

Reflections: The enduring symbiosis between art and science

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Summary. We have all seen reflections in glass windows every day. We take it for granted. Ever changing angles of light beams dance across the atmosphere bringing reflections of the reality all around us. But in exploring the uniquely charming and magnificent stare miasto (old city) of Kraków in Southern Poland, as well as in Prague and Boston, I have come to realize that the place where silica and simbeams meet –window glass- can be the homes of nature’s elusive poets and poetry... that silica, oxygen, and light combine to often reveal a side of earth, of nature, of us, that is hidden, beautiful, and mysterious. I have known this reflection world existed at the water’s surface, especially on a wind-less sunny day. But its’ expression in the compound silica dioxide, most familiar to us as “window glass”, may be the most revealing. Formed from unimaginable heat emissions of massive stars or supernovae in deep time, these elements actually make up much of our planet’s crust. One can see the reflective properties of silicon in rocks containing quartz minerals. These crystals with origins far in the universe are now commonly a part of windows, framing our lives by protecting and giving us essential and even profound connections to the outside, including our life-giving sun-star. [**Contrib Sci** 11(2): 249-251 (2015)]

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My 200-year old “mentor,” the great polymath Alexander von Humboldt, is reported to have spoken these words just prior to passing away at age 89, “How glorious these sunbeams are...!” When reaching glass surfaces such as windows, these persistent rays journeying from our nearest star and on an amazing journey through the spheres – exo, thermo, meso, strato, and tropo -- penetrate, reflect, refract, and scatter. My “Earth Gazes Back” photographic project captures and celebrates a few of these infinite number of ever-changing expressions, several of which are included in this article collection.

We all certainly know the often stimulating display when

sunlight meets water surfaces, and then becomes a part of our artistic sensibilities, even gravitating toward what became a new 19th century art form, Impressionism. But in the grand Renaissance architecture city of Kraków, Poland, a couple hours before sunset one day, I realized that while most reflections on window surfaces keep subdued or hidden, they can under certain specific conditions become mysterious masterpieces of Nature. That ride of rays through the spheres results in a special expression, here and there interacting with the second most abundant element in the earth’s crust, silicon, a key constituent of glass. When I glanced my initial photographs of distant window surfaces of Kraków on my laptop later, I con-

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cluded that sometimes the reflections I had discovered are far more beautiful, poetic, and mysterious than the reality that they reflect! To my delight, I found that only minimal adjustments for contrast and intensity were necessary to make the window come to life in often profound ways that defy analyses of angles, origins, source. Indeed, at first it was commonplace for me to turn around and see behind me structures, pipes, trees, gardens, fence, roof, clouds – whatever – that were apparently being reflected, often like a soft abstract painting. I quickly decided to abandon this fruitless venture and simply enjoy the outcome, eventually producing prints for on-line enjoyment [<http://www.douglaszook-photography.com>] and exhibitions in special venues, such as the historic 14th century Collegium Maius cellarium gallery/café at Jagiellonian University in Kraków in 2014.

While intriguing reflections can be noticed and photographed from exterior window surfaces anywhere, there are certain conditions that can enhance Nature's expression. For example, much of Kraków is a United Nations Educational Scientific and Cultural Organization (UNESCO World Heritage site, meaning that its historic architecture, particularly from the 13th through the 19th century, must be preserved in perpetuity. This material used for the many gothic, renaissance, and baroque buildings, ornamentations, edifices, sculptures is substantially linked to the ancient geology of southern Poland, including Kraków, wherein significant periods of geologic time featured shallow warm seas dominated by coral, sponge, and red algal reefs. These reefs and other related life forms contributed massive calcium carbonate or limestone that eventually accumulated through orogeny as layered terrestrial masses. These have been partially mined by humans and became the often extraordinary pliable building material which in the hands of famed architects and designers in Italy and Poland resulted in this brilliant medieval cityscape display. Moreover, the unique city features a 4.5 km arboretum-like park, the Planty, which surrounds the oldest region of the city. This synergy of current nature via its trees and ancient nature via human-constructed remnants of ancient life contribute significantly to unique reflections. This can be further enhanced when some of the glass used in windows dates back many decades or even more than century, allowing chemical "imperfections" in the glass to further dazzle the incoming usually indirect sunbeams.

This glass window history is mirrored somewhat in another extraordinary city where I have captured some unique reflections, Prague. That said, while Boston has some European flavor it has a different landscape and urban expres-

sion that in some districts and times of day resonates with provocative reflections.

Despite the fact that there have been some window reflection images done over the years, in my most egocentric moments, I don't find any like these and thus I end up perhaps falsely concluding that I have discovered a new art form—one where the earth and its spectacular biosphere is gazing back, revealing in special moments its beauty and mystery. Consequently, I feel that these ephemeral images of mine can proudly introduce the excellent scholarly written articles in this issue of CONTRIBUTIONS TO SCIENCE. 🌱

About the author

Douglas Zook is a biologist and directs the Global Ecology Education Initiative [<http://dpzook.wix.com/geei>] based currently at Boston University. In over three decades, his time extending to the present usually is spent teaching and researching how human beings can renew efforts to be more compatible with the planet that sustains us. He has also guided the development of hundreds of students who seek to become innovative biosphere-conscious science teachers through the Science Education Program at Boston University's School of Education. His photographic work can be viewed at <http://www.douglaszookphotography.com>. He can be reached at dpzook@gmail.com.



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Reflections Photography: Earth Gazes Back. Window reflections from Kraków (K), Prague (P) and Boston (B). No color changes or other photoshop alterations were made. Names and pages between parentheses indicate the authors and initial pages of the articles in this issue of CONTRIBUTIONS TO SCIENCE [<http://www.cat-science.cat>], vol. 11, issue 2. Photo 1-K (see Pagonabarraga, Ritort, p. 125); Photo 2-P (see Jou, Casas-Vázquez, p. 131); Photo 3-K (see Ritort, p. 137); Photo 4-B (see Rubi, p. 147); Photo 5-B (see Baró, Planes, Vives, p. 153); Photo 6-K (see Palassini, p. 163); Photo 7-K (see Faraudo, Aguilera-Arzo, p. 181); Photo 8-K (see Ortín, p. 189); Photo 9-K (see Reguera, p. 173); Photo 10-K (see Díaz-Guilera, Pérez-Vicente, p. 207); Photo 11-K (see Claret, Ignés-Mullol, Sagués, p. 199); Photo 12-K (Frigola, Sancho, Ibañes, p. 215); Photo 13-K (see Jona-Lasinio, p. 127); Photo 14-K (see Soriano, Casademunt, p. 225).

