

# 111 Years of Radiology in the Heart of Europe: Czech Radiology 1896–2007

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In memory of Antonin Hlava (1931–2007), Herodotus of Czech radiology.

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The first radiograph ever to be printed in the Czech press was an X-ray of a finger wearing a ring, a rather popular theme at that time, in the January 1896 issue of the *Živa*; the image had been obtained by Professor Karel Domalíp of the Czech University of Technology with an instrument he had designed and built [1]. The territorial units preceding the establishment of the Czech Republic, the historical Lands of the Czech Crown—the Bohemian Kingdom and the Moravian Margravate—were, at the time of Roentgen's highly celebrated discovery, part of the Habsburg Empire. Many Czech physicians of that time worked in long-term positions not only at the Imperial-Royal Charles University in Prague, but also at the University of Vienna. Czech academics also maintained active contacts with academics at institutes in nearby Germany. It comes, therefore, as no surprise that the first written record in the Czech specialized medical press, dated February 8, 1896, is the announcement of a lecture to be held by Professor Čeněk Strouhal on “Roentgen's Experiments,” printed in the *Casopis lékařů českých*—that is, the *Journal of Czech Physicians*.

## The Seeds

On February 17, 1896, Professor Strouhal (1850–1922) held his first lecture for the medical community in which he gave a practical demonstration of Roentgen's discovery; in front of an audience, he produced X-rays of various objects and animals (Fig. 1) and of a specimen of a hand in which needles had been stuck, and he demonstrated how an X-ray is obtained by imaging the right hand of a 21-year-old woman with posttraumatic pseudoarthrosis. The first experiments with X-rays were performed by this enthusiastic propagator of experimental physics, according to the records of his assistant Vladimír

Novák, after Christmas of 1895, although it was only on December 28, 1895 [1, 2], that Roentgen handed over the manuscript of his lecture “Ueber die neue Art von Strahlen”; the first press report was not published until January 5, 1896, in the Viennese daily *Die Presse*. Strouhal's interest in Roentgen's discovery was undoubtedly influenced by the years he had spent as a young scientist in Wuerzburg, Germany, where he earned his degree in 1878.

## Roots

Over the course of the year 1896, experiments with Roentgen rays were handed to physicians from physicists and chemists. In 1897, experiments by Jedlička and Chalupecký were performed to locate foreign bodies in the eyeballs of several patients. In a public lecture in January 1896, Professor Domalíp demonstrated, among other things, an X-ray of an enucleated eyeball with a foreign body, and the report published on this experiment in the *Bulletin* is apparently the first-ever account in the world of an intraocular foreign body imaged using X-rays [1].

Starting in 1897, intensive experiments with the medical use of images obtained with Roentgen rays aroused the interest of Professor Rudolf Jedlička, dubbed “the father of Czech radiology,” who, at that time, was still working as an assistant to Maydl at the Department of Surgery of the Charles University in Prague. It was Jedlička, with his immense diligence and energy, who created radiology as a self-reliant specialty. In addition to his many clinical successes obtained with the use of radiologic diagnostics, one has to mention two circumstances: first, Jedlička obtained one of the first X-ray films of calcified arteries ever to be published; and, second, he had a rather tragic vision of the negative effects of X-rays. Jedlička soon became the victim of his

untiring experiments and recognized as early as 1899 the nature of the dermatitis affecting radiologic diagnosticians [3].

Jedlička discussed the negative effects of X-rays with Zuppinger in Zurich and with Contremoulin in Paris. In the same year, 1899, the then 30-year-old Jedlička published the first textbook about the use of Roentgen rays titled *On Skiagraphy and Skiascopy with Roentgen Rays and Their Diagnostic Value in Surgery* (Fig. 2). Over the first 10 years since Roentgen's discovery, much like elsewhere in the world, imaging with Roentgen rays spread to other medical specialties. Experiments concerned with the therapeutic use of X-rays were published as well.

A turning year in the development of Czech radiology was 1918, related not only to the fact that the Czech state had regained its sovereignty after 300 years, but also to a surge in activities aiming to emancipate radiology as a specialty, which was not, unlike in Germany, an independent medical field in the Austro-Hungarian Empire of that time. Professor Jedlička became the founder of medical radiologic diagnostics in Bohemia, and when the independent Czechoslovak Republic came into being, he was appointed the first professor of radiology. He helped to establish the Radiological Society in 1924 and organized the first Czechoslovak Radiological Congress in 1926 to mark the 30th anniversary of Roentgen's discovery.

