Intersecting Colors
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Origins: Weimar and the Bauhaus

When Josef Albers was an elementary and middle school student in Bottrop from 1895 to 1902, the young apprentices who worked for his father lived with the family in their large house on Horsterstrasse (now the site of a busy regional bus terminal). Lorenz Albers was a house painter and decorator (Anstreichermeister), and Josef was fond of reminiscing about the craftsmanly skills he had learned from his father.

When asked later in life about his working methods for the "Homage to the Square" paintings, Albers would often explain that he always began with the center square because his father, who, among other things, painted houses, had instructed him as a young man that when you paint a door you start in the middle and work outwards. “That way you catch the drips, and don’t get your cuffs dirty.”

It is an open question whether the senior Albers also imparted words of wisdom on the use of color to his older son. By 1905, when Josef was seventeen years old, Lorenz had risen to be deputy chairman of the Bottrop Compulsory Guild of Painters, Glass Artisans and Decorators (Maler-, Glaser- und Anstreicher-Zwangsinnung) in a fast-transforming world where artisans’ guilds and associations were being overtaken by larger, more industrialized businesses. Trends in house painting and decorating were also changing. As far as color was concerned, its use in nineteenth-century house interiors, like that of other consumer materials, was contingent on both fashion and economics. Pigments varied greatly in cost and quality. By the 1870s, however, “there was a reliability of nomenclature, applicability and cheapness, a wide choice of colors...and, for the home, paints that could be ‘purchased ready for use’ rather than mixed on site.” In 1852 the widely read The Laws of Harmonious Colouring Adapted to House Painting, written by the Scotsman David R. Hays, was published in German translation. If Lorenz Albers kept up with developments in fashion and
technology, it is quite possible that he may have awakened his son’s fascination with color.

Once Josef Albers arrived at the Bauhaus in Weimar in 1920, he entered an environment in which matters of form in art were of primary concern. Yet of all the elements embraced by the term *form*, color is the most elusive. Color is a product both of culture and of nature, of the physics of light and the highly complicated structures of the human brain and eye. It is both absent and present, real and imagined, object and subject. Although much has been written about color teaching at the Bauhaus, Albers remembers the subject of color at the early Bauhaus as a “stepchild.” “We had very little color,” he remarked in a 1968 BBC interview, “real color studies, in Itten’s course and in Klee’s and Kandinsky’s courses....” Johannes Itten, an instructor, and Ludwig Hirschfeld-Mack, a fellow student, were both former students of the colorist Adolf Hölzel (1853–1934); but about Itten’s color teaching Albers would later remark, “Itten thought I had no color.... I was told to go first to wallpainting because glass painting is a branch of wall painting.... I did not agree.... I had learnt wall painting in my father’s workshop. I went to the wall painting workshop only to help my friends.”

Despite Albers’s disclaimer, and although formal instruction may not have been offered, it was difficult to avoid color at the Bauhaus. Albers soon became part of a circle of established artists and architects who were all, in one way or another, investigating aspects of color in their work, including the Bauhaus founder, Walter Gropius, the painters Wassily Kandinsky, Paul Klee, and Lyonel Feininger, and younger colleagues like Oskar Schlemmer, Marcel Breuer, and Hirschfeld-Mack. Color explorations at the Bauhaus during this time included the esoteric harmonizing exercises of the musician Gertrud Grunow that connected colors and musical tone through body movements; Hirschfeld-Mack’s color-light-music machine; and Kandinsky’s “scientific” questionnaire, which attempted to match colors, notably blue and yellow, to psychological states. The intellectual underpinnings to these studies were theories, treatises, and discourses from the late eighteenth to the early twentieth century written by scientists and philosophers including Philipp Otto Runge, Michel Eugène Chevreul, Arthur Schopenhauer, Hermann von Helmholz, and Wilhelm Ostwald. Perhaps
most significant was Johann Wolfgang Goethe’s *Die Farbenlehre* of 1810, which became the model for Albers’s color teaching.9

**Influence of Goethe**

Weimar was Goethe’s adopted hometown. He moved there at age twenty-six in 1775 and remained a prominent resident until his death in 1832. Goethe’s spirit must have permeated the very air of the early Bauhaus, which opened in Weimar in 1919, nearly a century after the great writer’s death. Walking daily to the former Royal Reithaus in the park on the River Ilm where he gave his preliminary design course, or *Vorkurs*, from 1923 to 1925, Albers would have passed Goethe’s picturesque garden house, already by 1886 a public memorial site and shrine for the writer’s admirers. Goethe’s writings on color were central to the teaching of Klee, who was the *Formmeister* in the weaving workshop that Anni Albers joined in 1923 and whose work and ideas were greatly admired by both Anni and Josef Albers.10 In a 1973 letter to Rudolf Arnheim, Albers wrote, “my reading of Goethe’s *Theory of Colors* goes back to a far-distant past, probably to a time before I joined the Bauhaus in 1920 when I was 32 years old....”11

