



Cubist Design, Scientific Crystallography, and Other tales of

“Crystalline Splendour”

In 1912 Pavel Janák (1882-1956), an outstanding Czech architect and designer, wrote alongside drawings of Utopian Cubist architecture in his notebook: “...If crystals, then nature!...”.

Janák thought hard over “pictorial” experiences that were triggered by views of a particular landscape and its natural morphology. In his expressively, terse, bewitching style he described two groups of feelings. On the one hand was balanced, calm emotion, “the idea of the zero point and duration,” embodied in nature by plains, by the calm surface of the sea, by sandy sediments on the banks of quiet rivers. He built an antithesis in contrast to this balance of natural forms – a powerful, distinctive emotion and dramatic movement embodied in the slanting surfaces of precipices, in ruins, ravines and volcanoes, in rain forcefully driven at an angle by the wind; and chiefly – the oblique facets of crystals.

Janák was one of the first designers to turn to inorganic nature for inspiration. The process of crystallisation was for him embodied in openness, openwork, and interpenetration of angles, dynamic growth, hidden energy, pregnancy of form. Whereas the vegetative world was close to the earth and tangible reality, crystals were the embodiment of the sacred, of the abstraction and spirituality.¹ Janák’s Cubist box in the shape of a crystal (1911) is not merely a useful object. This icon of Czech

design repeatedly invites elucidation.² Where in the European cultural environment was the myth of the crystal born? What was the spiritual, scientific and artistic context from which the concept of “crystalline splendour”³ derived?



Pavel Janák, Box with a lid, 1911, Museum of Decorative Arts, Prague

1. The Secret Writing of Nature

In Novalis’ fantastic story *The Novices of Sais*⁴ his fictional natural scientist, in harmony with the Romantic *Naturphilosophie*, searched for and examined “the strange shapes we see everywhere – on wings and egg shells, in clouds, snow and crystals, in stone formations and freezing waters, in the inside and outside of mountain ranges (...) and in special conjunctures of chance.” In crystals and geological folding he found a kind of “grammar of nature, the key to a miraculous secret script.” Novalis studied at the Mining Academy in Freiburg, was interested in geo-gnostic disciplines, and belonged to the narrow *Naturphilosophie* circle around the natural scientist Abraham Gottlob Werner, to which Johann Wolfgang Goethe and Alexander von Humboldt were also closely connected.⁵ The penetrating of the ravine and the prospecting of mountain slopes were images of the impenetrable human soul and the chief motif of the Central European Romantics. At the beginning of the

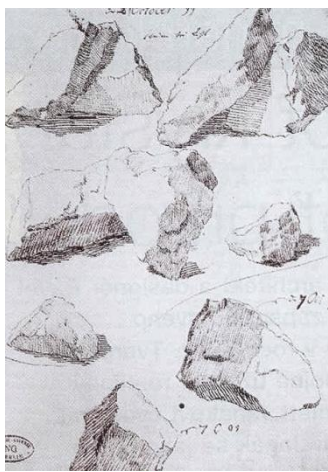
nineteenth century mining engineers and geologists stepped into the secret womb of mother earth.

At the beginning of the nineteenth century Goethe studied crystals and geological natural formations. He carried out much of his observation of minerals in the Ore Mountains in northern Bohemia.⁶ In these places, as he documents in his natural science writings, he was enchanted by the discovery of druses of crystal and admired the beauty and symmetry of what was known as twinned growths of crystals.⁷ Goethe considered this symmetrical growth of crystals as *Urteilchen* – some sort of elementary segments, substances of earth whose formal harmonic organisation was an ideally beautiful fragment of nature.

It had not been until the end of the eighteenth century that the discovery, scientific and artistic, of the alpine landscape took place. In Europe the Alps became a symbol of the freedom and loftiness of nature.⁸ At the same time it could be said that as late as the mid-eighteenth century there was a *terra incognita* in the heart of Europe. The wild, uncharted mountain landscape was considered “an example of evident discord without traces of reasonable moderation.” Mountain massifs and rugged cliffs were considered to be “natural temples of the earth.” The perception of a wild landscape had a religio-mystical nature. Mountain peaks were embodiments of the divine majesty whose pictorial abbreviation was the natural pyramidal shape of sharp rocky spikes.