The Czech community of radiologists came into being relatively slowly, and the excellent experts in radiologic diagnostics were first, most notably internists and surgeons. Interesting results were obtained by Prusfk and Vorlicer, who performed arteriography in patients with acute lower extremity ischemia [4]. They injected their patients with iodized oil via percutaneous punctures and established in 1928 that the diagnostic quality of the investigation was excellent, but they were surprised that none of their patients was ready to undergo the investigation again.

Over the period of the free First Czechoslovak Republic, a new generation of physicians gradually started their professional careers as specialists in radiology. Among these, Slavoj Věsín, an untiring promoter of contrast-enhanced gastrointestinal radiologic diagnostics, later became famous for several preeminent observations, such as a case of carcinoma of the appendix in the 1930s. In 1939, the promising development of Czech radiologic diagnostics was crushed by the tanks of Nazi Germany.

### Ripening

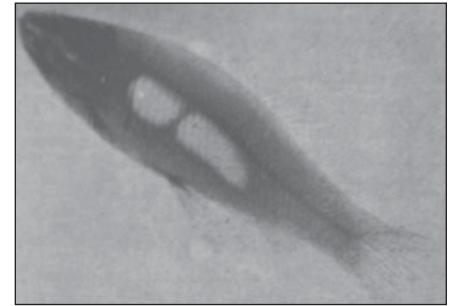
The freedom brought to us by the Allied armies in 1945 was followed, in addition to the establishment of new medical universities in Plzen, Hradec Králové, and Olomouc, by further expansion of the conception of central radiology departments. The academic institutes of universities remain places where radiologic diagnostics are cultivated with enthusiasm. The year 1946 saw the publication of the first issues of the Czech Radiological Society's specialist journal—*Czechoslovak Radiology*, which has been published continually to the present.

Czech radiology in the 1940s and 1950s was lucky to have enthusiastic pioneers of invasive diagnostics. Two of the most interesting personalities met in the Central Military Hospital in Prague and later became the most important innovators in Czech radiology. In the 1950s, Josef Röscher and Jiří Bret worked in the field of angiography diagnostics of the abdominal organs, where they achieved remarkable success [5, 6]. The second occupation of Czechoslovakia in 1968 divided these two colleagues for many years. Röscher, who initiated the legendary visit of Charles Dotter to Czechoslovakia in 1963 at the Czechoslovak Congress of Radiology in Karlovy Vary, left for Portland, OR, in 1967. In Portland, he became a colleague of Dotter, continued his work in interventional abdominal radiologic diagnostics, and described an experimental percutaneous method of connecting the inferior vena cava and the portal vein via the liver parenchyma—that is, transjugular intrahepatic portosystemic shunt (TIPS)—in 1969. The impact of the Congress in Karlovy Vary, organized by Röscher, on Czech radiology was exceptional, and as early as the late 1960s, recanalization of the limb arteries using the Dotter procedure was performed in Prague, Pilsen, and Hradec Králové.

Bret embarked on the path of interventional neuroradiology, applied himself to the treatment of arteriovenous malformations with embolization, and was the first to discover and perform an original method to treat hydrocephalus. The results of the treatment of hydrocephalus with catheterization of the aqueduct of Sylvius in more than 500 patients, published in 1981, bear witness to his untiring work.

For the second time and again with the force of tanks, this time from the Soviet Union, a gradual decline of the material equipment of Czech radiology started just as a new era of imaging methods was emerging. Despite this decline, the first CT unit was installed at the Department of Radiology of

University Hospital Hradec Králové in 1978, but this was different from the installation of the first MRI unit; Czech radiology had to wait for it until the latter half of the 1980s.



**Fig. 1**—X-ray of tench (*Tinca tinca*), a cyprinid fish, was presented during first public lecture in Prague held on February 17, 1896, by Professor Strouhal. (Courtesy of Antonin Hlava)



**Fig. 2**—X-ray obtained by Rudolf Jedlička shows needle in soft tissue of forearm. Needle was localized and removed under fluoroscopy guidance. Image was first published in 1899. (Courtesy of Antonin Hlava)

