

## Towards rehabilitation and promotion of Prof. Jan Czochralski



At the Czochralski Laboratory at ITME, photo by A. Duda-Nowicka

Already in 1986, a special dater was designed and used in Wrocław. It shows the scheme of the Czochralski method and the dater's axis is Wrocław's landmark – the famous Iglica, erected in 1948 for the Exhibition of the Recovered Territories.

In 1992 at the Institute of Electronic Materials Technology (ITME), the Czochralski Laboratory was founded. In May 1998 in Nałęczów, the Polish Society for Crystals Growth changed its name to the Czochralski Polish Society for Crystals Growth.

Since 2000 Czochralski Medals have been awarded, which show the recognition and gratitude for Jan Czochralski as a versatile materials scientist. These include the CGCT award, the Czochralski Golden Medal (Foundation of Materials Science Development in Kraków), E-MRS awards, medal "Person of Merit to Kcynia". In 2009, upon the decision of the Minister of Infrastructure of 31 March 2008, as part of the series Poles in the world, a stamp devoted to Prof. Jan Czochralski was issued.

On 29 June 2011, the Senate of Warsaw University of Technology adopted Resolution No 338/XLVII/2011 on rehabilitation of Prof. Jan Czochralski, thus ending controversies around the world-known scientist, lasting for a few decades.

On 24 October 2012, a Conference devoted to the memory of Prof. Jan Czochralski, organised by ITME, was held. In 2012, Warsaw University of Technology founded a plaque mounted on the tombstone of Prof. Czochralski.

A few publications on Czochralski were published, mainly written by Paweł Tomaszewski, Ph.D., i.a. "Jan Czochralski and his method" (Wrocław-Kcynia 2003) and "Comeback. About Jan Czochralski" (Wrocław 2012). Information about Czochralski has been presented during various scientific conferences, i.a. at the 15<sup>th</sup> World Congress of Crystallography (Bordeaux, France, 1990, poster by P.E. Tomaszewski and abstract in congress materials), during a special Scientific Session on the 45<sup>th</sup> death anniversary of Prof. J. Czochralski (Warsaw, 1998, organised by the Polish Academy of Sciences, Warsaw Scientific Society, Polish Society of Physics, Polish Society for Crystals Growth); at the world Forum of Science and Technology of Crystals Growth (Sendai, Japan, 2002, presentation by A. Pajączkowska).



Envelope from the first day of circulation of the stamp with Prof. Jan Czochralski

On 27 April 2012, Warsaw University of Technology organised a Seminar Jan Czochralski – world-known inventor and engineer. During the Seminar, the University was awarded with the medal "Institution of Merit to Kcynia".



Award of the Kcynia Medal for Warsaw University of Technology, April 2012, photo by A. Duda-Nowicka

## Kcynia promotional activities



Prof. Jan Czochralski Square, in the background the house of his birth, photo by A. Duda-Nowicka

For years, Kcynia has been promoting Prof. Czochralski and his achievements. In 1990, Jan Czochralski's name was given to the square on the corner of Szewska and Poznańska. The square is located between two houses connected with Czochralski; one where he was born and the other one where he lived until his death.

In 1990, on the 105<sup>th</sup> Czochralski's birth anniversary, a Popular-Science Session was held in Kcynia. The Kcynia community funded then a commemorative plaque placed on the walls of the Czochralski family home at 25 Szewska Street.

On 6 June 1998, on the 45<sup>th</sup> death anniversary of Czochralski, a Scientific Session was held (Kcynia-Grocholin). The town authorities financed two tombstones – of the professor and of his family with the list of people buried there.

On 28 May 1999, the Teachers' Council, the Parents' Council and the Pupils' Self-Government of Primary School no 2 in Kcynia jointly applied to the Town Council for giving the school the name of Jan Czochralski. On 19 August 1999, the Town Council adopted Resolution no IX/98/1999 on giving Primary School no 2 in Kcynia the name of Jan Czochralski. The celebration was held on 14 October 1999. The Parents' Board then funded a commemorative plaque on the school building. The school has also devoted a special room to the Professor from Kcynia.

On 7 August 2002, Kcynia accepted the offer of funding a bust made by the company Fugo-Odlew Sp. z o.o. from Konin. It was unveiled on 27 April 2003 on the 50<sup>th</sup> anniversary of Czochralski's death, when an International

Symposium Toruń-Kcynia was being held. The Polish Post prepared a special post dater and the Town Office issued a postcard designed by Jan Kurant and Władysław Szmyt.

Five years later, on another death anniversary of Czochralski, an oak was planted as a memorial tree. Next to the oak, a metal box was buried with an issue of a local newspaper and a waxed pharmaceutical bottle with a text signed by participants of the celebration.



