

## BEGINNING OF BIOMETEOROLOGY IN ABBAZIA/OPATIJA

### POČETAK BIOMETEOROLOGIJE U OPATIJI

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#### SUMMARY

*In addition to health facilities and many other organizations, there was also a functioning weather station in the health and seaside resort of Abbazia/Opatija, known as the Nice of the Austrian Riviera. Formal observation of weather in Abbazia/Opatija began in 1886 with the setting up of the weather station in Angiolina Park. During the period 1898-1915, the warden of this station and data collector was the local doctor, Dr Franz Tripold. On the basis of the collected data, he wrote the first study of Abbazia/Opatija's climate and its effects on people. The study *Das Klima in Abbazia* was published in 1906 in *Abbazia als Kurort* on the 60th birthday of Professor Julius Glax, head of the health resort in Abbazia/Opatija. The study highlighted the physiological effects of the maritime climate on people and examined the beneficial effects of the local climate on patients. The weather station in Opatija is still operating in Angiolina Park. Weather parameters to be gathered were determined by the First International Meteorological Congress in Vienna in 1873 and are still valid. The parameter of human well-being/bio-meteorological prognosis has been added. Today, the collected data are sent to the National Meteorological and Hydrological Service in Zagreb, from where they are returned to Opatija to be displayed on a screen in the town centre to help people to plan their daily activities and take appropriate measures to protect their health, which is especially important for patients.*

**Key words:** *history of medicine, 19th - 20th century, Abbazia/Opatija, weather observation, biometeorology, Dr Franz Tripold*

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## BEGINNING OF BIOMETEOROLOGY IN ABBAZIA/OPATIJA

Biometeorology is an interdisciplinary science that studies interactions between atmospheric processes and living organisms and is today a well-developed scientific discipline [1]. The International Association of Meteorology publishes the *International Journal of Biometeorology*, devoted to interactions between climate and human health. Franz Tripold (1865-1956), who lived and worked as a physician in Abbazia/Opatija between 1891 and 1947, described the pleasant and beneficial effects of the Abbazia/Opatija climate on general health, as well as the health of patients, based on his own observations and those of his father-in-law, Professor Julius Glax, MD (1846-1921), who also worked as a doctor and head of the health spa in Abbazia/Opatija.

The first attempts to predict weather began in Babylonian times, 4,000 years ago. Aristotle (384-322 BC) also focused on it. He wrote a treatise *Meteorology* and is thus considered the pioneer of meteorology. Modern weather forecasting began during the Renaissance, after the invention of measuring devices capable of accurately registering changes in atmospheric parameters. Collecting data over a wider area began with the invention of the electromagnetic telegraph in 1832, first in the United States of America, then in Europe. These data were used to produce the first weather maps. The first observational stations with measuring instruments were set up at that time [2].

The influence of weather and climate on human activity and welfare has been recognized from ancient times, as early as 650 BC, when the famous Indian physician Susruta recommended people to withdraw to cooler and drier parts of the mountains during the rainy season [3]. In 400 BC, in his book *On Airs, Waters, and Places*, Hippocrates warned physicians of possible complications during surgery at the time of weather changes and elaborated on the major impact of weather, climate and the seasons on human health [4, 5]. The Tower of the Winds in Athens, which shows the influence of major winds on man, was built in 200 BC. Various studies on the impact of weather on people were done in the seventeenth and eighteenth centuries, for example the connection between the emergence of rickets and lack of light, the importance of sweating and evaporation of sweat in hot weather. Biometeorology was developed as a science during the Second World War, when planning needs required intensive study of the impact of different weather and climatic conditions on soldiers and military equipment [3].



Figure 1 Weather station in Angiolina Park in 2011. Photo by Barbara Fischinger.

*Slika 1. Meteorološka postaja u parku Angiolina 2011. Foto Barbara Fischinger*

The development of meteorological organizations dates back to 1851, when the Austro-Hungarian Emperor Franz Joseph approved the establishment of the Central Institute for Meteorological and Magnetic Observations (*KK Centralanstal für meteorologische und für magnetische Beobachtungen*) in Vienna, which was the first national department for weather monitoring. The first director of the Institute was Dr Karl Kreil (1778-1862) [6]. The First International Meteorological Congress was held in Vienna in 1873. Five professors chaired the Congress, which lasted 14 days. The Congress set the parameters for weather observation, as well as hours of observation, designated winds according to the English terminology, agreed on units and the method of calibrating measuring devices and the method of information exchange between countries [7]. Given that some weather stations only had a gauge for measuring rainfall, while others had all the then existing instrumentation, they determined three types of weather stations. First-order weather stations measured meteorological parameters automatically; measurements at second-order stations were done three times a day, while only a few parameters were monitored