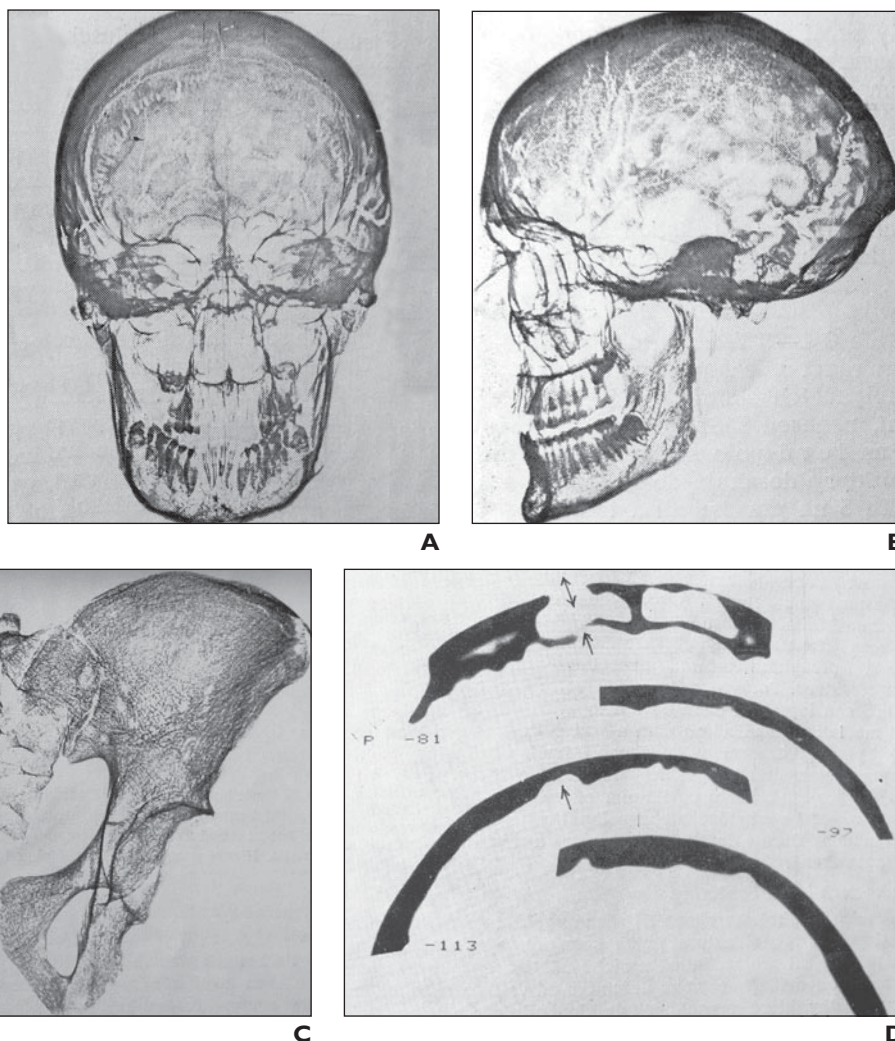
The fact that Czech radiologists did not become completely disconnected from and fall behind their colleagues from the West in the 1980s is due to their considerable inventiveness with which they dealt with the most basic problems of material equipment. Personal involvement was the weapon used to compensate for the country's lagging behind due to the socialist system, most notably in the centers of interventional radiology in the Institute of Clinical and Experimental Medicine in Prague and the Department of Radiology University Hospital Hradec Králové. Many other workplaces, however, had to work on pieces of equipment from the 1960s: For example in Pilsen—the largest Czech town freed by the U.S. Army—the Iron Curtain was tightened so closely that the first CT unit was not installed until 1985.

Even in times as difficult as the 1980s, one can find isolated examples of creative work. One rather interesting story is a "crime story." In 1984, the Office of the Czech President decided to remove the remains of King Ladislav Pohrobek (Ladislav the Posthumous) from the tomb of the Czech kings. King Ladislav was the last direct descendant of the famous royal dynasty of Luxembourg and the great-grandson of the greatest of the Czech kings, Holy Roman Emperor Charles IV. The death of this 17-year-old youth came rather unexpectedly amid pain and fever; he died on November 23, 1457, when immense preparations were being made for his glorious marriage to a French princess. His death was the source of speculation and passion for centuries. The king was reportedly poisoned by the then regent and subsequently Czech

King Jiří z Poděbrad (George of Poděbrady). The great Czech King George was a famous cult figure of Czech patriots for long centuries, but a shadow of doubt persisted regarding the death of his predecessor.

The exhumed remains of King Ladislav the Posthumous were reverently studied by the Czech anthropologist Professor Emanuel Vlček. The radiographs of the skeleton and CT scans of the neurocranium, obtained by Professor Josef Brůna, showed multiple osteolytic defects that were unequivocally interpreted as the aftereffects of acute hemoblastosis of a type of acute lymphatic leukemia [7] (Fig. 3). Signs of dissemination of the leukemia were determined to have been the immediate cause of death, and Czech King George was cleared of the suspicion of regicide after more than 500 years.

