chamber, the pressure was built up according to the pressure at the target depth, using compressed air as the gas was used. When the target depth was reached, the two divers opened the hatch of the overpressure chamber.

Hannes Keller changed the breathing apparatus and left the hyperbaric chamber. He placed a flag of Switzerland and one of the USA on the seabed. The action took longer than planned. When returning to the hyperbaric chamber there were problems closing the hatch, which further delayed the ascent. Decisive for the looming tragedy, however, was the dwindling supply of breathing gas. Hannes Keller recognized the life-threatening problem. His decision to part with the breathing mask and breathe compressed air was lifesaving for him.

He accepted the loss of consciousness; it was not life threatening. Hannes Keller's attempt to convince his friend Peter Small of the necessity of this measure failed. Peter Small stayed on the breathing mask and ultimately suffered fatal hypoxia.

When Hannes Keller regained consciousness, Peter Small could no longer be saved. Due to the longer stay at the world record depth and the changed gas composition during the ascent, the originally planned decompression was extended by 140 minutes. As an experienced intensive care doctor, my father managed to keep the necessary calm, adjust the decompression calculations promptly and thus save Hannes Keller's life. Subsequently, under the direction of Colonel John Craig, a broadly composed commission of inquiry with experts from various fields was put together. The public prosecutor examined the criminal liability.

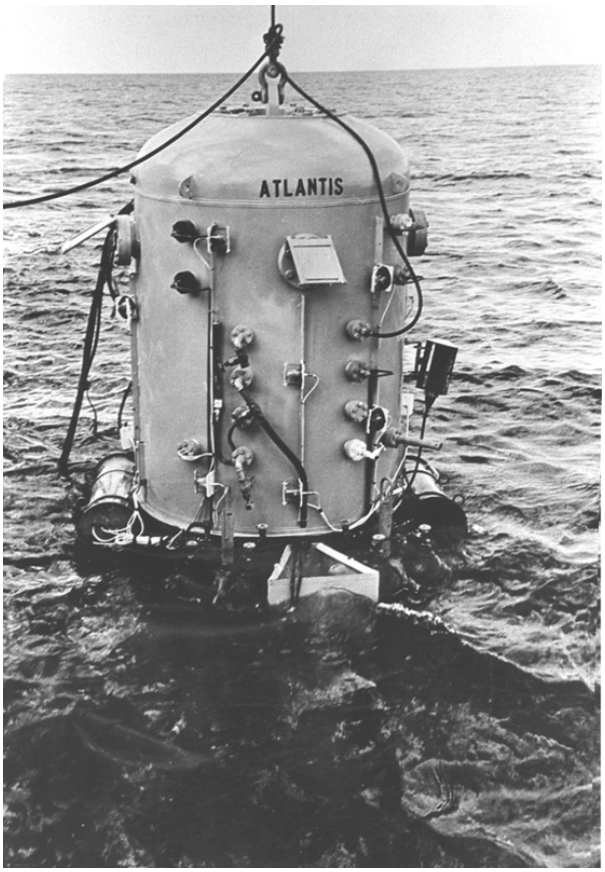
My father was interested in the fact that the commission of inquiry was informed of all relevant facts. He gave a complete insight into the facts from the preparation to the end of the world record attempt. In its final report, the investigation commission found serious deficiencies in the technical and organizational preparation. In terms of diving medicine, no errors or omissions were found. One of the decisive factors was that the medical diving procedures used in the series of preparatory tests in Zurich, Toulon and Washington could be carried out without any problems. The rescue of Hannes Keller was recognized as an extraordinary achievement in diving medicine. In the end, the public prosecutor's office waived an indictment because the parties involved denied any criminal behaviour.



1963 – 1974 Research and consultancy agreement with Shell International Research and Micoperi

In November 1963, my father and Hannes Keller, on the one hand, and Shell International Research and Micoperi, on the other, agreed a research and consultancy agreement. My father and Hannes Keller also became minority shareholders in a collecting society for intellectual property rights with the majority shareholders Shell International Research and Micoperi.