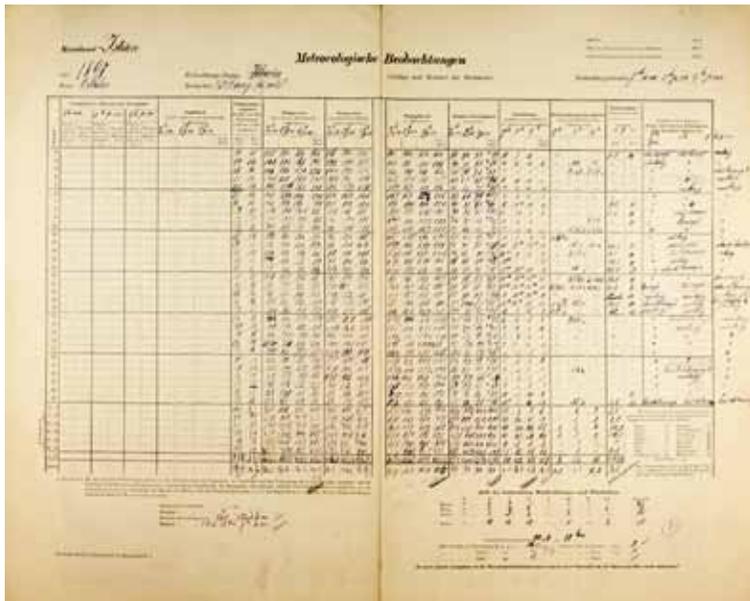


Figure 2 Weather reports for the month of October in Opatija (1898).  
Courtesy of ZAMG, Vienna.

*Slika 2. Meteorološki podaci Opatije (1898.) za mjesec dana. Ljubaznošću  
ZAMG-a, Beč*

at third-order weather stations [6, 8]. Immediately after the congress, the International Meteorological Organization was founded for the purpose of exchanging information that was gathered on weather in the world. It has been called the World Meteorological Organization since 1953 [9].

The first meteorological station in Croatia started operating in 1851 in Dubrovnik, followed by Zagreb in 1853 [8]. A second-order weather station was set up in Abbazia/Opatija in 1885 by the Central Institute for Meteorology and Geodynamic (Zentralanstalt für Meteorologie und Geodynamik - AMG), founded in Vienna in 1851. The proper placement of the wooden weather station, facing north and set in the shade of trees in Angiolina Park, where it still stands today (Fig. 1.), was supervised by Professor Julius Hann (1839-1921), director of the Central Institute for Meteorological and Magnetic Observation. The first formal recording of weather data therefore started in Abbazia/Opatija on 1 May 1885. The station was equipped with measuring devices for air pressure, temperature, humidity, precipitation, and wind (air movement); cloud cover and sea waves were also observed [6, 10]. These measurements actually started five

years prior to the work of Vincenzo Cuomo, an Italian doctor who is considered to be the pioneer of thalassotherapy [11]. Following the agreement reached at the Congress, readings of recorded data were taken three times a day (at 7 a.m., 2 and 9 p.m.) and were done on a voluntary basis. The data were sent daily by telegraph to the Institute in Vienna. This work was first performed for 13 years by Emerich Krainz. In 1898, Dr Franz Tripold took over and performed it until 1915 [6, 10] (Fig. 2). Dr Tripold (Fig. 3) was born in Graz in 1865. He was promoted to the position of medical doctor in 1889. His first job was as an assistant at the Children's Hospital in Graz, then as an aspirant in the First Medical Clinic of the University of Vienna. He came to Abbazia/Opatija in 1891 and opened a medical practice. He started a family and was the son-in-law of Professor Julius Glax, head of the government health resort in Opatija. From 1914 onwards, he had a medical clinic and laboratory in the fire station of Opatija, where he and his family also lived. In 1947, the Tripolds moved to Italy [12, 13].