The natural sciences and art were very close to each other during the nineteenth century. The field of the morphology of nature and the semantics of natural shapes in

particular were a contact field of interest for natural scientists and artists. The spheres of artistic and scientific imagination did not build the impenetrable barricades of contemporary taxonomy between themselves. The opposition of the studio and the laboratory was a rewarding cultural construction. However, the scientific observation of nature did not have to be far removed from the reflections, amazement, emotions and power of the aesthetic experience of the artist.

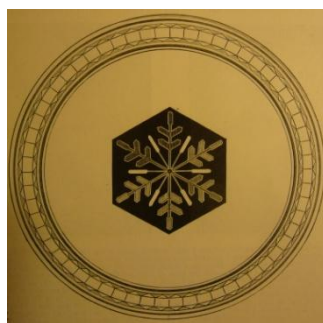
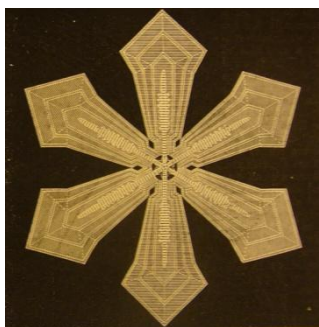


Caspar David Friedrich, *Study of Minerals*, 1799, Kupferstichkabinett, Staatliche Museen Berlin

2. Crystals of Snow As Ornamental Forms

In the course of the nineteenth century it was mainly organic nature that presented a broad scale of decorative patterns to designers and ornament makers. The influential theoretician John Ruskin⁹ urged the copying of the outer forms of organic nature and the use of local plant motifs. However, from the mid-nineteenth century, in harmony with the reform movement in the applied arts, theoreticians of design gave some hard thought to a modern form of decorative art. Christopher Dresser, Richard Redgrave and Henry Cole proposed that modern ornament as a “scientific decorative art”¹⁰ should derive from a geometric basis. New decorative forms should not only imitate

nature, they should create a new, conventionalised grammar of forms deriving from scientific diagrams or from the new microscopic structures. The magazine *The Art Journal* of 1857 even published microstructures of snow crystals,¹¹ in the course of which these forms were presented as suitable models for ornament makers: “...as any original source derived from nature for originating new forms of truth and beauty is scarcely to be overlooked in this age of progress, we wish to draw attention in the following columns... to crystals of snow observed by James Glaisher of the Royal Observatory in Greenwich... It occurred that snow crystals would furnish novel and most beautiful suggestions for the ornamental designer.” The founders of Schools of Design – Darwin’s contemporaries – appealed, unlike Ruskin, for the designer not to imitate the outer aspect of nature by a monkey’s “copycat” method, but by careful observation and the “intelligent eye” to extract the inner structure, principles and regularity from visible forms. The logic of the form of the new ornament should respond to the logic of the scientific view. The hexagonal crystal represented a new abstract beauty. For the decorative adornment of glass, Christopher Dresser copied the frozen crust formed in winter on windowpanes. Dresser was convinced that this natural geometric formation is best expressed, “in a single pattern idea of power, energy, force or vigour”.¹²



Mrs. Glaisher (wife of the scientist James Glaisher), Royal Observatory, Greenwich, in *The Art Journal* 1857

Christopher Dresser, *Principles of Decorative Design*, 3rd edition, Cassell, Peter & Galpin, London. Paris and New York 1878

3. The Ideal Morphology of Crystals: The Designer Janák and the Mineralogist

Vrba

Nor was Janák, in his Cubo-Expressionist period shortly before 1910, interested in “primitive forms of calm, (...) but natural actions, which evoke feelings of dramatic, directional movement, sharpened and tapered.” For Janák it was the crystal that became the rewarding natural archetype of this schismatic feeling, of this charged and forceful contention. Janák wrote with a similarly rugged briskness about crystallisation strength: “(...) crystallisation strength seems to be some sort of weight of matter laboriously concentrated within matter and so strong that under every circumstance it materialises for itself in a concentrated world (...)”¹³