Celebration on the 55<sup>th</sup> death anniversary of Prof. Czochralski, photo by A. Duda-Nowicka

## Kcynia promotional activities



Medal "Person of Merit to Kcynia"

i.a., professor Anna Pajączkowska, Paweł Tomaszewski, Ph.D. and Warsaw University of Technology.

A book devoted to Prof. Jan Czochralski was published in 2008, entitled "Jan Czochralski (1885-1953) a great scientist and patriot?" by Tomasz Hałas.

On 1 May 2009, on the 5<sup>th</sup> anniversary of Poland's accession to the European Union, the Town Council in Kcynia issued the first in Poland town banknote – 10 Kcynia Euro. The main theme of the banknote is Prof. Jan Czochralski. Organiser of the emission was the Advisory Office of Krzysztof Dubiński.

In 2012, on the 750<sup>th</sup> jubilee of awarding town rights to Kcynia, two events promoting Prof. Jan Czochralski took place. On 20 April, there was a joint session of the Town Council with representatives of Warsaw University of Technology. The Town Council then adopted a declaration on the promotion of Prof. Jan Czochralski, his achievements and scientific work. 12 October, the Day of National Education, was organised under the title "Let's remember Prof. Jan Czochralski" and was combined with the Kcynia promotion of the latest book by Paweł Tomaszewski, Ph.D.

On 31 October 2012, the Town Council announced a competition for a welcome sign design for the town of Kcynia connected with Prof. Czochralski. It was won by Adam Zieliński from Poznań, actually Professor's great-grandson. With Resolution no XXXI/305/2012 of 31 December 2012, the Town Council in Kcynia posthumously awarded Prof. Czochralski with the title "Honorary Citizen of Kcynia". On 2 January 2013, on the Kcynia Square an open-air exhibition was opened, devoted to the Professor and starting the Year of Jan Czochralski.



Finale of the competition for the welcome sign design, photo by A. Duda-Nowicka

## 2013 – YEAR OF JAN CZOCHRALSKI RESOLUTION OF THE SEJM OF THE REPUBLIC OF POLAND

of 7 December 2012 on 2013  
– YEAR OF JAN CZOCHRALSKI

On the 60<sup>th</sup> death anniversary of Jan Czochralski, the Sejm of the Republic of Poland has decided to pay a tribute to one of the greatest scientists in modern technology, whose breakthrough discoveries contributed to world advancement of science. His discovery, the method of growing single crystals, was ahead of its era by a few decades and enabled the development of electronics. Today all electronic devices contain integrated circuits, diodes and other elements made of single-crystal silicon, grown with the Czochralski method.

The contribution of the Polish scientist, Prof. Jan Czochralski, to world science and technology has been recognised by scientists all over the world who started to use his most important invention; an invention, which it would be difficult to function without in the 21<sup>st</sup> century.

The Sejm of the Republic of Poland hereby decides to pronounce the year 2013 Year of Jan Czochralski.

MARSHAL OF THE SEJM  
/ – / Ewa Kopacz



Kcynia – promotion of the book "Comeback. About Jan Czochralski", photo by A. Duda-Nowicka

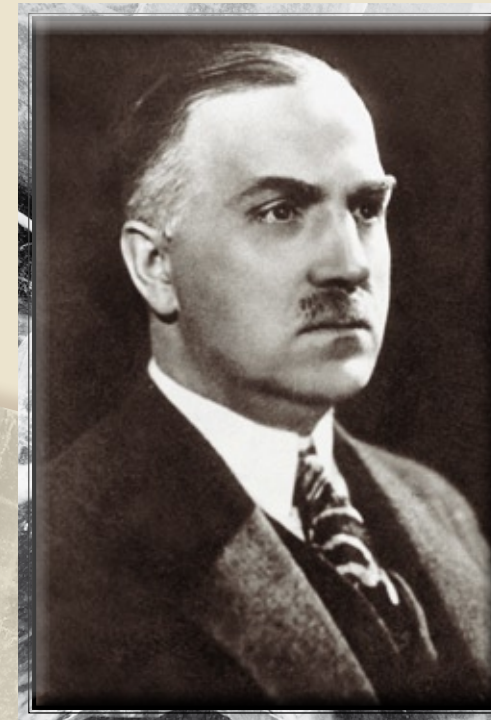


Single crystals grown with the Czochralski method, photo by A. Duda-Nowicka

**Publisher:** Town Council, ul. Rynek 23, 89-240 Kcynia, www.kcynia.pl  
**Idea of the exhibition:** Anna Duda-Nowicka  
**Supervision:** Paweł Tomaszewski, Ph.D. (INTiBS PAN, Wrocław)  
**Translation:** Warsaw University of Technology