In addition to his medical practice, Dr Tripold devoted his time to voluntary work, including being a meteorological observer. He wrote two articles based on 20 years of weather observations: *Das Klima in Abbazia* and *Die Heilanzeigen von Abbazia*. They were published in *Abbazia als Kurort*, a booklet printed by *Verlag der Kur-Kommission Abbazia* in 1906. The book was dedicated to the 60<sup>th</sup> birthday of Professor Julius Glax. Dr Tripold was also the first person who, in addition to recognizing the overall beneficial effects of the Abbazia/Opatija climate on health, also explored the favourable impact of various climate parameters on the treatment of specific diseases and conditions [14, 15].

At that time, towns and islands along the Croatian coast, such as Opatija, Lošinj and Brijuni, as well as similar places throughout Europe, were being discovered as extremely beneficial due to the curative properties of their mild climate and sea water. Weather reports in connection with health became more and more important and detailed [16]. In the first chapter of his work, Dr Franz Tripold presented a study of the climate in Abbazia/Opatija. He highlighted the town's very favourable position on the eastern coast of Istria, where the sea reduces temperature fluctuations during the year, and a 1396-meter high mountain range of Učka and the Dinaric massif protected it from the cold northerly winds. The result is a mild climate, also reflected in the lush Mediterranean vegetation.

He subsequently stressed the numerous beneficial effects of climate, sea water and the therapeutic health infrastructure in Abbazia/Opatija. Through organic systems, he presented possible indications for medical



Figure 3 Dr Franz Tripold (1865–1956).

*Slika 3. Dr. Franz Tripold (1865.–1956.)*

conditions in which climatotherapy in Abbazia/Opatija could be useful, relying on his own and the extensive experience of Professor Glax, he described in his second book on balneotherapy. Among metabolic conditions, Tripold highlighted obesity and the potential for weight loss by swimming in the autumn and by hiking in the mountains over the winter. He also discussed the beneficial effects on weight gain when recovering from an operation or in the case of being underweight due to chronic malnutrition. Drinking thermal and sea water had already been identified by Professor Glax as having beneficial effects on diabetes control. In addition, he described the beneficial effects of exercise and fresh, dry air in the winter, early summer and autumn months on reducing blood pressure, especially in diabetics, in whom high blood pressure promotes atherosclerosis even more than in non-diabetics. In his opinion, sunshine and moderate temperatures at the coast in the winter and in the mountains in the summer have proved to be beneficial in patients with chlorosis (green sickness), now known as hypochromic anaemia or anaemia due to iron deficiency. Exercise and warm baths were used to treat pernicious anaemia. After visiting Abbazia/Opatija patients with leukaemia were expected to improve their physical ability. Staying at seaside resorts was supposed to be beneficial for patients with lymph node tuberculosis, acute in the autumn or chronic in the summer. Clean and moist air in the autumn and spring months had a positive effect on chronic catarrhal inflammation of the respiratory tract and ears. Constant mild wind, abundance of trees and absence of pasture seem to have helped to reduce the number of attacks in patients with hay fever. These guests could choose rooms that were not

surrounded by lush vegetation. Moreover, Tripold describes the newly discovered method of serum immunotherapy. Tripold also observed a favourable effect on patients with asthma, especially in May, June and September, due to clean air, small fluctuations in temperature and humidity, medium-high average humidity, and the lack of wind. Depending on their own comfort, patients could choose either to stay at the sea shore or at higher elevations in the mountains. Patients with chronic tuberculosis who stayed in Abbazia/Opatija throughout the year had increased appetite and gained weight. Therapeutic benefit was also observed in patients recovering from pleural inflammation and pneumonia. High air pressure, small fluctuations in temperature and humidity, and relatively high humidity during the south wind were expected to expand peripheral blood vessels and increase diuresis, which helped patients with organic heart disease. Patients with organic heart disease also received a special diet and physical therapy. Unlike patients with organic heart conditions, however, patients with neurotic heart disease poorly tolerated periods when the south wind was blowing (autumn months). Staying in the seaside resort was also beneficial for people with neurotic digestive problems, such as dyspepsia and constipation. The south wind and high outdoor temperatures were also poorly tolerated by most people with neurasthenia, a psycho-pathological disease manifested by chronic fatigue, anxiety, headaches, neuralgia, and depression. Several doctors had observed the beneficial effects of half-hour exposures to strong summer sunlight, followed by a refreshing sea bathe. The healing effect of the environment in Abbazia/Opatija in moderately warm months resulted in an increase in body weight in patients with Basedow's disease. Warm baths in sea water and accommodation at the spa in warm autumn months had a healing effect on patients with neuritis, *tabes dorsalis*, chronic myelitis, and muscle cramps. Clean air and sunlight also contributed to the treatment of children with rickets and people with bone tuberculosis. Staying by the sea in the hot summer months was therapeutic in chronic kidney disease patients, since perspiration relieved the diseased kidneys. Dr Tripold also pointed out that it was useful for such patients to move to warmer southern regions, as far as Egypt, before the first autumn north wind. The health of people with inflammation of the eyes or ocular infection with tuberculosis or syphilis improved significantly during their stay on the Adriatic coast [15].