The crystalline shapes of subjects from the Cubist period, just like Janák’s theoretical texts describing crystallisation strength, indicate that the Czech designer must have been interested in contemporary mineralogy. On closer investigation we find the connections between the Czech designer and the Prague scientist to be very symmetrical. Janák must certainly have followed the new installation of the mineralogical collection belonging to the National Museum¹⁴ and the Czech university, whose curator was his contemporary, Professor Karel Vrba (1845–1922). Karel Vrba carried out valuable work in expanding and putting in order the Czech mineralogical collections, as well as personally designing the showcases in which the collections were displayed and stored. In spite of the fact that the collections were not generically the most abundant, it was thanks to Vrba’s installation that they were in

their time considered “for their splendid arrangement at least, the most beautiful mineral collections ever.”

In around 1900, Vrba’s activity as a teacher brought about the publication of almost 568 graphic fold-and-glue crystallographic models, which, for their preciseness and practicality, were introduced into “numerous higher and middle educational establishments throughout the world” by the German firm Krantz. These geometric fold-and-glue models of ideal crystals with black edges are kept in glass cases in a corridor of the Mineralogical Institute. In 1908 Vrba depicted and constructed what was called a crystal polyscope, which represented crystal symmetry by mirroring. The myriad of ideal geometric shapes of crystals was – it seems – the scientist’s true passion. The crystal polyscope and photographs that Vrba¹⁵ created on the basis of the kaleidoscopic principle of mirroring indicate a reciprocal influencing of the scientist by the Cubist aesthetic of faceting of the image.

The similarity between the scientist’s model and the designer’s realisation prove that Janák undoubtedly knew Vrba’s models.¹⁶ Janák’s box of 1911 had its prototype in what was described as a twinned crystal of pyrite.¹⁷

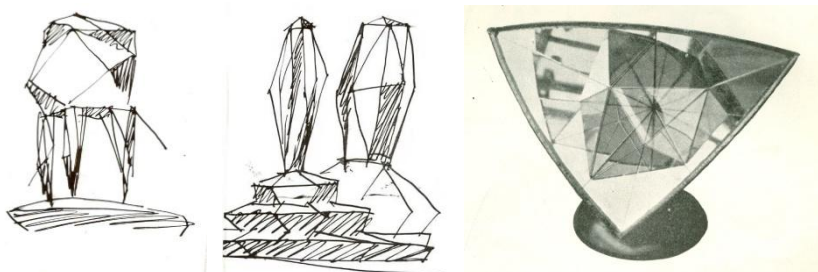


Pyrite, Institute of Geochemistry, Mineralogy and Mineral Sources, Faculty of Natural Sciences of the Charles University, Elba, Italy, acquired by Prof. Karel Vrba, 1896

Crystallographic models of pyrite, pentagonal dodecahedron and combinations, Karel Vrba, c.1900, Institute of Geo-chemistry, Mineralogy and Mineral Sources of the Faculty of Natural Sciences of the Charles University.
Pavel Janák, container with lid, 1911, Museum of Decorative Arts, Prague

Why did Janák choose this crystal? His specific selection of pyrite out of all the models was no accident. Janák chose to base the box on the penetration together of two pentagonal dodecahedrons, one of the five bodies known as Platonist,¹⁸ whose proportions were traditionally considered to be ideally beautiful. Moreover, form of the pyrite Janák chose for his ceramic box symbolically. In basic Greek etymology (*pyrithés lithos*) is known as the “fire stone,” creating sparks. Pyrite enabled the domestication of fire, and thus the development of earth burnt under technical control – ceramic – and, later, applied art in general. In distant civilisations, polished pyrite served as a mirror and was thus, alongside the image reflection in the surface of the water, an object of visual re-presentation.

