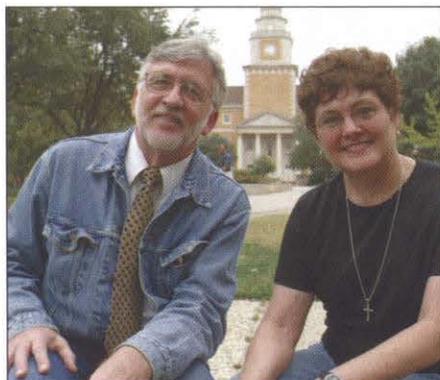


Rediscovery of the Elements

Jáchymov (Joachimsthal), Czech Republic

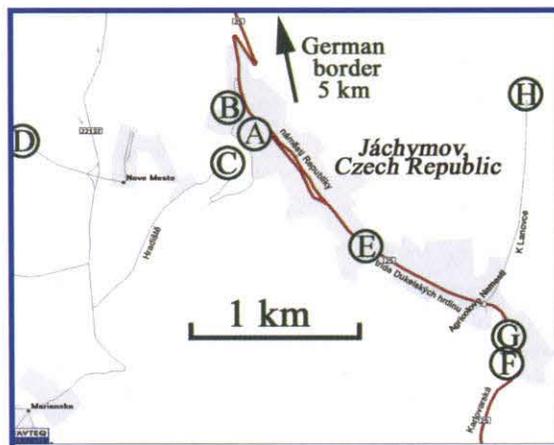


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The history of Jáchymov. Between Germany and the Czech Republic lie the Ore Mountains, known on the western side (historic Saxony) as “Erzgebirge” and on the eastern side (historic Bohemia) as “Krušné hory.” The village of Jáchymov rests in a valley nestled on the Bohemian slopes of this mountain range, about 100 kilometers west of Prague. With the discovery of silver and gold in the second millennium A.D., there was a population shift from the countryside to the towns, with a simultaneous migration of German expertise population from the west, and German became de facto the principal language of the cities and the ruling class.¹

Before the silver boom the Krušné hory was richly forested, but the climate was harsh and the growing season was short, and there were few settlements. With the development of mines in the 13th century, a number of boom towns sprang up on both sides of the mountain range, the primary ones being Joachimsthal (the original name of Jáchymov) on the east side and Freiberg² on the west side. When silver was found in the valley in 1512—the first discovery being in the very center of present Jáchymov—Stefan Schlick, an ambitious

Figure 1. Map of Jáchymov, Czech Republic, which is 5 km south of the Czech-Germany border. (A) Church courtyard, includes the Joachim Church, City Hall, and Mint, 50° 22.78, E 12° 54.82; (B) Svornost Mine, N 50° 22.35, E 12° 54.70; (C) Stefan Schlick Castle, N 50° 22.16, E 12° 54.65; (D) Rownost Mine, N 50° 22.24, E 12° 53.59; (E) Schlick Memorial, N 50° 21.89, E 12° 55.36; (F) Radium Palace, N 50° 21.51, E 12° 56.09; (G) Curie Memorial, N 50° 21.58, E 12° 56.11; (H) Bratrství Mine, N 50° 22.40, E 12° 56.18.



landowner, founded a settlement here named “Thal” (valley). In a lavish ceremony Schlick renamed the village “Thal des heiligen Joachims” (valley of the holy Joachim), later shortened to Joachimsthal.¹ During the period 1516–1577 the profits were incredibly high, reaching 30 percent. Extremely rich ores containing up to 60 percent silver were processed by hand, and frequently large pieces of native (pure) silver were uncovered.

Major reasons why mining production was so lucrative included newly developed mechanization and ore processing, as well as efficient water pumping which avoided disastrous flooding.⁴ These methods were described in a previous *HEXAGON* article on Agricola,⁵ who wrote a sophisticated treatise on mining.⁶ Agricola was a city physician at Joachimsthal during the period 1527–1530, during the boom years of Schlick. It was here that Agricola wrote *Bermannus*⁷ where elements beyond the ancients’ seven were documented for the first time—viz., Bi, Sb, Zn were recognized, in addition to Au, Ag, Cu, Fe, Sn, Hg, Pb.

