The emperor himself was an ardent lover of art. Known for his collecting mania, he gathered everything from pictures, statues, to clocks as well as various other curiosities. In his day, his grand art collections were truly unique and incomparable in size to any others. They became the cornerstone of many present-day European galleries.

Emperor Rudolf II even rebuilt part of the Prague Castle to create more space for his ever-growing collections. He invited painters and sculptors to Prague as well as goldsmiths, who were ordered to create his own crown jewels.

Rudolf II was not just renowned as a passionate art collector, but he also an enthusiast in alchemy, astrology, and occult sciences. The Imperial Court attracted scientists and fraudsters from all around the world. The alchemists were looking for the philosopher’s stone, the elixir of eternal youth, and a way to turn non-precious metals into gold. The most famous conman was the English alchemist Edward Kelley, who was said to have turned mercury into gold right in front of the emperor’s eyes. Some contemporary historians argue that Kelley was actually an agent for Queen Elizabeth I.

As Rudolf’s weakness for alchemy and sorcery was universally known, Kelley’s task was to sneak into the emperor’s favour. It is important to mention that alchemists, though often swindlers, were also mostly renowned as healers. They mixed herbal elixirs and potions which sometimes had real healing powers. They are rightfully considered the predecessors of today’s pharmacists.

Astronomers and astrologists Tycho Brahe and Johannes Kepler were also significant members of the Imperial Court. Brahe thought that the Earth was the centre of the universe, orbited by the Moon and the Sun, with other planets orbiting the Sun. Kepler, in contrast, was an advocate of Copernicus’s heliocentric theory. He is most renowned for creating the laws of planetary motion. While we are introducing important personalities from Emperor Rudolf’s court, we mustn’t forget Jan Jesenius, a physician and anatomist who, in 1600, was the first person ever to perform a public autopsy.

At the end of our journey through Prague during the reign of Rudolf II, we leave the Imperial Court behind and visit the Jewish ghetto. The end of the sixteenth century was marked by frequent attacks on local Jews, so Rabbi Loew created the Golem, an artificial human fashioned out of clay, brought to life by a small piece of paper (shem) with mysterious writing inserted into his mouth. The Golem helped protect Jews against all enemies. He was growing stronger and stronger and eventually, people got scared of him. The wise Rabbi saw that the Golem was doing more harm than good and pulled the shem out of his mouth. Legend says that the Golem is still hidden in an attic in the Old New Synagogue.

In 2002, Prague was hit by hard floods which caused the collapse of the basement ceilings in the Rabbi Loew House in the Old Town. By complete accident, a secret alchemist’s workshop dating back to Rudolf’s era was discovered. The room contained original equipment, old recipes for potions, and even one small bottle with its original contents. The discovered alchemist’s workshop was restored and is now open to the public as part of the Museum of Alchemy.

Petra Ménová
MARKING VS. EXPLORING

While students were enjoying sunny weather in Solvay’s Quarry, their mentors and the authors of problems were working hard at their hotel in Prague marking all exam sheets shipped from Slovakia. Each sheet was double-checked by a collective of authors and the sheets were given two sets of marks, red and green. Guessing from their thoughtful facial expressions, it was not always easy to grade the partial answers fairly. Let’s hope markings will be arbitrated smoothly among the authors and mentors today.
Any scientific nomenclature is a language, although to some extent artificial. The priority is to make the terms specific, even if this means that their forms are not entirely natural.

100 YEARS OF THE MOST ARTICULATE CHEMICAL NOMENCLATURE

The naming of inorganic compounds relies on expressing atomic ratios and oxidation numbers. Numeric prefixes (such as in dinitrogen pentoxide) or explicit numerals (such as in dilead(III) lead(IV) oxide) seem inevitable. However, even in English, we find examples that a different approach is also possible. In the old days, copper(I) ions were called cuprous and copper(II) ions were cupric. In other words, oxidation numbers were expressed indirectly, encoded in a proper suffix. Unfortunately, -ous and -ic had to be recycled for various oxidation numbers. While cupric meant copper(II), ferric was iron(III) and ceric was cerium(IV). Finally, this limited approach was obviously inadequate for elements that have more than two oxidation states.