Clearly, the art historian must be careful when comparing images that originate in the different regimes of the field of science and the field of art.¹⁹ Nevertheless, is there not silent amazement over the lofty, ideal beauty of abstract forms that connected the scientist in the laboratory with the artist in the studio?



Pavel Janák, Study of crystals, 1912, National Technical Museum, Prague

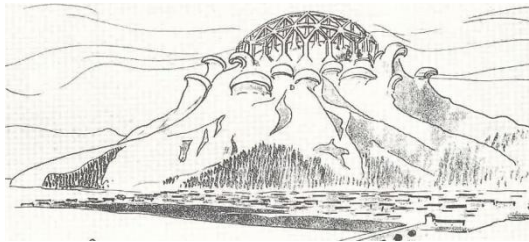
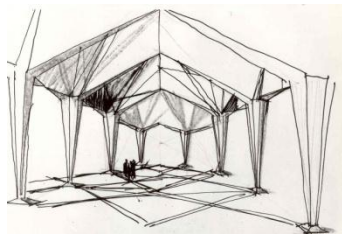
Karel Vrba, Crystal polscope, teaching aid, Charles University, Prague 1908

4. Crystalline Splendour²⁰ and Temples of the Heavens

Janák's interest in the inorganic world and crystal structures was very probably influenced by a work by Wilhelm Worringer. In 1908 was published in Munich Worringer's doctoral thesis, called *Abstraktion und Einfühlung* (Abstraction and Empathy).²¹ This work, which was demonstrably read and translated²² by a whole artistic generation, played an important role in its time, in a certain sense simplifying and shaping aesthetic and art historical theories. Worringer's concept of "empathy" was derived from earlier normative aesthetics whose artistic ideals could be found in the peak of Antiquity and the Classical Italian Renaissance. In the context of aesthetic "empathy" the viewer is, according to Worringer, capable of identifying and understanding a work that in a certain sense imitates nature. The ability of "empathy" is made possible by the various positions of Realism and the organic world. Wilhelm Worringer places the antithetical concept "abstraction" in opposition to this concept of "empathy". Whatsoever abstraction is turned up by theoretical enlightenment in the antithetical level to the organic world will be shaped "by the negation of the living, by crystalline substance". On the basis of Worringer's theory the "crystalline glory" of mathematical combinations and clear geometrical shapes approaches absolute beauty. The crystal became to some extent the symbol of a new, inimitable art.

The geometric formation of the crystals, just like their translucency, inspired architects. On one of the drawings of Janák's architecture from 1912 is a Cubist arcade made of a crystal network of ribs supporting a vault. The ribs on Janák's Cubist sketch are projected onto the floor, apparently as shadows, as though Janák had thought up a transparent, glass vault. The German Expressionists Bruno Taut and Wenzel Hablik – Janák's contemporaries – also tried crystal architecture.²³ Both

belonged to the circle of the visionary writer Paul Scheerbart. In 1914 in Berlin Scheerbart published his kind of manifesto, called *Glasarchitektur*. He believed that through clear, translucent and optically dematerialised crystal architecture one could contribute to moral cleansing. Scheerbart's idea of *Glasarchitektur* was the syncretism of a Gothic house, nineteenth century English exhibition pavilions, and modern ideas of a tangible, clear, and – last but not least – ethical architecture. In 1917 the German architect Bruno Taut 1917²⁴ created a print series, *Alpine Architecture*, which was in its idealistic variant placed on the peaks of mountains. Through its transparent membrane the modern house of glass makes possible an ideal linking between Earth and the universe, and in Scheerbart's intentions should have a beneficial cleansing power.