The contract provided for the establishment of a positive pressure laboratory at the University of Zurich with the aim of developing procedures for carrying out long-term dives at depths of up to 700 m. As a doctor, my father was no longer interested in spectacular records, but in safe decompression procedures for professional divers on long-term dives to great depths. The entry of Shell International demonstrated the future importance of professional diving in the development of new oil and gas fields in the area of the continental shelf.

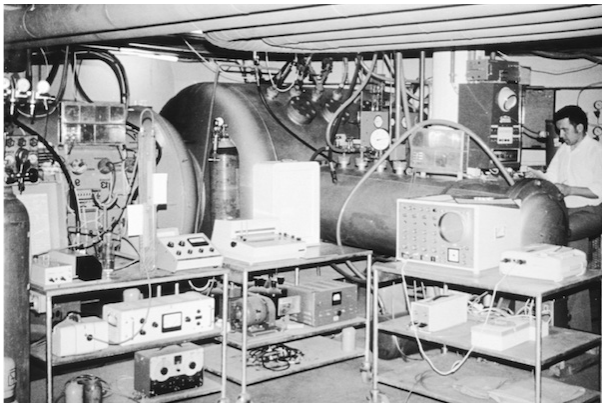


My father was solely responsible for the implementation of the research program at the University of Zurich that he agreed annually with Shell International and Micoperi. He had contractually guaranteed the freedom to publish the results of the research work.

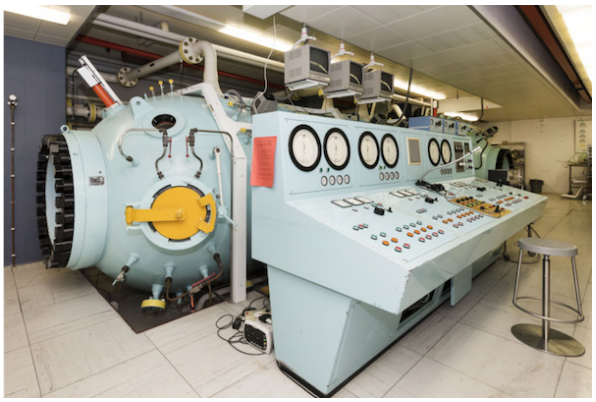
At the beginning of the construction of the overpressure laboratory in 1964, Hannes Keller was responsible for the technical implementation. Soon, however, Benno Schenk took over responsibility for the construction, maintenance and operation of the system. Research in a scientific environment, as it was practiced in Zurich after 1964, no longer corresponded to the ideas of Hannes Keller. Although their professional paths parted, my father and Hannes Keller remained on friendly terms until his death.

For my father, the clear separation of research activities in the laboratory and the practical implementation of the research results under realistic operating conditions was essential after his experience with the world record attempt in California. The prerequisite for this was professional organization in both areas. Shell International and Micoperi took over responsibility for the practical implementation of the research results of the hyperbaric chamber laboratory at the University of Zurich after 1964. For this purpose, they built the Capshell in 1966, a hyperbaric chamber designed for long-term experiments in the sea.

In 1965 and 1966, over 100 long-term experimental tests were carried out in the hyperbaric chamber of the University of Zurich. They form the prerequisites for long-term dives, i.e. for the attempts at saturation in the Tyrrhenian Sea near Porto San Stefano to a depth of 220 meters, which took place from September 14th to October 24th, 1966. «Capshell» was a ring-shaped hyperbaric chamber with several divisible compartments. The design was based on the assumption that the overpressure chamber would be lowered along the drill string. The pressure chamber was generously dimensioned so that divers could stay under pressure for several days, even weeks, to carry out repeated work assignments. During the test days, the Capshell was repeatedly lowered to the target depth at the place of use while hanging from a crane. With these successful experiments it was proven for the first time under real conditions that long-term dives to great depths were possible. Under the direction of Cdr. J. Carr of Shell International conducted the series of tests without incident. These practical tests were a prerequisite for the later assignments of hundreds of professional divers who, after the oil crisis of 1973, undertook more and more diving assignments in connection with the development and operation of new oil and gas fields.