The Czech and Slovak advantage

Compared to English, our languages are much richer in word inflection, but also in the formation of new words through morphological derivation. For instance, we can take the word “wood” and add different suffixes to form several distinct adjectives meaning made of wood, made from wood, resembling wood, and so on... Indeed, this is a perfect linguistic environment for sustaining a suffix-based nomenclature that could not be sustained in English. Our languages are used to giving many flavours to the same word, and we also have enough adjectival suffixes to support a suffix system that is not limited to differentiating just two oxidation states of an element.

Linguistically seamless and chemically precise

In our nomenclature for inorganic chemistry, we have one suffix firmly assigned to each oxidation state. From the suffixes for cations, we also derive the suffixes for the anions of oxidoacids. Numeric prefixes are only used when it is necessary to explicitly state how many atoms of a certain element are present. The names are usually very simple, yet informative. In English, to write a formula for calcium nitrate, you must know that calcium implies calcium(II) and nitrate is nitrate(V). In our system, both oxidation numbers are understood from the suffixes in the two words of the name. Importantly, our approach is not incompatible with IUPAC recommendations. Even though the core of our nomenclatures remains traditional, it has been continuously extended in line with the most up-to-date international rules; we simply omit the tools that others need to specify oxidation numbers.

The German version that never took off

We rarely think about it, but the unique suffix-based system of Czech and Slovak nomenclatures for inorganic chemistry is the only one of its kind in the entire world today. The system is so efficient and so firmly established that it has resisted all pressures to replace it with more international versions. Interestingly, in 1913, a system similar to ours was also proposed in Germany. Each oxidation state was assigned a morpheme, e.g. VCl, and PCl would be vanadichlorid and fosfanchlorid. However, the proposal never gained traction; in 1913, it was already too late for such a dramatic reconstruction of the existing nomenclature.

How the nomenclature got its suffixes

Our first system distinguishing various ratios of elements in compounds through suffixes dates back to the 1820s, when our scientific language was born. In chemistry, many essential domestic terms are mostly attributed to Jan Svatopluk Presl. He established our words for acid, solution, compound, and analysis. He also created our own domestic names for several elements. Presl also established the first suffix-based nomenclature. Luckily, the system also survived the dramatic changes that happened in writing chemical formulae. When symbols of elements started denoting atoms rather than equivalents, water became H2O instead H2; NO, was reformulated as N2O, and so on. Finally, Alexandr Sommer Batěk and Emil Votoček proposed the final revision of the suffix system, sorting out all the mess that has accumulated over the years. Their suffix system became normative exactly 100 years ago, and it has been used almost unchanged until today.

Erik Szabó

TRY IT YOURSELF

1. As an example, take one of the salts CsMnO3, Na2CrO4, Ce(NO3)3, CoCO3. (These were chosen to minimize secondary grammatical phenomena.)
2. Identify the oxidation numbers of the atom that is the cation and the central atom of the anion.
3. From the Czech names of the elements (Cs cesium, Mn mangan, Na sodík, Cr chrom, Ce cer, N dusík, Co kobalt, C uhličitan kobaltnatý, VII -isťý, VIII -víťazný).
4. Find their word-forming root by removing any -um or -ik suffixes.
5. Combine the roots with appropriate adjectival suffixes, according to the oxidation number: I -ny, II -natý, III -íťy, IV -íťič, V -ičný, VI -ový, VII -istý, VIII -víťazný.
6. To derive the noun for the anion, replace -ý or -ový with -an.
7. Put the noun of the anion first and the adjective of the cation second.

Emil Votoček proposed the final revision of the suffix system, sorting out all the mess that has accumulated over the years. Their suffix system became normative exactly 100 years ago, and it has been used almost unchanged until today.