**The following publications were used when preparing the exhibition:**  
• Tomasz Hałas, Jan Czochralski (1885-1953) wielki uczoney i patriota?, Kcynia 2008  
• Paweł E. Tomaszewski, Powrót. Rzecz o Janie Czochralskim, Wrocław 2012  
• Instytut Technologii Materiałów Elektronicznych wobec postaci Prof. Jana Czochralskiego, ITME, Warsaw 2012

## PROFESSOR JAN CZOCHRALSKI FROM KCYNIA CREATOR OF THE METHOD OF GROWING SINGLE CRYSTALS



JAN CZOCHRALSKI is often called the father of electronic revolution. His method (called the Czochralski method), a technique of growing single crystals, has found application in semiconductor physics and the electronic industry, thus creating great opportunities for development of many fields of industry. The discovery of this famous inhabitant of Kcynia was ahead of its era by decades, though the revolution took place only after the Second World War.

Discovery of the method was accidental and happened thanks to Czochralski's observant nature. "Again he mechanically dipped his pen in the inkwell and... It's impossible! How could he be so wrong and destroy a good nib by dipping it in a crucible with cooling tin? Why did he put the crucible so close?! But what's that?! From the pen there hangs a thin thread of metal. Excited, he changed the nib for a new one and carefully dipped the pen in the crucible. He slowly pulled it out – again at the tip of the nib he saw a hanging thread." This event shows how clever and thorough an observant Czochralski must have been (excerpt from the book "Comeback. About Jan Czochralski" by Paweł Tomaszewski).

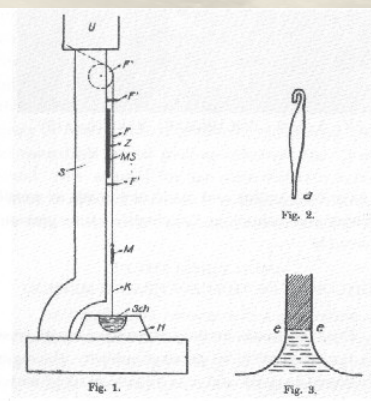
19 August 1916 is regarded as the date of the official birth of the Czochralski method, when the journal "Zeitschrift für physikalische Chemie" received the article entitled "A new method for the measurement of crystallisation rate of metals".

# THE CZOCHRALSKI METHOD - what is it?

The material being crystallised is melted in a crucible. The tip of a capillary, i.e. a pipe of a very small diameter, is put on the surface layer of the alloy. After aspiration of a small amount of the melted material, crystallisation begins. In order to obtain a single crystal of required orientation, one uses a previously prepared seed crystal, i.e. a small crystal on which subsequent layers of material of this forced orientation start to build up in an ordered manner. The seed is then pulled out at a certain speed so that the contact of the crystal with the alloy is not broken. Surface tension keeps a short rod of the liquid material at the end of the capillary or "stuck" to the seed. Contact of the rod of the liquid metal with cooler air causes its slow condensation over the surface of the liquid.



Device for growing single crystals with the Czochralski method, photo by A. Duda-Nowicka



The scheme of the Czochralski method comes from the article from Zeitschrift für Physikalische Chemie 92, 219-221 (1918)

As a result, a single crystal is grown, a material of particularly valuable physical properties. A characteristic of such material is so well-ordered arrangement of atoms that both ends of the crystal have exactly the same orientation of their lattice, regardless of the size of the grown crystal.



Control device with a view on the single crystals grown with the Czochralski method, photo by A. Duda-Nowicka

# KCYNIA - it all started here... and then there was Germany

Jan Czochralski was born on 23 October 1885 in Kcynia. He was the eight of ten children of Franciszek Czochralski and his wife Marta from the Suchomski family. His family home was a one-storey building at 25 Szeńska Street in the corner of the so-called Kozi Rynek (today Prof. Jan Czochralski Square). His father's wish was for Jan to become a teacher, so until the age of 16, he attended the Teachers' Seminar in Kcynia.



An old view of Kcynia, in the foreground the present Prof. Jan Czochralski Square, archive of M-GBP

Jan Czochralski took his fate in his own hands. At the age of 16, he left Kcynia to work in a pharmacy in Krotoszyn. Finally in 1904 he moved to Berlin. Since 1906 he worked in laboratories of German factories, after he had learned the theory and practice of chemistry in Berlin pharmacies. In the AEG company, he was given the position of head engineer. In 1911, he married a German pianist, Margarethe Friederike Elze Haase.

In 1917, in Frankfurt on the Main, the Association of German Metals Industry founded a laboratory of metal science for Jan Czochralski, which he organised, thus becoming director of one of the best equipped industrial laboratories in Germany.