Because gold coins were in short supply in European commerce, the timing of these silver discoveries was propitious. Schlick was almost immediately minting coins in his own basement, later in a formal mint building beside the St. Joachim Church. These “Joachimthalers”—soon contracted to “Thalers”—were recognized

and accepted everywhere in Europe. The name “dollar” is derived from “Thaler.” By the middle of the 16th century, silver was playing out in Joachimsthal. In its place bismuth, cobalt, lead, and arsenic mining became important, extending into the late 19th century.

Klaproth discovered uranium in 1789 in minerals from Johanngeorgenstadt⁸ (15 kilometers northwest, on the German side of Erzgebirge). The common ore of uranium (uraninite, uranium oxide) had been discarded and piled up in dumps—this refuse by-product of silver mining had impeded efficient silver mining, and the miners had given it the name “Pech-blende” (“Bad luck-mineral”), evolving to the modern name “pitchblende.” But in the middle 18th century, uranium had become an important mining product. In 1847 yellow uranium coloring was proposed as a profitable enterprise for glassware and porcelain,³ and a silver processing factory in Joachimsthal was converted to uranium coloring production. The new plant was called “The Imperial and Royal Factory for production of uranium yellow color” (in German, “Urangelbfabrik” = uranium yellow factory).³

Radioactivity was discovered by Becquerel in 1896 in Paris.⁹ The Curies in Paris ordered for study 10 tons of processed material in the Urangelbfabrik—discarded processed ore from which uranium had already been extracted, sit-



Figure 2. Entering Jáchymov, this town sign greets the traveler, reminding one of the important role played by this village in the history of the atom and radioactive elements. From the uranium ore produced in the nearby mines, the Curies in Paris discovered radium and polonium, and their colleague Debierne discovered actinium.

ting behind the factory, a refuse pile mixed with dirt, leaves, and twigs. From this material in 1898 the Curies discovered radium and polonium.⁶ The Urangelbfabrik then developed a section for radium production and held a monopoly for radium during 1909–1913, until Buchler & Co. in Braunschweig, Germany, became the predominant producer. Finally, in 1938 the old Urangelbfabrik was beyond modernization, and by 1941 the building was taken down and the site cleared. In its place now stands a memorial dedicated to the Curies (see Fig 12).

After World War II, there was a total emigration of Germans from Joachimsthal and the village was named Jáchymov, the Czech derivation of Joachim. Uranium mining continued until 1964, with slave labor camps set up principally at Svornost, Rovnost, and Bratrství mines. In memory of these camps, a special museum exhibit has been set up in the old mint building (Note 1).

Directly across from the old Urangelbfabrik site was built in 1912 the sumptuous Radium Palace, which still stands. Water is pumped down from the old Svornost Mine which is used for therapeutic baths in the basement of the Radium Palace, and which is advertised



Figure 3. (Left) The church of St. Joachim, built 1534–1540. Behind the church (not in view) is the Svornost Mine, which figured prominently in the history of silver, uranium, and radium. (Right) The statue of St. Joachim, the patron saint of the city and of the mines, standing in front of the church. St. Joachim was the husband of St. Anne and the father of Mary, mother of Jesus.



Figure 4. The Svornost Mine. Silver ore was mined from here by Count Stefan Schlick. Since the mid-19th century, ore here was used to produce special colors for decorating glass and porcelain. After the discovery of radioactivity and the isolation of radium ore from Jáchymov by the Curies, the mine became a supplier of raw materials to factories for the production of radium. After 1964 the mine shafts closed down, but the radioactive water has continuously been pumped to the Radium Palace curative baths.

unabashedly as the “first radon spa in the world.”