Erik Szabó
LATVIA

1. Many young people prefer communicating through memes rather than using a traditional lexicon.
2. Our national food is grey peas with pork fat. We know it sounds awful, but we also eat bread with cabbage.

GEORGIA

1. Drinking imaginary Georgian wine at an imaginary Georgian feast called supra.
2. Every time Tamada (the host) drinks, you have to drink as well.

ROMANIA

1. Playing a popular game of cards, Război Egiptea.
2. The biggest building in Europe is called Casa Poporului, located in Bucharest.

CHINESE TAIPEI

1. We are playing baseball, our national sport.
2. We encourage you to come to Taiwan and try some stinky tofu.
We asked teams to snap an original, fun photo and explain it.

We also asked: What’s something about your country others usually do not know?

**KAZAKHSTAN**
1. Imitating our national bird, the berkut.
2. The first man in space was launched from Baikonur, situated in our country.

**PAKISTAN**
1. Playing cricket, our favourite sport in Pakistan.
2. There’s a common stereotype that we speak Arabic, but we don’t. We speak Urdu. We also have the second tallest mountain in the world, K2.

**SYRIA**
1. At every wedding, we dance dabke.
2. Our ancestors invented the first musical notation as well as the first alphabet.

© IChO TEAM
Garnet was described by Pliny and is also mentioned in the Bible: Noah used a garnet lamp in his Ark. As early as the fifth century, garnets in our territory were collected and traded by the Celts. Garnets were given their name “Bohemian” – granatus bohemus – by Anselm Boetius de Boot, the personal physician to Emperor Rudolf II. In that period, garnets also became more frequently used in jewelry.

Before this time, garnets were collected on the surface and shipped to Germany for processing, but during the reign of Rudolf II, their mining and processing in the Bohemian Kingdom began. Underground mining of garnets was first described by Georgius Agricola. Industrial processing of garnets got a significant boost with edicts given by the Empress Maria Theresia and her son Josef II. In the second half of the eighteenth century, they forbade the export of extracted garnets for processing in foreign countries. Gem cutting workshops were established near the garnet mines. In the nineteenth century, garnet deposits began to be depleted and the size of extracted stones decreased to 1–5 mm. In jewelry, garnets were accompanied with almandines and, by the end of the nineteenth century, glass imitations of garnets and bijouterie appeared. In the Middle Ages, garnets were used chiefly to adorn liturgical objects (e.g., the corona)

Deformed dodecahedral symmetry of the crystal structure is manifested in the habit (characteristic external shape) of garnet crystals.

Garnet structure

The typical colours of garnets are the result of transition metals cation impurities, e.g. Fe²⁺ and Cr³⁺ in red pyrope and Ti⁴⁺ and Fe³⁺ in reddish brown almandine.

Synthetic garnets are used in various fields of optical applications. Their chemical composition is different from natural silicate garnets. The crystal structure is the same, but the fundamental composition only contains two cations—e.g., Y₃Al₅O₁₂ (abbreviated as YAG). This garnet was one of the first to be prepared as a monocrystal by growth from the melt. It was also used as a diamond substitute in jewelry, before it was replaced by zirconia.

In the 1960s, after having been doped with various ions, YAG began to be used in optics. The first was [Y, Nd³⁺]₃Al₅O₁₂, used in laser technology. Other lasing garnets appeared quickly afterwards including [Y, Er³⁺]₃Al₅O₁₂, and Gd₃[Ga, Cr³⁺]₅O₁₂, among others.