Goethe’s poetic imagination permeated Albers’s teaching, especially the color course. Goethe’s research in physical science never lost sight of the intimate relationship between the human being and the objects of scientific curiosity—whether physical phenomena like light or biological ones like the plants that populated his environment. Albers’s insistence on the primacy of the relationships operating within a framework of known facts took its cue from Goethe, whose “course as a scientist took him not only on a search for data, but also on an active and imaginative quest for relationships in man and in nature.”12

In his preface to *Die Farbenlehre* of 1810, translated into English as “*Theory of Color*,” Goethe suggested a highly nuanced notion of “theory,” writing that “any theoretical endeavor should do no more than outline the paths along which a deed may wander with the touch of life until it bears fruit in keeping with the laws of nature.”13 Albers’s writings on color are frequently referred to, similarly, as color “theory,” but Albers himself was careful to avoid that label. He always insisted that practice came before theory and that he was teaching a philosophy and a way of seeing and not a theory; we should note that Albers titled his own work *Interaction of Color*.

The part of Goethe’s long and detailed treatise most relevant to Albers’s enterprise is the section “Physiological Colors” at the beginning of part 1:

> It is appropriate to start with a study of physiological colors because they are wholly, or largely, a property of the observer, of the eye. These colors
are the basis for our entire theory... Until now, however, they have been considered inconsequential and random, an illusion and a defect. Physiological colors have been known from the earliest times, but since their fleeting quality could be neither caught nor held they were exiled to the realm of mischievous phantoms... We have called them physiological colors because they are the property of the healthy eye. We consider them innate conditions for sight, evidence of the living interaction between its inner nature and the outer world.14

Color, according to Goethe’s formulation, is “a property of the observer,” whose color perceptions are “fleeting.” For Albers, the important distinction was between “ocular seeing,” the neurobiological processes of sight, and “vision,” which, coupled with imagination, is a transformative process.15 In an undated written statement explaining the use of color in his own work, Albers gave an extended explanation of what Goethe had named “physiological colors”:

The physio-psychological phenomenon of the so-called after-image is the reason why we don’t see neighboring colors as what they actually are, that is, physically.

In our perception, juxtaposed colors, change each other in two ways, on the one hand in regard to light, on the other in relation to hue.

As there is nothing large or small in itself but only in relationship, so any color appears lighter or darker and brighter or duller in connection with other colors.

That is, a light color makes any less light one darker or heavier than it really is, and vice versa. As to hue, a strong red, for instance, pushes its neighbors towards green, its opposite hue.

This effect can be understood in two ways. First as it is done usually, in an additive direction as any outspoken hue adds its complementary hue to its neighbor. But it is just as important to see this as a subtractive influence in absorbing from its neighbor its own hue, or light.

This interaction of colors exists in all color combinations to a larger or smaller degree, but is in most cases unrecognizable even for trained eyes.

This interaction permits the knowing colorist to make opaque colors look transparent, heavy ones turn light, colorless neutrals become colorful, warm ones seem cool, and vice versa. It makes it possible to make equal colors look different, and different ones look alike, that even defined shapes as well as color areas vanish from our sight.

Though there are other factors which change the psychic effect of colors, as placement and shape, quantity and recurrence, in my paintings, “Homage to the Square,” the interaction of color caused by juxtaposition was one of my main concerns.16

In the introduction to Interaction of Color, moreover, Albers includes a firm statement about the difference between factual “knowledge” and artistic “vision”:
The book does not begin with optics and physiology of visual perception, nor with any presentation of the physics of light and wave length. What counts here—first and last—is not so-called knowledge of so-called facts, but vision—seeing. Seeing here implies Schauen (as in Weltanschauung) and is coupled with fantasy, with imagination.17

Black Mountain College and Yale University

The story of Interaction of Color begins late in the fall of 1933, when Josef and Anni Albers arrived in the United States. Fresh from the recently closed Bauhaus, where he had been teaching the preliminary course design, or Vorkurs, Josef Albers was invited to create a department of art at Black Mountain College near Asheville in rural North Carolina.

At the Bauhaus Albers had designed highly colored glass pieces (many destined for architectural installation) as well as furniture, wallpaper, and a typeface. In 1928 he acquired a Leica camera and immersed himself in photography. Design and photography would remain professional interests, and he would continue to teach a version of the Vorkurs, which at Black Mountain was called Werklehre and was described in the college catalogue as teaching “the development of the feeling for material and space.”18 At Yale, from 1950 on, the course morphed into “Basic Design.”