Rediscovering Jáchymov. The small village of Jáchymov is not accessible by train, but can be conveniently reached by good roads. The highway from Chemnitz, Germany (final home of Agricola³) runs 50 kilometers south to the

Czech border at the crest of Erzgebirge, and then descends into the narrow valley of Jáchymov, another 5 kilometers (Fig 1). As travelers enter the town, signposts remind them of the Jáchymov’s contribution to the chemistry of radioactive elements (Fig 2). Jáchymov is essentially a “one-street” town, and one can see vir-



Figure 5. Information sign, in Czech: "Mine Svornost. One of the oldest mines in Jáchymov. The name 'Svornost' ('Unity') was given in 1530 in commemoration of a dispute between two clans. Since the discovery of silver in 1516 other metals have been mined including nickel, cobalt, arsenic, bismuth, radium, uranium, etc. The mine is now under the administration of the Spa Jáchymov [company], which benefits from the radioactive water."



Figure 6. (Left) Schlick mansion, on a hillside overlooking the Svornost Mine 300 meters to the north. If one continues on the road 3 kilometers further, one reaches the Roonost Mine (see Fig 1). (Right) The Schlick Memorial, halfway between the St. Joachim Church and the Radium Palace. The memorial, erected in 1924, is inscribed in German: "The Great Benefactor Count Stefan Schlick. In gratitude. Dedicated by the city." By 1534 Joachimsthal had become the second largest city in Bohemia (Prague was the largest). Agricola was city physician in Joachimsthal during the prosperous years (1527–1530).⁴ There is no monument dedicated to Agricola in Joachimsthal, even though he figured significantly in the development of its mining technology.

tually the whole town by driving along its 3-kilometer road sloping down to the famous Radium Palace.

The first notable site as one drives south through the village is the Joachimsthal church itself with the statue of St. Joachim in front (Fig 3). Today the church sign identifies the temple as "Chrám Sv. Jáchyma," not "Kirche St. Joachim" as it was called prior to mid-20th century. Above the church, 100 meters away up the hillside, is the historic Svornost Mine (Fig 4). Tourist signs give a brief history of the mine (Fig 5).

A kilometer winding side road leads up from the Svornost Mine to the old Schlick mansion (Fig 6). Next to the mansion is a sign (in Czech) explaining the history of the home: "Here are the remnants of the Freudenstein Castle built in 1517 by Count Stefan Schlick. Since 1519, in its cellars, the famous Jáchymov silver coin mint operated, producing Thalers with purity of 0.931. Because of their quality, the coins were accepted virtually everywhere and thus became the model, also for the name of U.S. dollars. In the years 1520–1528, the mint production was 3 million Thalers..." A memorial to Schlick was erected in 1924 in the Jáchymov city park, about a kilometer east of the Schlick mansion and on the main street of town (Fig 6).

Across from the St. Joachim Church are the City Hall and the Mint (Fig 7). The City Hall offers much information regarding the history of Joachimsthal, and many old photographs therein give a good image of the layout of the



Figure 7. The mint (right) was constructed in 1536. It now houses a special exhibit on the atrocities of post-WWII slave labor camps. In the City Hall (left) is an interesting display on the history of Joachimsthal (see Figures 8 and 9).

city and industrial activity a century ago (Figs 8 and 9).

About 2 kilometers south of the City Hall, past the Schlick memorial, is the elegant Radium Palace, lavish in its furnishings throughout its huge dining and meeting halls. According to tradition, the healing effects of the Svornost Mine waters were well known to the 19th-century miners. In 1906 a local baker began to use this mine water, fetched in wood-

en buckets from the mine, to fill tubs built in his bakery, where laborers would soak and soothe their sore muscles. The fame of the Joachimsthal baths attracted the sick and the rich from afar, and a decision was made to build a huge spa hotel—right across the street from the Urangelbafabrik (Fig 10). Today authentic radon baths are found in the basement of the Hotel for ailing patients (Fig 11). Also prescribed in the regimen for the afflicted are gym-