Dr Franz Tripold did not neglect the beneficial physiological effects of climate and its favourable impact on overall health. In his opinion, the climate in Abbazia/Opatija slowed down the heart rate, strengthened the

heart, decreased the respiratory rate and deepened breathing. It could also increase sweating and diuresis, stimulate the metabolism and appetite and help increase body weight, and be either soothing or stimulating to the nervous system, depending whether the weather was predominantly dry or wet. [15].

New discoveries in the field of zoonotic diseases in the 19<sup>th</sup> century somewhat reduced interest in weather conditions that affect human health. However, due to the development of spa tourism, the need arose to develop medical meteorology [17]. The building of the Southern Railway (Vienna-Trieste-Rijeka) enabled the discovery of Abbazia/Opatija and its surroundings, which became a seaside spa and health resort, which it was officially proclaimed in 1889 [18]. During the time of the Austro-Hungarian Empire, as Dr Tripold said, physicians recommended a stay in Abbazia/Opatija for patients with various conditions [15]. The tradition of health tourism in Abbazia/Opatija continues today, especially for patients with cardiopulmonary and rheumatic diseases. The Abbazia/Opatija riviera is also suitable for rehabilitation of patients and a general strengthening of health [19].

Weather observation still continues in Abbazia/Opatija. The weather station is still located in the same place in Angiolina Park. The same parameters and methodology in terms of measuring intervals defined by the First International Meteorological Congress are still applied, to which the parameter of human well-being/biometeorological prognosis was added in 2004. Instead of Vienna (as in the early days), collected data are nowadays automatically sent to the National Meteorological and Hydrological Institute (DHMZ) in Zagreb. From there, the information is returned to Opatija to be displayed on the screen in the city centre (Fig. 4) [20] to help people plan their daily activities and take appropriate measures to protect their health, which is especially important for patients.

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## SAŽETAK

Na austrijskoj rivijeri, morskom kupalištu i lječilištu Abbazia/Opatija, nazvanoj austrijska Nizza, djelovala je, uz zdravstvene ustanove i mnogobrojna udruženja, i meteorološka postaja. Njezinim je djelovanjem u parku Angiolina 1886. počelo i službeno meteorološko promatranje u Opatiji.

U razdoblju od 1898. do 1915. skrbnik meteorološke postaje i zapisničar meteoroloških podataka bio je opatijski liječnik dr. Franz Tripold koji je na osnovi prikupljenih podataka napisao prvu studiju o opatijskoj klimi i njezinu utjecaju na čovjeka. Ta je studija, *Das Klima in Abbazia*, bila objavljena u knjizi *Abbazia als Kurort*, izdanoj prigodom 60. obljetnice rođenja ravnatelja lječilišta prof. dr. Juliusa Glaxa. U studiji je dr. Tripold upozorio na fiziološko djelovanje morske klime na ljudski organizam i naveo da je svojim proučavanjem opatijske klime utvrdio njezin blagotvoran utjecaj na bolesnike. Meteorološka postaja u parku Angiolina djeluje i danas. Očitavanju meteoroloških podataka, koji su bili određeni na Prvome internacionalnome meteorološkom kongresu u Beču 1873., dodan je i podatak o osjetu ugone. Meteorološki parametri očitavaju se u isto vrijeme kao 1873. godine. Prikupljeni meteorološki podaci šalju se iz Opatije u Državni hidrometeorološki zavod u Zagreb koji obrađene podatke, zajedno s dodanim zdravstvenim komentarom, objavljuje na screenu – meteorološkom panou u Opatiji. Na osnovi tih podataka ljudi mogu planirati svoju djelatnost i poduzimati mjere za zaštitu zdravlja, što je posebno važno za bolesnike.

**Ključne riječi:** povijest medicine, XIX.–XX. stoljeće, meteorološka promatranja, biometeorologija, dr. Franz Tripold, Abbazia/Opatija

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