Pavel Janák, Design for a monumental interior, 1912, National Technical Museum, Prague

Bruno Taut, *Alpine Architecture*, House of Glass in Pontofino, 1917

5. A Myth Always Living: The Crystal As a Cleansing Space

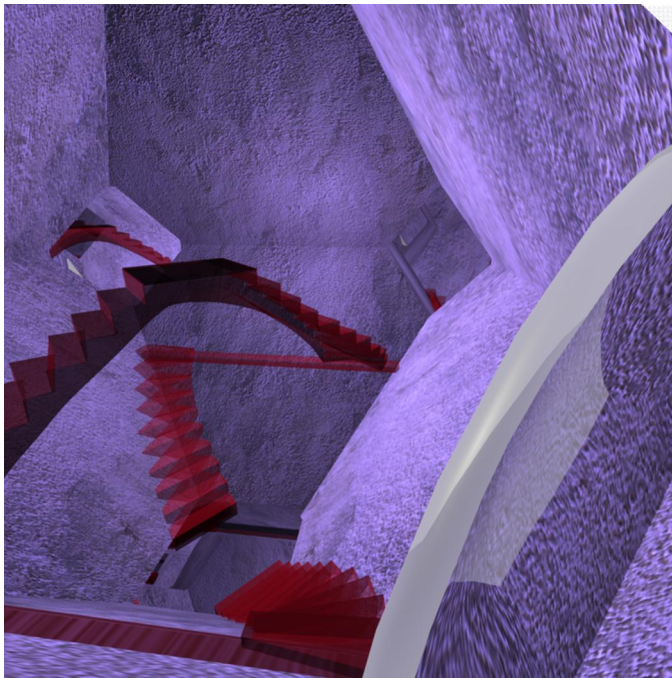
Matěj Görner, a fourth-year student from the architecture studio of Professor Eva Jiříčková at the Prague School of Applied Arts, also made use of the crystal motif in his examination work. This work showed that the inorganic shapes of the crystal are still considered the embodiment of abstract ideas, whilst the organic morphology of plants and animals are closer to an imaginary real world.

Matěj Görner, who as well as studying architecture attends the Faculty of Mathematics and Physics, is convinced that mathematical logic can help him find pictorial cohesiveness and compositional integrity. He is not interested in designing traditional living space, but concentrates primarily on visualisations of Utopian, idealist architecture, which for him is a primarily geometric combinational analysis of penetrating walls and apertures.

One school assignment was the creation of a virtual space for a specific person chosen by the student. Görner supplements his original and ambiguously accepted architectural project with a detective story:

There was a murdered girl. There are three suspects, who for various reasons communicate badly with the detective. They live alone and their personal testimonies are inadequate. The detective tries to understand the psychology of the suspects through the environment in which they live. To make it easier to know the accused, Görner describes in detail the houses and apartments in which they live. The first suspect lives in a wooden cottage with animals; the second has a modern house of glass; the third lives in a perfectly ordinary angular house. It is however ordinary only on the outside. Most of the inner space is taken up by an octagonal crystal in the form of a cubo-octahedron. The crystal fits most of the inner space of the house. Only in the spaces remaining in the corners is there minimal room for a study and bedroom, bathroom and toilet. The living and the sanitary quarters are some distance

away from each other. Every time he wants to get from one to the other he has to pass through the crystal, which is some sort of cleansing dematerialised space without a materially useful function; some sort of contrived Functionalism in reverse. Mirrors have been placed on the points of the regular central crystal multi-wall that complicate orientation in the space; the inhabitant of the house, whilst walking up or down the inner staircases, at the same time escapes, through the optical deceptions of the mirrors.



