

Special Section

ArtScience: The Essential Connection

Guest Editor: Robert Root-Bernstein

The fifth installment of a Leonardo special project exploring the work and writings of artistic scientists who find their art avocation valuable; scientifically literate artists who draw problems, materials, techniques or processes from the sciences; or others interested in such interactions.

Call for Papers

What is the value of artistic practices, techniques, inventions, aesthetics and knowledge for the working scientist? What is the value of scientific practices, techniques, inventions, aesthetics and knowledge for the artist? When does art become science and science, art? Or are these categories useless at their boundaries and intersections?

Can an individual excel at both science and art, or is even a passing familiarity with one sufficient to influence the other significantly? Do the arts ever contribute significantly to scientific progress? Where will current scientific innovations lead the arts in the next few decades?

Leonardo will publish a series of special sections over the next 3 years devoted to exploring these questions. Submissions can be from artistic scientists who find their art avocation valuable; from scientist-artist collaborators who can demonstrate a scientific or artistic innovation; from scientifically literate artists who draw problems, materials, techniques or processes from the sciences; or from historians of art or science looking at past examples of such interactions.

Interested authors are invited to send proposals, queries and/or manuscripts to the Leonardo editorial office: Leonardo, 800 Chestnut St., San Francisco, CA 94133, U.S.A. E-mail: <isast@leonardo.info>.

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Authors interested in submitting a text for this project, please send proposals, queries and/or manuscripts to the Leonardo Editorial Office: <isast@leonardo.info>. Additional information available on the Leonardo web site: <www.leonardo.info>.

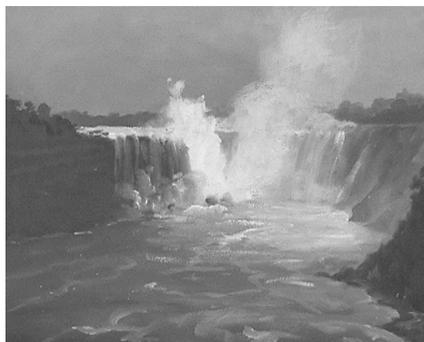
WILHELM OSTWALD AND THE SCIENCE OF ART

Latvian scientist Wilhelm Ostwald (1853–1932) was awarded the Nobel Prize in Chemistry (1909) for his foundational contributions to physical chemistry, but among artists he is known as an inventor of modern color theory, and he left posterity more than 1,000 paintings (Fig. 1, Color Plate F) and 3,000 pastels and color studies of his own [1].

Ostwald grew up in a family that made everything from crafts and poetry to art and music, and it is not surprising he became a modern Renaissance man. As an adolescent, he made fireworks and synthesized collodion film for a camera he constructed himself. He invented a new method of decalcomania, a dye transfer technique, and fabricated his own pastel crayons and oil paints for his artworks. He played viola well enough to consider a professional career and learned piano, harmonium and bassoon as well. He also composed music [2]. These interests often took precedence over course work, so that college took Ostwald several extra years to complete.

His interest in making things eventu-

Fig. 1. Wilhelm Ostwald, untitled depiction of Niagara Falls, New York, oil on cardboard, 1904. (Reproduced with the permission of the Ostwald-Gesellschaft)



ally led Ostwald to chemistry, where his crafts skills prepared him to become a prolific inventor of physicochemical techniques and equipment. Artistic experience was as important as scientific knowledge to his inventive process. He said that both science and art have the common aim of “coping with the infinite diversity of appearances through the formation of appropriate concepts. . . [Science builds] intellectual ideas; art constructs visual ones” [3]. Both were necessary to translate a scientific idea from concept into imagined apparatus and structural plans into working inventions.

Chemistry finally captured most of Ostwald’s imagination, but only because he reconceptualized it into a universal discipline that informed all others. Color, in particular, was a steadfast universal bridge. Among Ostwald’s earliest observations was that some compounds change color when dissolved in water. The reasons for this color change were unknown until Svante Arrhenius proposed in 1887 that salts in solution dissociate into ions. Ostwald, an early ionist, reported in 1892 that compounds that change color upon dissolution are invariably ionized salts. Thus, color became a clue to physicochemical processes [4].

Understanding the science of color also became one of many ways that Ostwald believed that scientists could contribute to art. In 1903, he argued that science should provide the arts with better “methods and means” for the artist to express what he imagines [5]. “Most fields of natural science” [6] are applicable to developing such methods and means, he asserted, and in the years following this lecture he began systematically to explore the physical, chemical and physiological phenomena required to use everything from glues to sizing and from color to lacquers.

The most influential result of Ostwald’s studies is his well-known mathematical theory of color [7]. This theory had widespread, long-lasting impact on art and industry during the 1920s, influencing various members of the Dutch group *de Stijl*, including Vilmos Huszar

and Piet Mondrian [8], and some members of the German Bauhaus group, including Wassily Kandinsky, Walther Gropius, Joost Schmidt and Paul Klee. Ostwald was invited to lecture to the Bauhaus members in 1927 and became a director of the Circle of Friends of the Bauhaus in 1931 [9]. In addition, two very influential American art teachers, Faber Birren and Egbert Jacobson, were converts to Ostwald’s theory [10].