An important group of synthetic garnets consists of Ce³⁺- or Nd³⁺-doped Y₃Al₅O₁₂ or Lu₃Al₅O₁₂ that are used as outstanding scintillating materials: They manifest luminescence after having absorbed electrons or high energy photons. Ce³⁺-doped garnets are also used in phosphor-based white LEDs (blue InGaN LED combined with yellow-green [Y, Ce₃⁺]₃Al₅O₁₂, or [Y, Ce₅⁺]₃Al₅O₁₂, luminophore). These materials have been prepared in the form of transparent ceramics in recent times. This kind of ceramics is polycrystalline, but the grain boundaries are so perfect that they do not disperse light. When seeing this kind of material, it is hard to believe that it is not glass, but ceramics instead (2).
Mushrooming is heartily embraced by Czechs and Slovaks (in contrast to many other countries), as was already stated in the introduction to Theoretical Problem 6. The species mushroomers mostly pick are boletes, parasol mushrooms, brittlegills, chanterelles, and milkcaps. However, among chemists, inedible—or even poisonous—mushrooms are much more popular due to the content of many interesting biologically active compounds.

**LET'S GO MUSHROOMING!**

In the Problem, you already became acquainted with the inky cap and false morel. You learnt that the inky cap (*Coprinus atramentarius*) (1) is, on one hand, edible and delicious; but, on the other hand, the metabolites of the compounds contained in it are capable of inhibiting the enzyme alcohol dehydrogenase. Thanks to this, when alcohol is consumed along with inky caps, it usually results in a severe sickness.

False morel (*Gyromitra esculenta*) (2) is classified as inedible in our country. By contrast, in Scandinavia, this mushroom is commonly sold in marketplaces accompanied by a warning that it needs to be cooked properly (otherwise, it remains toxic).

During cooking, gyromitrin is hydrolyzed to $N$-methylhydrazine, which boils away thanks to its relatively low boiling point (87.5 °C), and the mushroom becomes non-toxic. When false morels are cooked in a poorly ventilated space, $N$-methylhydrazine vapours can accumulate in the room, and false morel poisoning may manifest itself even without having eaten the mushroom.

The most poisonous mushroom in Central Europe, commonly found also in North America, is called the death cap (*Amanita phalloides*). This mushroom contains hepatotoxic oligopeptides named phallotoxins and amatoxins. Amatoxins are absorbed particularly easily into the bloodstream, from where they get to the liver. However, the initial symptoms of intoxication do not manifest themselves until a larger number of liver cells are damaged, which can occur up to 48 hours after mushroom consumption. The most common antidote for intoxication is silibinin, a hepatoprotective flavonoid isolated from milk thistle (*Silybum marianum*).

Fools webcap (*Cortinarius orellanus*) is a very interesting mushroom as well. Despite being deadly poisonous, it was considered edible until 1958. Intoxications have a long latent period though, from two days to three weeks. Therefore, it took quite a long time to find the causal link between the symptoms of the fools webcap intoxication and mushroom consumption. The active compound of this mushroom is pyridine alkaloid orellanine, which is nephrotoxic and causes kidney failure. It is noteworthy that this alkaloid contains $N$-oxide moiety in its structure, owing to which it is explosive in pure form.

Clathrus is a genus of fungi into which many interesting mushroom species fall. Most of them produce a slime with the typical revolting smell of spoiled meat. It is caused primarily by sulfur compounds (sulfane, methanethiol, sulfides, and polysulfides), phenylacetaldehyde, or by monoterpenes linalool and trans-ocimene. A representative of this genus is devil’s fingers (*Clathrus archeri*), a mushroom that resembles a red flower or an octopus and which is very rare here (its homeland is Australia, from where it was brought into Europe). Another representative is the common stinkhorn (*Phallus impudicus*). This mushroom, as its Latin name indicates (its literal translation is “a shameless penis”), resembles an erect penis in appearance.

Unfortunately, there is no more space left for any other remarkable mushrooms in our Problem or in this essay. Therefore, there is nothing left to do now but to set out for the woods!

Ondřej Šimůnek
Creative improvisation is a bit of a Czech national sport, as evidenced by the incredible popularity of “how to” shows. However, this handyperson spirit isn’t limited to mundane gardening and home improvement; it permeates even scientific endeavours all the way up to nuclear physics.