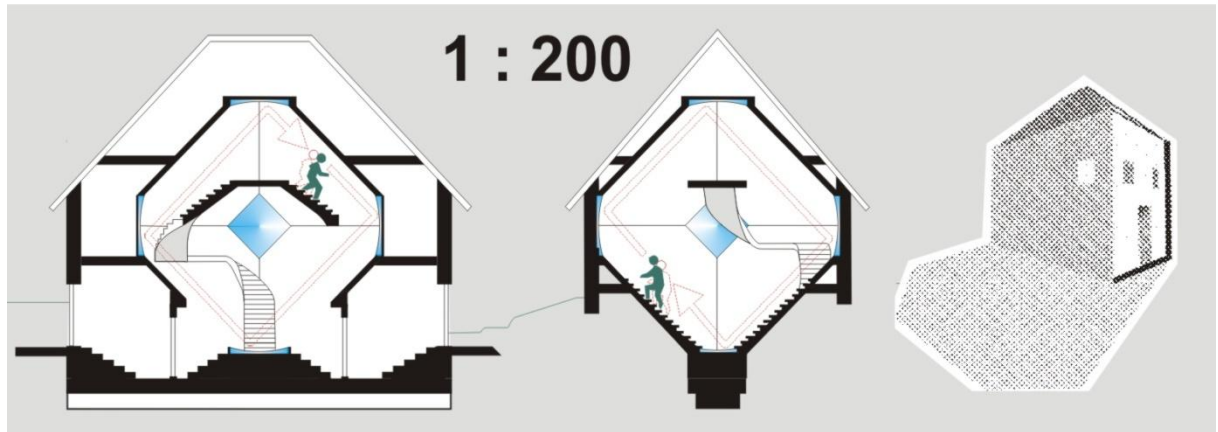
Matěj Görner, House with a crystal within, view of the interior, studio of Eva Jiříčná, Prague School of Applied Arts, examination work 2005

In the fictional case study, Professor Rudolf Nečas of the Charles University, who is engaged in mathematics and combination analysis into n-dimensional spaces, resides in the crystal house. The gradations of the story enable and apparently simplify

Görner's engagement through fictional characters with the psychology of buildings and their testimony value. The simple house, insignificant from the outside, into whose interior a crystal is inserted, is in harmony with its inhabitant. Görner writes about the feelings of the inhabitant of the house: "Between the bedroom and the kitchen I have so to speak a Platonist body. It shatters the everydayness of the world a little. It is actually quite an adventure to go and make tea in the morning, or to go from the study to the toilet. Perhaps it sounds a little absurd, but somehow that environment where I live makes one lighter, rids one of substance. I can savour the feeling that I am taken out of the surrounding world, I am in my own mini-world, where my own rules apply. The whole house serves me as a protective bubble which gives me peace for meditation and protects my thoughts so that they do not interfere with the surrounding world. My ideas fill the space without reservations and have no way to escape; they remain captured in mirror loops which indicate that my house is wound only around me. I had my best ideas endlessly walking up and down my own staircases."

Görner, experimenter of architecture, touches on the psychoanalysis of architectural building, where the room becomes the spiritual image of its owner. In the course of this, the crystal is valid -- in Görner's case in essence subconsciously -- as a symbol of abstraction and spirituality.

In conclusion, and to put your minds at rest, I will just add that the inhabitant of this crystal for living in is not the murderer; he is only a scholarly dreamer escaping from himself. The tale of crystalline splendour is finished – actually – well.



Matěj Görner, House with a crystal within (the house of Rudolf Nečas), studio of Eva Jiříčna, Prague School of Applied Arts, examination work, 2005

Lada Hubatová-Vacková

Academy of Arts, Architecture and Design

Prague

Czech Republic

Email: hubatova@vsup.cz

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Translated from Czech by Barbara Day.

¹The theme of the crystal in art in relation to abstraction and the sacred is touched on by the current exhibition in the Centre Georges Pompidou; the author has no idea about the concept. Olivier Schefer, “Cristal”, in *Traces du Sacré*, Centre Georges Pompidou, Paris, 2008, pp. 142-147.

²Karel Srp concerns himself with the myth of the crystal from another point of view in Jiří Švestka, Tomáš Vlček and Pavel Liška (ed.), *Český kubismus 1909–25*, Düsseldorf 1991, pp. 318–325, for the last time Dalibor Veselý, “Czech New Architecture and Cubism”, *Umění* 6, LIII/2005, pp. 586–605, and others.

³This concept was used by the influential theoretician Wilhelm Worringer, *Abstraktion und Einfühlung*, München 1908 in reference to the Viennese art historian Alois Riegl. Concerning Worringer's text, see further.

⁴Novalis, *Die Lehrlinge zu Sais*, 1802.

⁵See Michaela Haberkorn, *Naturhistoriker und Zeitenseher, Geologie und Poesie um 1800*, Frankfurt am Main, 2004.