Under the direction of my father and Prof. Dr. H. Mattys was in the Medical Center of the Royal Navy in Alverstoke / UK from 3 to 10 February 1969 a saturation attempt on 300 m with several descents to 350 m carried out. In 1990 my father wrote in his monograph “Tauchmedizin”: “The concept developed in Zurich was in part at odds with the opinion of diving medicine experts in the USA and England. The «Swiss Concept» provided an explanation for the fact why the decompression time during helium dives can be shortened considerably without risk by switching to air breathing at the appropriate point in time. The theoretical basis of the method, however, contains the apparently paradoxical consequence that without lowering the total surrounding pressure and with the inert gas partial pressure in the breathing gas remaining the same, the inert gas partial pressure in the tissue, which is composed of helium and N2, can be higher than the inert gas partial pressure in the breathing gas. This idea aroused disbelief in the headshake, although it inevitably arises with the different saturation speeds. The practical utility of the method was recognized, but not the theoretical basis. The use of mixed gases and inert gas changes during decompression was copied and little was given to the basics. «



The year 1969 was connected with another important event for research in diving medicine. In that year the first diving swimmer recruiting school of the Swiss Army was held. After diving in Lake Silvaplana at an altitude of 1,800 m above sea level, two out of eight divers had symptoms of paralysis in their legs. The divers used the then common French GERS decompression tables, which were valid for sea level. The two divers were treated successfully in the one-man pressure chamber according to my father's telephone instructions. As a result, decompression tables for air dives at different altitudes were calculated in Zurich for the first time on the basis of experiments with the combination of positive and negative pressure. These new tables were used by the Swiss Army from 1972 onwards.

Construction of the new hyperbaric chamber at the University of Zurich

The old hyperbaric chamber of the University of Zurich met the requirements for a modern laboratory less and less. The diving depth was limited to 300 meters. The space was limited, especially with regard to the treatment of accident victims. There was also no water tank in which diving missions in the water could be simulated. In addition, there was no efficient helium cleaning and recovery system.

The research program was largely privately funded until the early 1970s. My father was responsible for raising the funds and making decisions about the investments. The majority of the medical and technical staff costs were borne by the Canton of Zurich. For the financing of a new hyperbaric chamber and the construction of the new laboratory building in the basement of a new building at the University Hospital Zurich, my father was dependent on support from the Canton of Zurich and the Swiss Confederation in addition to the funds made available by Shell International. At the request of my father, the government council of the canton of Zurich approved a grant of CHF 650,000.00 on November 12, 1970 and the Federal Military Department a contribution of CHF 150,000.00. The canton of Zurich also assumed the on-site costs. In its resolution, the government council justified the investment with the extraordinary and internationally recognized research successes in the past and the expectation that research at the hyperbaric chamber at the University of Zurich will continue to deliver outstanding results and as a competence center for diving training and treatment of accident divers will play an important role. During the construction phase of the new hyperbaric chamber, the Canton of Zurich increased the amount by CHF 162,000.00 and the Federal Military Department by CHF 50,000.00. My father made a contribution of CHF 85,000.00. Shell International is contributing CHF 1,159,000.00 to the costs. The overpressure chamber was designed for an overpressure of 101ata, which corresponds to a depth of 1.000m. The new hyperbaric chamber was put into operation in 1975.

Shell International continued to provide most of the annual research budget. The research goal remained the same as in 1963, namely the development of procedures for long-term dives to a depth of 700 m and treatment methods for accidental divers.

In mid-1977 a test at 500 m was carried out in Zurich. Two out of three subjects felt very bad at this depth. A work assignment would have been out of the question. My father described the symptoms as «High Pressure Nervous Syndrome» and published his findings in the specialist press.

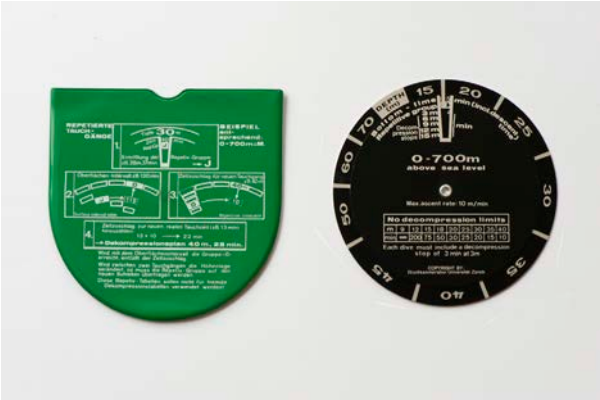
In the pressure chamber test No. 373 from January 28 to February 5, 1981, the record depth of 575 m was reached in Zurich.