Art was not just an intellectual discipline for Ostwald, however. In the midst of his most important scientific work, he would refresh his mind by making art [11]. In 1903 he told an American audience, “I personally am indebted to art for many uplifting and beautiful hours. Poetry, music and painting have given me refreshment and new courage, when exhausted by scientific work I have been obliged to lay my tools aside” [12]. A few of his thousands of artworks have been published [13] and the rest reside in the *Ostwald Energiehaus* in Grossbothen, Germany [14], where they remind us how often Ostwald used art to refresh science and vice versa.

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References

1. See <www.wilhelm-ostwald.de>.
2. Paul Walden, *Wilhelm Ostwald* (Leipzig, Germany: Wilhelm Engelmann, 1904) p. 98; Wilhelm Ostwald, *Lebenslinien: Eine Selbstbiographie*, 3 vols. (Berlin: Klinkhardt, 1926–1927), Vol. 1.
3. Walden [2] p. 99; Ostwald [2] Vol. 1.
4. Wilhelm Ostwald, “Ueber die farbe der Jonen,” *Abhandlungen der Mathematisch-physischen classe der Koenig. Saechsischen gesellschaft der Wissenschaften* 16, No. 4, 281–307 (1892).
5. Wilhelm Ostwald, *Kunst und Wissenschaft* (Leipzig, Germany: Von Veit, 1905) pp. 1–29. Based on letters to the *Muenchener Allgemeine Zeitung* in 1903–1904. Translated in 1906 by H.W. Morse as *Letters to a Painter on the Theory and Practice of Painting* (Boston: Ginn, 1906).
6. Ostwald [5] p. 1.
7. Wilhelm Ostwald, *Einfuehrung in die Farbenlehre* (Leipzig, Germany: Verlag Unesma, 1919), translated

as *Colour Science Part 1: Colour Theory and Standards of Colour*, and *Colour Science Part 2: Applied Colour Science*, 2 vols. (London: Winsor and Newton); Wilhelm Ostwald, *Farbschule: Eine Anleitung zur Praktischen Erlernung der Wissenschaftlichen Farbenlehre* (Leipzig, Germany: Verlag Unesma, 1924), translated as *Colour Science: A Handbook for Advanced Students in Schools, Colleges, and the Various Arts, Crafts, and Industries Depending on the Use of Colour* (London: Winsor and Newton). Wilhelm Ostwald, *The Ostwald Colour Album: A Complete Collection of Colour Standards for Use in Colour Specification and the Study of Colour Harmony. Arranged by J. Scott Taylor* (London: Winsor and Newton, 1934).

8. John Gage, *Color and Culture: Practice and Meaning from Antiquity to Abstraction* (Boston: Bulfinch Press, Little, Brown, 1993) pp. 257–258.

9. Gage [8] p. 262. See also Philip Ball and Mario Ruben, “Color Theory in Science and Art: Ostwald and the Bauhaus,” *Angewandte Chemie International Edition* 43 (2004) pp. 4842–4846.

10. Faber Birren, ed., *The Color Primer: A Basic Treatise on the Color System of Wilhelm Ostwald* (New York: Van Nostrand Reinhold, 1969); Egbert Jacobson, *Ba-*

sic Color: An Interpretation of the Ostwald Color System (Chicago: Paul Theobald, 1948).

11. Walden [2] p. 101.

12. Wilhelm Ostwald, “The Relations of Biology and the Neighboring Sciences,” *Physiology* 1, No. 4 (1903) p. 18; see also Ostwald [5] p. 16.

13. Wilhelm Ostwald, *Ostseebilder: Reugen, Vilm, Hiddn-see, 1886–1910*, Ralf Zimmermann, ed. (Stralsund, Germany: Baltic, 1995).

14. See [1].

CALL FOR PAPERS

LMJ 17: My Favorite Things: The Joy of the Gizmo

If, as Marshall McLuhan so famously suggested, the medium is the message, then the gizmo must be the one-liner. From baroque violinists to laptopppers, sound artists have long fetishized the tools of their trade, the mere naming of which can provoke an instant reaction: Shout “LA-2A,” “TR-808,” “JTM45” or “Tube Screamer” in a room full of musicians, and you will notice the eyes brighten, the breath shorten and the anecdotes pour forth. But only to a point: Many a “secret weapon” is held close to the chest.

This is the chance to get that secret off your chest: LMJ 17 will address the significance of *physical objects* in music and sound art in a time of increasing emphasis on software and file exchange. We are soliciting papers (2,000–5,000 words) and briefer artists’ statements (500–1,000 words) on the role of purchased or homemade instruments, effects boxes, pieces of studio gear, “bent” toys, self-built circuits, and so on, in your work as a composer, performer, artist, producer, recording engineer, etc. Wherever possible, please include photographs of your subjects (300 ppi TIFFs preferred).

DEADLINES

1 October 2006: Brief proposals sent to Nicolas Collins <ncollins@artic.edu>.

1 January 2007: Final texts and all materials to the LMJ Editorial Office.

Contact Nicolas Collins <ncollins@artic.edu> with any questions.