WHO IS BEHIND THE BIG INVNETIONS IN HISTORY

Perhaps the most famous Czech scientist, acclaimed for his novel ideas, was Otto Wichterle (1). This macromolecular chemist, together with many innovations in developing artificial fibers, became famous as the inventor of soft contact lenses, now used by millions around the world. The lesser-known part of this success story is that he made his first contact lens centrifugal cast prototypes at home in the kitchen during the Christmas holidays. For these, he used a Merkur children’s construction set (think metallic LEGO with little screws instead of pegs) and a dynamo from his son’s bicycle. When the dynamo started to be too weak to power the ever upscaling lens caster, Otto switched to a stronger motor scavenged from a gramophone. This machine made over 5,000 contact lenses.

Another open thinker was physical chemist Jaroslav Heyrovský, interested in the electrochemical analysis of solutions. As he was attempting to determine the trace amounts of ions in a solution, he was often annoyed by the contemporary solid electrodes, which were prone to rapid degradation in the analyzed solutions. Not only did that affect the readings, also polishing them was a chore. If only there was an electrode with a self-renewing surface! And he created just that, in the form of a glass capillary filled with slow-dripping mercury. When he and his Japanese colleague, Masuzo Shikata, made an improvised automatic and highly sensitive analyzer—the polarograph—a new analytical method was born, resulting later in the Nobel Prize for Chemistry (1959).

Even Czech religious figures were in love with scientific experimentation. A Catholic priest, Prokop Diviš, who experimented with electricity in many fields ranging from electric musical instrument to medicine, made several not yet fully recognized discoveries. Six years before Benjamin Franklin, in 1754, he erected the first functional lightning rod in his backyard. Unfortunately, Central Europe was experiencing an unusually dry summer, and the superstitious villagers in his town ended up destroying the “machine that had dispersed the clouds”. Lightning rods, strange weather, and a mob of angry villagers...doesn’t that evoke some well-known movie scenes?

The Augustinian abbot, Johann Gregor Mendel, was also not recognized in his lifetime. Behind the walls of his monastery—after reading Darwin’s Origin of the Species and allegedly proclaiming “That’s not all; something’s still missing!”—Mendel patiently devoted himself to crossing pea varieties and observing their offspring. Based on his observations, he formulated the concepts of Mendelian inheritance. Perhaps because of his use of mathematics and statistics in biology or because the chromosome had not yet been discovered, Mendel’s contributions were not recognized until years after his death.

The resourceful Czechs learned to cross-breed more than just pea plants. They also experimented with dog breeds—not for their love of experimenting or the desire to create a sabre-toothed bruiser with the nature of a dog, but for laboratory purposes. The scientist behind the idea was František Horák, a Czech cynologist who crossedbread two mongrel dogs of unknown origin, both of which were property of the Institute of Physiology at the Czechoslovak Academy of Sciences in Prague. The wolf grey Riga and the three-coloured Miša begot 9 puppies, two of which were selected for further crossbreeding. The new breed was named the Bohemian Spotted Dog or Horák Laboratory Dog as it was first intended only to serve medical and genetic research purposes. The second focal point of their research was to monitor the heredity of missing teeth. This dog was also the first live being to receive a kidney transplant in a test surgery in Czechoslovakia. Later on, the breed became popular among the public, although it has not been accepted by the international cynology authorities.

Two Czech contributions to medicine are textbook examples of serendipity. Psychiatrist Jan Jánšky, for example, played a leading role in investigating possible connections between mental diseases and blood types. After many years of demanding research with 3,160 patients, he came to the conclusion that there is no correlation between mental diseases and blood type, but noted, in a 1907, report the existence of four blood groups. While Jánšky himself did not conduct further research into blood types as he was more interested in psychiatry, his classification was later confirmed and remains in use to this day, enabling effective blood transfusions and saving countless lives.

Another case of an experiment showing surprising, unanticipated benefits is 2-deoxy-2-fluoroglucose (18F-FDG). This molecule, synthesized for the first time by a group of Czech chemists, was originally intended as a treatment for tumours. However, it was deemed unsuitable for this original purpose and has since, as 18F-FDG, been used in PET imaging.