By changing the procedure in the compression phase, the effects of the «High Pressure Nervous Syndrome» could be alleviated. It soon became apparent that deep diving had reached its limits, even if the research laboratories in Germany, France and the USA were to reach even greater depths in the years to come. These tests were no longer relevant in practice.

Professional deep diving was time-consuming, expensive and not without risk. Robotic technology, which was developing in rapid steps, increasingly represented an alternative and competed with divers. Shell International recognized this early on and, unsurprisingly, did not extend the research contract beyond June 30, 1981 for my father. My father decided to stop deep diving research. It was not entirely involuntary that he was a pioneer around the world.

From mid-1981 to the end of 1985, 69 tests were carried out in the hyperbaric chamber laboratory at the University of Zurich. The aim of the test series was to develop the data basis for new decompression tables for 0 - 700 m above sea level. NN, 701-2500 m above sea level NN and 2501-4500 m above sea level NN including repetitive dives to be completed. It was during this phase that my father dealt with the topic of decompression computers for the first time. During the development of the Deco-Brain II by Divetronics, the calculation model ZHL-16 developed by him was used for the first time in a dive computer.

My father increasingly used the data recorded by the dive computer in the log about the dive profile, on the one hand to analyse incidents and on the other hand as a data source for the further development of the calculation model. In the years that followed, members of diving clubs made themselves available to carry out series of tests according to my father's specifications. My father used the data to check the accuracy of the decompression tables and to improve them. Many years later, DAN Divers Alert Network Europe will collect data on a broad basis for research purposes to improve safety.



At the end of 1985, after a total of 455 attempts in the hyperbaric chamber of the University of Zurich, my father decided to forego further research experiments in the hyperbaric chamber. At the same time, he announced his resignation as medical director of the hyperbaric chamber laboratory.

The attempt of the University Hospital Zurich to position itself as a technical competence center in the field of the development of breathing apparatus for deep diving failed as early as 1986. The establishment of a center for hyperbaric medicine did not find lasting acceptance either at the university hospital or by the political bodies. Up until 1996, divers who had had an accident were treated in the hyperbaric chamber. However, the number of cases was low and Zurich was in competition with other locations in Switzerland and in other countries near the border. In 2006 the company was definitely closed.

Calculation model ZH-L16A and Bühlmann table 1986

As a scientist, my father's goal was to incorporate the empirical results obtained in over 450 overpressure tests with over 1,000 test persons into a computer model. This should enable the calculation of dives of different heights above sea level, length, depth, diving profiles, breathing gases, single dives or repetitive dives. He succeeded in doing this with the ZH-L16A calculation model published in 1986. The number "16" indicates the number of tissues considered.

This basic mathematical model was used in the following years and is still used today in a large number of dive computers for calculating decompression.

The mathematical model forms the basis for the Bühlmann table 1986 for individual dives as well as repetitive dives and different heights. The Swiss Underwater Sports Association recommended these tables to its members for use. Various underwater sports associations in other countries followed this recommendation. For the users to accept the calculation model and the tables, the decisive factor was that my father always published the scientific principles in a transparent and comprehensible manner.

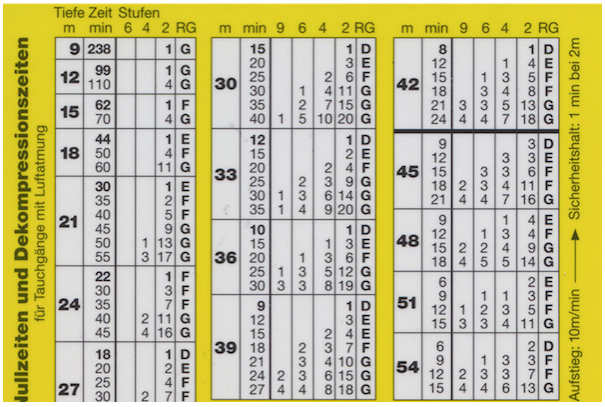
New generation of dive computers

The dive computer Deco-Brain II was a sophisticated dive computer in terms of functionality. He calculates with the calculation model ZH-L16. Its disadvantages were size, weight and high energy consumption.