Jan Czochralski in the Berlin laboratory (first on the left), archive of Z. Czochralska

He worked on, i.e., technology of alloys for bearings manufacturing. In 1924, Czochralski's team patented an alloy called metal B, characterised by very good slide properties. It was an alloy based on lead, without expensive and scarce tin. It found application in the railway industry.

he became its president. He was also consultant of the biggest companies, i.e. Schneider-Creusot (France), Bofors (Sweden) and the Institute of Metals in London. He conducted research into physical properties of metal alloys and crystals, especially of aluminium. He invented, i.e., reagents for treatment of metals and a non-roentgen (optical) method of determination of orientation of metal crystals.

An interesting event from the Frankfurt period was a trip to the United States at the invitation of Henry Ford, founder of the automobile industry in the US. Ford was one of the first who showed practical interest in Czochralski's work.



Family photo of Prof. Czochralski in Frankfurt, archive of Z. Prusak

# WARSAW and Warsaw University of Technology

Despite family connections and work in Germany, Czochralski always stressed that he was Polish. He kept in touch with Polish scientists. In 1928, he resigned from the function of the president of the German Society for Metals Science and other well-paid offers (also in the USA) and at the invitation of the President of Poland, Ignacy Mościcki, Jan Czochralski with his family came back to Poland and settled down in Warsaw.

He was then entrusted with the organisation of the Chair of Metallurgy and Metals Science at the Faculty of Chemistry of Warsaw University of Technology. Since 1 April 1929, he headed the Chair as a tenured professor. On 2 May 1929 in the Main Hall of the University he gave an opening lecture. In 1929, he was awarded the highest academic dignity - a honoris causa doctorate and then the degree of professor.



Prof. J. Czochralski in his office at Warsaw University of Technology in 1943, archive of B. Jasianowska

In 1934, he created and became director of the Institute of Metallurgy and Metals Science, which conducted research into metals for the industry and the army. He was member of the Polish Chemistry Society. He was socially active, member of many national and foreign scientific associations, president and member of numerous scientific boards and colleges, he co-founded the Museum of Industry and Technology, sponsored the fine arts and historical research.

After the outbreak of the Second World War, Jan Czochralski and his family stayed in Warsaw. Using

his connections, he organised the Department of Materials Research, which employed workers from his institute. The department mainly worked for the city self-government administration, thus protecting the scientists and apparatus from deportation to Germany, at the same time allowing to manufacture some weapons for the resistance movement with the help of a After the war Prof. Czochralski was accused of collaboration with Germans against Poland and arrested. After four months he was released and the investigation was terminated.



Prof. J. Czochralski's business card, archive of Z. Czochralska



Board of the 6th Convention of Polish Mechanical Engineers in 1932, archive of Z. Czochralska

# COMEBACK - Kcynia again

In 1945, Jan Czochralski came back to Kcynia. He did not accept the offer of going to Austria. And so the circle closed: Kcynia-Berlin-Frankfurt on the Main-Warsaw-Kcynia. Czochralski lived in a villa at 20 Poznańska Street, called *Margowo* after his wife. Its designer was J. Alwin - an architect from Znin, and the construction was supervised by Władysław Czochralski.



An old photo of the market in Kcynia, archive of Z. Czochralska

On 1 April 1946 in Kcynia Czochralski established a company *BION Chemical Company - dr inż. M. Wojciechowski S-ka*. The small factory was located in the house at 28 Poznańska Street (today 43 Poznańska Street). The company produced various types of cosmetics and household chemicals, such as bottle sealing wax, stamp wax, candles, salt for rapid conservation in paper bags. Apparently, its best selling product was its famous *runny nose powder with a dove*.



Villa "Margowo" in Kcynia around 1935, archive of B. Jasianowska

In 1956, the company was relocated to Poznań and under a new name, *Ce-Wu Czochralski Chemical Products Manufacturing Company*, it mainly produced cold and hot permanent wave lotion.

Czochralski explained the issue of potential petroleum beds in Kcynia. To the disappointment of Kcynia inhabitants, he gave no hope for oil excavation that had been dreamt of since 1934.

Małgorzata and Jan Czochralski were great lovers of art. They had a rich collection of works of art, Jan Czochralski organised literary evenings, funded artistic scholarships. Under the nickname Jan Pałucki he wrote poems. The collection of lyrical poetry entitled *Maja. Love Story* is the oldest known work of literature by Jan Czochralski.

Due to heart disease, he spent the last days of his life in hospital in Poznań. He died on 22 April 1953 and was buried next to the chapel on the old cemetery in Kcynia.

Tombstones of Prof. Czochralski in Kcynia, photo by A. Duda-Nowicka



# 2013 - YEAR OF JAN CZOCHRALSKI



Kcynia 2013