⁶J.W. Goethe, *Schriften zur Naturwissenschaft*, the chapter "Zur Geologie, besonders der Böhmisches", Berlin 1926, p. 35.

⁷Goethe found symmetrical growths of ortoklas in the Loket region in Bohemia.

⁸Concerning changes in the perception of mountain landscape, see Birgit Verwiebe (ed.), Caspar David Friedrich *Der Watzmann*, Berlin and Cologne 2004.

⁹John Ruskin (*Seven Lamps of Architecture*, Smith & Elder, London, 1849) was a great advocate of the use of organic morphology in design.

¹⁰The designer Christopher Dresser, one of the representatives of the revival movement, with Richard Redgrave, Henry Cole and Owen Jones tried to raise decorative art into a science; see Christopher Dresser, "Botany, as Adapted to the Arts and Art Manufacture", *The Art Journal*, 1857, pp. 17-18, "...Though the science of botany has been long more or less perfectly understood, it has been but very scantily applied to the purposes and requirements of the beautifying ornamentists. Perhaps, upon reflection, we may find that this neglect is pardonable – for how were the two sciences to become mingled?..."

¹¹James Glaisher, "On the crystals of snow as applied to the purposes of design", *The Art Journal*, 1857, col 73-76.

¹²Christopher Dresser, *Principles of Decorative Design*, 3rd edition, Cassell, Peter & Galpin, London, Paris and New York 1878, p. 157.

¹³Pavel Janák, "Pavel Janák, Hranol a pyramida" in *Umělecký měsíčník*, year. I, 1911-12, pp. 162-170.

¹⁴Vrba's installation of the mineralogical collections in the National Museum on Wenceslas Square in Prague dates from 1893; the collection of the Mineralogical Institute of the Czech University was definitively lodged in the building on Albertov in 1914; see Antonín Prchlík, Karel Vrba, *Časopis Musea království českého*, XC, Praha 1916, pp. 1–7 and the "Konference při příležitosti 150. výročí narození pro Karla Vrby", *Bull. Min.-petr. Odd. NM v Praze*, 3, 1995.

¹⁵The photograph of Karel Vrba's Crystal Polyscope are in many ways similar to the first abstract vortographs by Alvin Langdon Coburn in 1917. Vrba's photographs however retain the statute of scientific representation. See also: Lada Hubatova-Vackova, Crystal and Kaleidoscopic Abstraction: Scientific Photography and Cubist Design, *Centropa*, vol 9, No 1, January 2009, s. 28-42.

¹⁶Unfortunately there is no proof of any mutual correspondence. It is probable that Janák met Vrba at the Jubilee Exhibition in Prague in 1908.

¹⁷The ideal form of the interpenetration of two pyrites.

¹⁸The ideal "divine" proportion of Platonist bodies: the first tetrahedron of four equilateral triangles, the second a hexahedron – a cube of six squares, the third an octahedron of eight equilateral triangles, the fourth a dodecahedron of twelve pentagons, the fifth a triakisoctahedron of twenty-four equilateral triangles.

¹⁹The field of comparing images from the fields of science and of art requires an independent methodology that was touched on especially by James Elkins, *The Domain of Images*, Ithaca, London, 1999.

²⁰This concept was used by the influential theoretician Wilhelm Worringer, *Abstraktion und Einfühlung*, Munich 1908, in a reference to the Viennese art historian Alois Riegl.

²¹Wilhelm Worringer, *Abstraktion und Einfühlung*, Piper, Munich 1908.

²²Most people in the Czech Lands were bilingual at this time, so a German text was not an obstacle.

²³Antony Tischhauser, "Creative Forms and Crystalline Architecture In Remembrance of Wenzel Hablik", *Daidalos*, Berlin Architectural Journal, 2/1981, pp. 45-52; see also Wenzel Hablik, *Schaffende Kräfte*, 1909, 20. prints with 20 aphorisms and a foreword, exhibited for the first time in 1909 in the Vienna Kunstgewerbe Museum, in 1912 at the third exhibition of Sturm in Berlin with Herwarth Walden.

²⁴Janák was engaged in World War I at this time.