Uwatec AG produced and sold diving equipment worldwide. Uwatec AG was interested in expanding its product range with a high-end product. She set herself the goal of developing a dive computer only slightly larger than a wristwatch at an attractive price. The know-how for this was lacking in-house, which is why Uwatec had to buy this externally. You signed a development contract with Dynatron AG, which specializes in the development of microchips. Dynatron AG subsequently worked closely with my father. Uwatec AG recognized that the name of the diving doctor Albert Alois Bühlmann could be helpful for the acceptance of the product on the market. Deco-Brain II used the name of Hans Hass as an advertising medium. Hans Hass had made a name for himself as a successful underwater filmmaker.

In order to produce an energy-efficient dive computer, the number of arithmetic operations had to be kept small. Unlike today, the computing capacity of the hardware available at the time was limited. Together with my father, Dynatron AG developed a calculation model that was limited to six tissues. In 1987 the no-stop dive computer «Aladin» was announced. Just one year later, the «Aladin Pro» was announced as the next development stage. The calculation model was revised by Ernst V. Völlm, Markus Mock, both Dynatron AG, and my father. Aladin Pro was a full-fledged decompression computer. With the Aladin Pro, Uwatec AG has established itself as the world market leader in the rapidly growing dive computer market.

Together with Dynatron AG, my father then worked on the next stage in the development of dive computers, the “intelligent” dive computer. The calculation model with the name ZH-L8 ADT was developed for this purpose. This computer model took into account the variability of the blood flow to the organs, muscles and skin due to exertion and cooling by integrating a micro gas bubble system. The Aladin Air X dive computer was presented to the international press on January 25, 1994 at the «Boots» in Düsseldorf by representatives of Uwatec AG, Dynatron AG and my father.



Tiefe Zeit Stufen

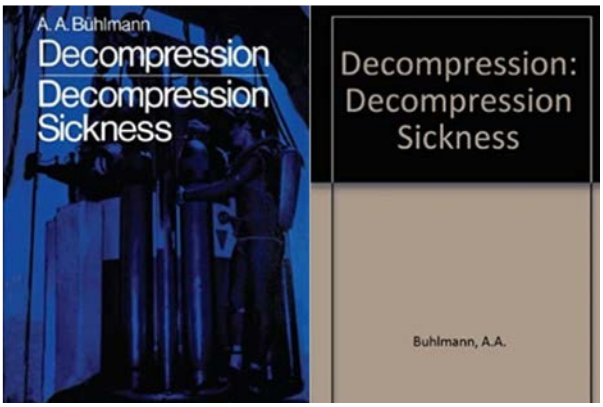
m	min	6	4	2	RG
9	238			1	G
12	99			1	G
	110			4	G
15	62			1	F
	70			4	G
18	44			1	E
	50			4	F
	60			11	G
21	30			1	E
	35			2	F
	40			5	F
	45			9	G
	50		1	13	G
	55		3	17	G
24	22			1	F
	30			3	F
	35			7	F
	40		2	11	G
	45		4	16	G
27	18			1	D
	20			2	E
	25			4	F
	30		2	7	F

m	min	9	6	4	2	RG
30	15				1	D
	20				3	E
	25			2	6	F
	30		1	4	11	G
	35		2	7	15	G
	40	1	5	10	20	G
33	12				1	D
	15				2	E
	20			2	4	F
	25		2	3	9	G
	30	1	3	6	14	G
	35	1	4	9	20	G
36	10				1	D
	15			1	3	E
	20		1	3	6	F
	25	1	3	5	12	G
	30	3	3	8	19	G
39	9				1	D
	12				3	E
	15			2	4	E
	18		2	3	7	F
	21		3	4	10	G
	24	2	3	6	15	G
	27	4	4	8	18	G

m	min	9	6	4	2	RG
42	8				1	D
	12			1	4	E
	15		1	3	5	F
	18		3	4	8	F
	21	3	3	5	13	G
	24	4	4	7	18	G
45	9				3	D
	12			3	3	E
	15		3	3	6	F
	18	2	3	4	11	F
	21	4	4	7	16	G
48	9			1	4	E
	12		1	3	4	F
	15	2	2	4	9	G
	18	4	5	5	14	G
51	6				2	E
	9		1	1	3	F
	12	1	2	3	5	F
	15	3	3	4	11	G
54	6				2	D
	9		1	3	3	F
	12	2	3	3	7	F
	15	4	4	6	13	G