**Fig. 3**—500-year-old mystery solved using radiologic images. (Reprinted with permission from [7])  
**A–D**, X-rays of skull (**A** and **B**) and pelvis (**C**) and CT scan of neurocranium (**D**) obtained during investigation of skeletal remnants of the Czech King Ladislav aided in discriminating the true cause of his death—acute leukemia. Regicide was excluded on the basis of these imaging findings.





## The Harvest

The Velvet Revolution of November 1989 opened a new chapter in Czech radiology. Gradually, it became possible for Czech radiologists to renew contacts with academics at centers abroad and to establish new contacts. The material equipment at workplaces began to improve as well, and the centers were equipped with state-of-the-art systems. After the “Velvet Divorce” of Czechoslovakia in 1994, Czech radiology developed independently of its sister society in Slovakia.

The acquisition of equipment that was already in most radiology workplaces made it possible for Czech radiologists to pursue current issues in the specialty. The most important centers in the Czech Republic are the following: in Prague, the Institute of Clinical and Experimental Medicine (IKEM), which concentrates on interventional radiology and experimental work with MRI; and Homolka Hospital and the Central Military Hospital, which focus on neuroradiology. Centers located outside Prague include a center in Hradec Králové, focusing on interventional radiology and prenatal MRI; and a center in Plzen, developing noninvasive cardiovascular diagnostics and new methods of gastrointestinal and oncologic diagnostics. In Moravia, the excellent center in Brno is active in diagnostics and treatment of conditions affecting the liver and biliary pathways, and a center in Olomouc pursues endovascular treatment of the aorta.

Important activities of Czech interventional radiology include the establishment of centers developing endovascular treatments of the aorta. The process of centralization has also been completed in the field of therapy of cerebral aneurysms, arteriovenous shunts, and stenoses of the carotid arteries. Workplaces that are active in oncologic centers, in addition, perform radiofrequency procedures not only in the liver, vertebral column, and skeleton, but also in pulmonary tumors. Similar to all European countries, the Czech Republic is paying attention to the diagnostics and monitoring of oncologic therapy.

The fact that the Czech population belongs among the populations with the highest incidence of colorectal cancer, renal cell cancer, breast cancer, and head and neck tumors is matched by rather developed oncologic diagnostics. The mammographic screening that is currently in process has resulted in higher detection rates of curable stages of the disease. Radiology workplaces are paying considerable attention to whole-body imaging of malignant tumors, whether with hybrid PET/CT or with MRI. Centers equipped with PET/CT and with MRI are located in Prague, Plzen, and Olomouc.

A characteristic feature of the populations of Central and Eastern Europe is a high incidence of coronary artery disease and stroke. Noninvasive diagnostics of cardiac conditions with CT angiography of the coronary arteries has been performed since 2002 in two institutes in Plzen and at IKEM in Prague. Since 2007, it has been possible to perform coronary CT angiography in 10 centers. Two workplaces, the University Hospital in Plzen and the University Hospital in Prague-Motol, have installed CT units with two radiation sources. In addition to the diagnostics of cardiac diseases, these workplaces conduct dual-energy radiation imaging.

A rather active subpopulation of Czech radiologists are those in the section of MRI; each year, two meetings are held for specialists from throughout the Czech Republic. The Czech Republic has now installed 18 MR scanners, two of which operate at 3-T intensity. Experimental work in the field of MRI is performed at IKEM in Prague, also using its equipment for animal studies. Czech radiologists participate in preclinical and clinical trials of new contrast media, organ- and molecule-specific, and test the possibilities of hybrid molecular imaging. Another area of interest that has developed especially in a center in Hradec Králové, but also in centers in Prague, Olomouc, Plzen, and Brno and at other centers, is prenatal imaging.

The activities of the Czech Radiological Society include the traditional biennial Czech Congress of Radiology and more specialized actions such as those dedicated to interventional radiology (e.g., Czech Society of Interventional Radiology [CSIR], percutaneous transluminal angioplasty [PTA] courses), biennial Czech Neuroradiological Congress, MRI meeting sections, CT courses, abdominal radiologic diagnostics courses, and more. The year 2007, the 111th anniversary of Czech radiologic diagnostics, saw the rebirth of the journal *Czech Radiology*, which continues the tradition of *Czechoslovak Radiology*. Volume 61 has been published with a brand-new look ([www.ceskaradiol.cz](http://www.ceskaradiol.cz)) and is published four times a year, 1,500 copies per run. The Czech Radiological Society currently has 1,300 members, and the academic community includes 13 professors and associated professors. Accredited workplaces offer, in addition to specialization in the basic specialty of radiology, specialization in neuroradiology, interventional radiology, and pediatric radiology.

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