At Black Mountain College Albers resumed the practice of painting he had put aside during his Bauhaus years, and it was also at Black Mountain that he launched the first color course in an American art school curriculum. He initially relied on conventional methods to introduce color to his students: the color wheels and systems of Goethe, Schopenhauer, and Ostwald (fig. 5). But he soon moved away from that approach, encouraging students to understand color by creating their own color studies based on a series of exercises that led them to discern the differences in hues, tones, and intensity, not as definitions and diagrams to be learned by rote, but by comparison and through trial-and-error experience. It was a way of teaching color that was Albers’s own and at Black Mountain College it took

Figure 5: Barbara (Bobbie) Dreier, Goethe Color Circle. Cut and pasted paper on a page from a notebook from Josef Albers’s color class, Black Mountain College, 1935. The Theodore and Barbara Loines Dreier Black Mountain College Collection, State Archives of North Carolina, Western Regional Archives, Asheville, NC (PC 1956.17).
on a distinctive character, shaped by Albers’s long classroom experience and his insistence on hands-on learning.

The best way to appreciate what was so unusual about Albers’s way of teaching is to examine photographs of him in action in the classroom (fig. 6). He was constantly in motion, getting up close to his students, subtly in command, guiding and nudging them. In photographs from Black Mountain Albers is seen sitting among his students, getting down on the floor, putting himself on their level. The photos convey activity and vitality. Photographers who visited the college—among them Josef Breitenbach (1896–1984), Genevieve Naylor (1915–1989), and Clemens Kalischer (b.1921)—captured multiple images of Albers in action. Later at Yale, in 1954, Albers’s student John Cohen made a series of photographs and a short 16mm movie in Albers’s classroom. As a consummate performer, Albers seemed not to consider the photographers’ presence an intrusion. The sight of him teaching was so compelling that it may have made him the most photographed teacher in history.
For Albers, teaching and learning were not a matter of the teacher imparting privileged information and the student acquiring received knowledge. Teaching involved asking questions, not providing answers; and Albers always privileged learning over teaching. His idea of education—true to its Latin root *e-ducere*, to lead or to lead out—was to draw out the creativity that is part of being human. “Art is a demonstration of human life,” he said. “Art is revelation instead of information.”

The notion that we learn best by direct experience is a familiar one, expressing an ideal state of education. But while it is often touted, it is seldom followed. Albers was one of the few who could make “learning by doing” a reality. His methods were direct, consistent, and free of cant. Practice, doing, trying, experimenting, playing—all of these concepts were brought to life in his classes. Theory, rules, dates, and information were secondary and would come later. For Albers true learning was a physical and a collective act. It led to insight, vision, and imagination. It took courage, and gave confidence in return.

Albers’s holistic view of the world and of life led to his classroom focus on context, contiguity, and relationships among elements as the key to understanding both the real world and the world the artist creates. Of all the elements of art—shape, space, color, texture, and so on—color, to Albers, was “the most relative medium.” Color relationships were the most powerfully demonstrable and decisive; “*how* a color is used and related to others...is decisive in art.”

In Albers’s color class there were few materials and they seldom varied: colored paper swatches, rubber cement, cutting tools (scissors, knives, razor blades), cutting boards, and cardboard for mounting the completed studies. He would present the exercise in few words, then circulate among the students observing their work, sometimes sitting down beside a student, making certain his charges understood the task. “Albers,” wrote one student, “is interested in what is happening out there where the colors are actually interacting: the objectivity, the dedicated accuracy of observation, the sheer hard work he requires, amount to a selflessness unseen in the art world since the Middle Ages.”

The goal of the exercises was not to elicit a single correct answer but to engage students in active experimentation that would yield many and varying solutions—that would extend the question or investigation at hand and suggest new ones: to get them to “see color action as well as feel color relatedness.” Conveying his accumulated experience of how colors behaved and how color relationships worked was the point of the class; guiding the students’ own first
exploratory steps in gaining their own experience was the means by which it was accomplished.

The Publication of *Interaction of Color*

In January 1928 Albers had written from the Bauhaus to his friends Franz and Friedel Perdekamp, “This year I am turning 40. Therefore I have to be successful soon. Two things I am planning for this year: a pedagogical book about my teaching...and an exhibition of my new glass pictures.”\(^{24}\) The unrealized book was to have been one in the now legendary series of “Bauhaus Books” (*Bauhausbücher*).\(^{25}\) As it turned out, three-and-a-half decades would pass before a book on Albers’s teaching was realized.