Tauchzeiten und Dekompressionszeiten
für Tauchgänge mit Luftatmung

Sicherheitshalt: 1 min bei 2m
Aufstieg: 10m/min



Height tables

Since the incidents on the occasion of diving recruits in Lake Silvaplana in 1969, my father has repeatedly dealt with the topic of altitude. From 1986 to 1988, expeditions under medical supervision were carried out in Lago di Lucendro and Muttsee as well as in Titicaca (Exercise Paddington Diamond https://en.wikipedia.org/wiki/Exercise_Paddington_Diamond). My father provided the altitude-adjusted decompression tables. The dive computers from Divetronic and Uwatec were also used successfully in the tests. The extensive data material was taken into account for the further development of the calculation models.

Caisson work and occupational safety regulations

The caisson technique in tunnel construction was rarely used in Switzerland. However, this technology was used for the construction of the gray wood tunnel. The medical service of the Swiss Accident Insurance Fund («SUVA») commissioned my father to develop special decompression tables, which were declared binding in 1989. German labor inspectorates took advice from my father on the same matter.

In the Ordinance on the Safety of Workers When Working in Overpressure, Article 3 of the state-of-the-art technology, the Swiss Federal Council refers to the applicable SUVA guideline. The Bühlmann tables are dealt with in detail in the SUVA guideline as a recognized rule.

Literature:

- 1st edition of Albert A. Bühlmann's monograph «Tauchmedizin» 1983
- 2nd edition of Albert A. Bühlmann's monograph «Tauchmedizin» 1990
- 3rd edition of Albert A. Bühlmann's monograph «Tauchmedizin» 1993
- 4th edition of Albert A. Bühlmann's monograph «Tauchmedizin» 1995
- 5th edition of Albert A. Bühlmann's monograph «Tauchmedizin» 2002
- The way into the depths by Albert A. Bühlmann, Copyright 1961 by J.R. Geigy S.A. Switzerland
- Professional diving in positive pressure, SUVA guidelines written by Martin Rüegger, Dominik Schwarb June 2012
- Bühlmann Memorial Symposium 29. /30. March 2018 published papers in «caisson» organ of the Society for Diving and Pressure Medicine Vol. 34 No. 3 July 2019 and Vol. 35 No. 1 January 2020

THE CRONATEC TEAM

Thomas Bühlmann

Lawyer and Son of Albert A. Bühlmann
My biography seems rather traditional at first. A typical lawyer. But whether by accident or by design, I was always fortunate enough to be offered new challenges and be introduced to interesting people with whom to exchange ideas. My interests are interdisciplinary and I am always on the lookout for discoveries. This, in turn, has led to new opportunities.

Adrian Stahel

Entrepreneur and Project Manager
I see myself as an entrepreneur and project manager. Others see me as an unconventional guy and free spirit. It is easy for me to combine knowledge and experience from different areas to create innovative solutions. For me it is an enormous luxury to work in interdisciplinary teams with motivated members. Among many other things I have been working with watches for a long time, developing completely new products and advanced complications.

Patrick Rohner

Digital Nomad, bon vivant, Divemaster (among others) …
Friends call me Pat, well-educated, gentle in mind, but wild at heart. I lived in several countries, grew up multilingual. The scent of the wide world is in my DNA.
Forces of nature are my inspiration – to practice humility towards life.
Being on the road is my home – to understand the world and see the big picture.

Daniel Wechsler

Watch Creator – Watch Collector – World citizen
Half of my live was dedicated to the Swiss Watch industry and luxurious brands, the other half was dedicated to collect unique watches, but the last two years were used to create the Bühlmann Watch – together with my friends Adrian, Thomas and Pat. The result is the essence of the experience of each one in the Cronatec Team.

BÜHLMANN

DIVE WATCHES

WATCH ANGELS

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