Jan Havlík, Petra Ménová
Only a handful of people know that many inventors have their roots in Slovakia. Even though some of the inventors had to face difficulties and naysayers in the course of their work, they succeeded in the end and helped shape our world into what it is today.

INVENTIONS IN HISTORY

DISCOVERY OF THE PRINCIPLE OF REACTIVE FORCE
Johann Andreas Segner’s greatest discovery, which entered the history of physics forever, is referred to as the Segner Wheel (1735), a type of water turbine. In principle, water is delivered to the top of a cylinder, at the bottom of which is a rotor with pipes bent in the same direction. The ejected water causes the rotor to rotate in the opposite direction with the use of the reactive force of water. This discovery laid the foundation for today’s designs of water turbines, rockets, and sprinklers.

OIL MAGNATES WOULDN’T MAKE DO WITHOUT HELL’S INVENTION
Jozef Karol Hell, a Slovak mining engineer, invented the water-pillar, a kind of a water pumping machine used today for oil extraction. When only twenty-five years old, he built his first wooden water pumping machine. It could extract 200 litres of water per minute from depths of around 80 meters. This marvelous invention revolutionized the mining industry, being the first pumping machine to use compressed air as its power source. The first recorded use of this machine was in Pennsylvania, where it was used to pump oil from great depths. The same principles are still used today in oil fields all around the world. Nowadays, these pumping machines do not use compressed air, but instead use compressed natural gas as their power source.

A PIONEER IN ELECTRICAL ENGINEERING
Štefan Anián Jedlík, an inventor, physicist, engineer, and Benedictine priest, brought circa seventy-six inventions to the world. To name a few of his accomplishments, he invented an electromagnetic rotating device, which he called “lightning-magnetic self-rotors”, and the first electric motor, comprised of three main components: A stator, a rotor, and the world’s first mercury commutator. In the prototype, both stationary and revolving parts were electromagnetic, which was another first. In the 1850s, he invented his most brilliant creation, the dynamo (3), four years before Werner Siemens, its so-called inventor. Because Jedlík did not patent his creation, Siemens was given credit for this invention.

Another of his inventions was a soda making machine, which was later used in 1841 to serve soda drinks in the very first soda fountain. Jedlík foolishly did not publish or spread the results of his research and only built machines for regional demonstrations. Because of this, the soda making machine was sadly the only of his inventions to have industrial application during his lifetime. He is the author of a physics book, Tentamen publicum a physica (1845).

A MAN WE CAN THANK FOR SELFIES
Jozef Maximilián Petzval (3), a physicist, mathematician, and inventor, is the father of modern photography. In 1840, he invented a lens used in photography which enabled a picture to be taken in less than a minute compared to the usual waiting times of fifteen to thirty minutes. His work didn’t end there: He made an optical mechanism used to this day in astronomy and cinematography. Parts of his inventions are still used in today’s digital cameras.

ADMIRED EVEN BY ALBERT EINSTEIN HIMSELF
Aurel Stodola, a university professor, Einstein’s teacher, engineer, and inventor, was a pioneer in the area of technical thermodynamics and its applications. He is most well-known for his book, Die Dampf-turbine (The Steam Turbine), released in 1903. Another of his inventions is the world’s first electric driven vapour recompression plant. It heats the Geneva City Hall to this day by extracting and heating water from a nearby lake. With the help of German surgeon F. Sauerbruch, Stodola was able to design and build a prosthetic hand capable of motion. The principle was later widely used in the creation of prosthetic legs and feet, later replaced only with the advent of 3D printing and microelectronics.

THE FIRST RADIO WAS MADE BY A SLOVAK
Jozef Murgaš was an inventor, architect, botanist, painter, and Roman Catholic priest. Shortly after migrating to the United States in 1896, he received his first two patents: Apparatus for wireless telegraphy and The way of transmitted messages by wireless telegraphy. In 1907, he built two radio antennas in Wilkes-Barre and Scranton which were later used in a huge experiment testing the ability to transfer spoken words over twenty miles between towers. This accomplishment was noticed by both T. Edison and T. Roosevelt, who later visited him in his lab.