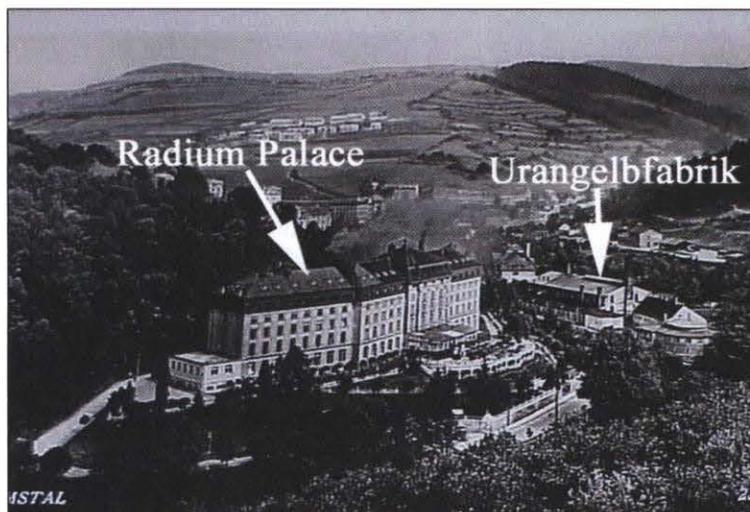


Figure 8. Among the exhibits in the City Hall, this 1915 photograph was taken shortly after the construction of the Radium Palace (left and foreground). The famous Urangelbfabrik—which figured prominently in the production of uranium yellow and later of radium—was directly across a brook from the Radium Palace. The view is northward. The St. Joachim Church, City Hall, and Mint are 2 kilometers north, behind the hill to the left and out of view. The Urangelbfabrik no longer exists; on its site now stands the Curie Memorial (see Fig 12). (Labels and arrows inserted by authors.)

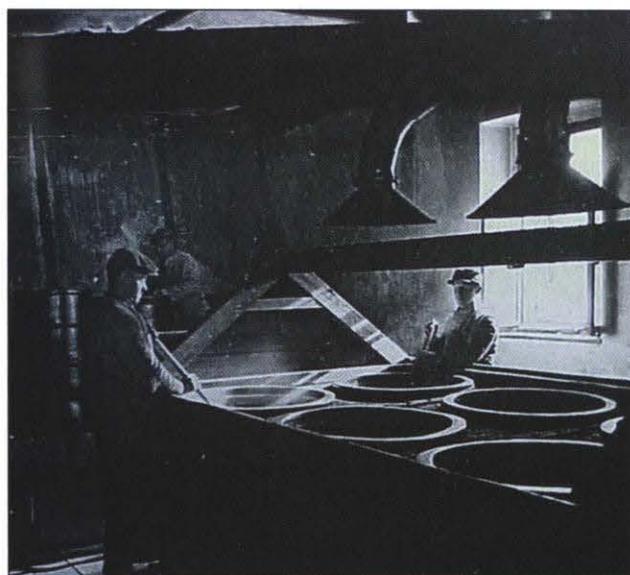


Figure 9. This photograph was taken inside the Urangelbfabrik where tons of uranium ore were processed to create nine different shades of uranium colors for the porcelain and glass trade, ranging from light greenish-yellow to deep orange. Yellow Bohemian glasses were the rage in Great Britain at the time. Health conditions for workers in the factory were atrocious.



Figure 10. Radium Palace. The first radioactive spa was established in Joachimsthal in 1906. With funding from a company in Vienna, the Radium Palace was built in 1912. Thousands of political dignitaries and wealthy industrialists visited the hotel and guaranteed the success of the local business. Today the Radium Palace has been joined by a score of other imitators in Jáchymov who have built Kurzentrum (health centers) in the mountain valley.

nastic exercises in the swimming pool, acupuncture, electrotherapy, laser therapy, and massive vitamin treatments. If this regimen is not sufficiently effective, "brachyradiumtherapy," by use of so-called "Jáchymov boxes," is available for direct exposure to radium—a

treatment proudly advertised as unchanged since 1910.

Across from the Radium Palace—on the same site as the Urangelbfabrik which was taken down in 1941—is the Curie Park, with the Marie Curie Memorial (Fig 12). The memo-

rial inscription underscores the beneficial aspects of radioactive elements discovered in ores taken from Jáchymov—in particular the researches of the Curies in Paris and the healthful effects of radium that they pioneered. With the attention of Jáchymov concentrated on the peaceful aspects of radioactive elements, it is perhaps not surprising that there is no mention of the uranium ore shipped from Jáchymov to the Kaiser Wilhelm Institute in Berlin where the splitting of the atom was discovered in 1938, ushering in the atomic age with realization of nuclear weapons (Note 2). In future articles we will describe the work in Paris and in Berlin on the Joachimsthal ores.