In his other hobby, fishing, he received another patent, Spinning reel for fishing rod. He was known as the “Radio Priest.”
WHAT A FOOLISH THING TO DO, BOYS, BUT SO BRAVE. THANK YOU.

COME ON! LET'S GET IN!

PROFESSOR! WE DID IT!

GOODBYE PROFESSOR. I LIKED YOU A LOT.
We had to hide with the Golem. Everybody was after us, collaborators, snitches, and the Nazis.

They were dark times and they seemed infinite.

We spent six years in hiding. I think we became quite close during those years. I learned many interesting things about the Golem and chemistry.

That’s strange. I was expecting the Americans...

And then something incredible happened. The war ended. Evil was defeated, for once...

To be continued tomorrow...
For a long time, scientists did not believe that they could exist: Structures which are regularly ordered but are not periodic. 2D-tiling (with similar properties) was first discovered by mathematicians. After that, quasiperiodic crystals were predicted to exist. In 1982, they were discovered by Daniel Shechtmann, whose scientific career was almost ruined as a result. Quasicrystals represent an incredible connection between mathematics, physics, chemistry, art, and scientific stamina; their discovery earned a Nobel Prize in 2011.

WAY TO THE NOBEL PRIZE
1963 – Scientists discover it is possible to tile a surface with aperiodic tiling in an organized way. However, they do not come up with the best solution, because they need more than 20,000 different tiles. 1974 – Roger Penrose discovers a set of just two tiles enabling the non-periodic tiling of a plane. Penrose tiling, the tiling named after him, was made of two different rhombic tiles. It exhibits 5-fold symmetry.

1982 – Daniel Shechtmann observes a 10-fold diffraction pattern during a routine investigation of a rapidly cooled Al-Mn alloy. He hesitates to share his results for two years. He gets a basic textbook of crystallography from his colleagues, who remind him that 10-fold symmetry is not possible. Since 1984 – Hundreds of quasicrystals with various compositions and different symmetries have been reported, thus proving Shechtmann’s discovery. Quasicrystals conquer the world.

1987 – The first of many stable quasicrystals was discovered and it opened the door to possible applications. Due to their electronic structure, most quasicrystals have ceramic-like properties: low thermal and electric conductivity, hardness and brittleness, resistance to corrosion, and non-stick properties.

1992 – The definition of the crystal changes, accepting the possibility of an aperiodic arrangement. 2009 – The first natural quasicrystal, icosahedrite, is observed in a meteorite from the Khatyrka River in eastern Russia. 2011 – D. Shechtman is awarded the Nobel Prize for the discovery of quasicrystals.

PROPERTIES AND USE
The first observed quasicrystalline materials were thermodynamically unstable, rapidly cooled alloys (natural quasicrystals of a meteoritic origin belong to this class). After heating, they formed regular crystals. Later, in 1987, the first of many stable quasicrystals was discovered and it opened the door to possible applications. Due to their electronic structure, most quasicrystals have ceramic-like properties: low thermal and electric conductivity, hardness and brittleness, resistance to corrosion, and non-stick properties.

Low friction Al-Cu-Fe-Cr quasicrystalline material has been used as a coating for non-stick frying pans. The surface is ten times harder than stainless steel and can withstand temperatures up to 1,000 °C. However, cooking with plenty of salt causes etching of the coating. Dan Shechtman himself has one of these pans.

DNA
Already in 1944, Erwin Schrödinger thought of how information could be stored at the molecular level. A periodic crystal can be encoded with a small piece of information. Amorphous solids are too chaotic. Thus, a crystal should have an aperiodic structure bearing information. In 1953, the structure of DNA was discovered by Watson and Crick. Although not crystalline, it met Schrödinger’s prediction, being both regular and aperiodic.