Postscript: The Revigator. Bohemia had no monopoly on radon water. Hundreds of thousands of the "Wonderful Radium Ore Revigator" (Fig 13) were sold in the United States during the 1920s and 1930s as a source of medicinal beverage. If one could not travel to the radioactive springs of Hot Springs, Arkansas, one could depend upon the Revigator to provide the radon water in situ. The proud owner of a Revigator (pronounced "re-vig'-a-tor" with a short "i") would store tap water in the crock-pot overnight whereupon 1-100 microcuries of radon concentration would develop. "The wonderful healing gas [radon]... disintegrates or destroys itself; in four days, half of it will be lost." (The half life of radon-222, the

(Continued on page 75)



Figure 12. The Curie Memorial is in the exact spot as the Urangelbfabrik taken down in 1941. The inscription in Czech: "In ores from this location in the year 1898, Marie Curie Sklodowska and Pierre Curie discovered the element radium so it could seroe mankind: thanks to mining and science, radium rays and medicine have brought health to hundreds of thousands of people."

Rediscovery of the Elements *continued from page 71.*

decay product of radium-226, is indeed 3.8 days.)

Acknowledgments.

Much information regarding Jáchymov was gained from Josef Vajdak, owner of Pequa Rare Minerals of Massapequa, NY, who has supplied many minerals to the authors' elemental collection and whose many professional contacts of denizens of Jáchymov have led to a wealth of lore from that historic city.

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Notes.

Note 1. Svornost, Rovnost, and Bratrství translate as "Unity," "Equality," and "Brotherhood," respectively. None of these major mines are operative today, except for Svornost which furnishes radon water for the Radium Palace. At Rovnost, a sign details the activities of the slave labor camps during the 1950s; brick housing compounds still exist and remind one of its shameful past. Prior to mid-20th century, Svornost and Rovnost were known by the German names "Einigkeit" and "Werner."

Note 2. Otto Hahn, Lise Meitner, and Fritz Strassman are recognized as discoverers of the splitting of the atom ("Kernspaltung") at the Kaiser Wilhelm Institut für Chemie in Dahlem, Berlin, in December 1938, although Lise Meitner had just fled the Nazi purges to Sweden. Hahn and Meitner co-discovered protactinium in the same institute in 1917.

Figure 13. This revigator—a two-gallon crockpot lined with black radium ore—resides in the personal element collection of the authors. On the back of the pot are printed instructions to "drink six glasses of radon water daily." This model was constructed about 1925. The radioactivity of water taken from the Revigator was guaranteed to "increase the eliminative forces of the body... driving out poisons that may have accumulated."

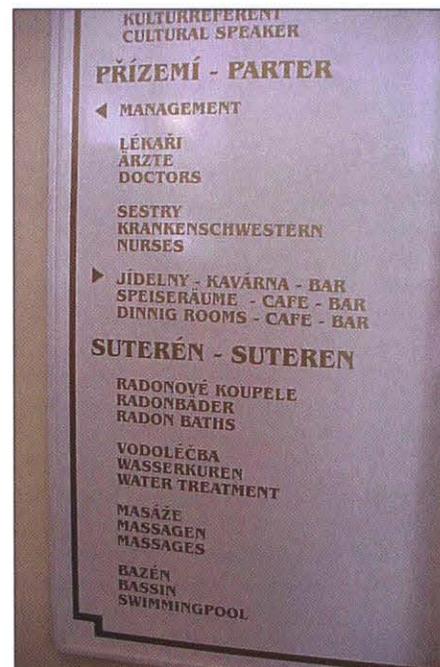


Figure 11. Radon baths: they mean it! In the "Suterén" (Czech word for basement) are the radon baths, water sprays (hydrotherapy), a swimming pool, and massages. The management boasts an activity of 5.5–7.5 kBq/liter (approaching that of the americium emission in a household smoke detector). The treatment in the radon baths lasts three weeks, with 20-minute duration each day. The accompanying brochure assures us that any fears the patient may have are allayed by the fully air-conditioned facilities, which prevent "any side effects of the radon fission products."