The idea of publishing a volume about Albers’s color course came under discussion at Yale University Press in 1956. The initial response, according to the press’s deputy director, Howard Sayre Weaver, was that such a project was “quite out of the question.” To reproduce the Albers color course the book would need to cover an extensive area, convey Albers’s idiosyncratic and poetic “voice,” and be simultaneously academic and anti-academic—placing practice before theory (an Albers absolute). “Above all,” Weaver said, “it would have to contain color embodying a degree of precision not ordinarily necessary in books of any kind. It would have to be not a book about color but nothing less than a book of color.” Four-color printing was not capable of reproducing the studies from Albers’s class with the necessary specificity, purity, and opacity of color. “Even if a means could be found,” Weaver said, “the project would be so elaborate and costly that no publisher could reasonably be expected to take it seriously.”\(^{26}\)

But Albers, charismatic, authoritative, and contagiously enthusiastic, had a dedicated following of true believers, and with Yale University Press eventually taking the lead, an unprecedented and original collaboration began. While the press was securing funding (an estimated $35,000–$50,000), work on the text, the design, and production began.

Albers had little if any experience with the screen-printing process before 1956, when two former students—Sewell Sillman, Albers’s hands-on teaching assistant in the color course, and the graphic designer Norman Ives—were enlisted to oversee design and production of the catalogue of a retrospective exhibition of Albers’s work at the Yale University Art Gallery. Albers was especially eager to have his *Homage to the Square* paintings reproduced in a way that would come as close as possible to replicating their powerful demonstrations of color interaction. Sillman experimented with screen printing, and the first *Homage to the Square* screenprints were born as two tipped-in plates in the catalogue (fig
7). It was a watershed moment in Albers’s career and would enable not only the production of *Interaction of Color* but also an array of screen-printed editions of his work that continued for the next twenty years—the remainder of his life.

Working closely with Albers, Sillman mixed an astonishing eight-hundred-plus colored inks for the plates of *Interaction of Color* while Ives came up with a three-part design for the publication: a volume referred to as “Text”; eighty individual folders containing the color studies (for the most part accurate re-creations of works made of colored paper by students in the color course); and a companion volume titled “Commentary”—Albers’s directions to readers and his discussion of individual plates. Albers specified an arrangement and typography that paralleled the rhythms and cadences of his speech, and he wrote the entire text.
Sixteen of the folders were simply unsuited to screen-printing and were completed by a combination of four-color letterpress and offset lithography. The letterpress plates were made in the Netherlands by the firm Enschedé, of Haarlem, and Connecticut Printers Inc. did the printing. The offset lithography as well as the printing of the “Text” and “Commentary” were the work of Yale University Press’s own Carl Purington Rollins, longtime manager of the manufacturing department at Yale University Press and Printer to the University at Yale. Apart from the letterpress plates, therefore, *Interaction of Color* was made entirely in the U.S.

Because of the huge scale of the project, the screenprinting was divided among three separate companies—R. H. Norton and Company and Sirocco Screenprints in New Haven, and Homer Mitchell in Detroit. Proofing of the sixty-four screenprinted folders (120 studies) was exacting and arduous—a perfect analogue of the attention and craftsmanship Albers demanded of his students. Albers was closely involved and in several cases wrote the final commentary only after approving its related color study so that the two elements would be matched precisely.

Collating and assembling the two thousand three-part volumes and the folders was no less of a challenge. Weaver recounted how the one hundred and sixty thousand individual folders arrived at the Yale Press offices in wooden boxes specially constructed to avoid compression and possible damage to the printed surfaces. Each folder was inspected, folded, interleaved with a slip-sheet, and manually inserted into its portfolio box together with a “Commentary” volume. Finally the portfolio box and the “Text” volume were inserted into a slipcase and boxed.

Yale Art School students were engaged to help assemble the folders. For some it was their first encounter with the Albers color course, which, although it
continued to be a course option taught by other instructors, was by 1963 already losing the master’s imprint.

The Reception of *Interaction of Color*

When *Interaction of Color* was released to the public in 1963, Yale University Press promoted its unconventional format, its “un-bookness” (fig. 8). Reporters in daily newspapers dutifully recounted the book’s vital statistics, and especially its high price. Reviewers in professional journals cited Albers’s mastery of color, articulated in the book, as a reason that his practices were distinct from the apparently arbitrary use of color associated with the rising group of “color field” painters. Critics like Nancy Malone, who had some experience of Albers’s teaching, pointed out the complexity of *Interaction of Color*. Malone advised her readers to have “a comfortable chair, a large table, and a good bit of time” to come to grips with this “very large book [which] cannot be assimilated quickly. In fact,” she continued “any attempt to comprehend it at one sitting or skim it for its flavor, is guaranteed to result in visual dazzlement and intellectual bewilderment.... Begin slowly.”27 Howard Sayre Weaver cautioned, “Before it will be truly rewarding, *Interaction of Color*—like Josef Albers himself—will be demanding. It is to be looked through and used, as a sort of grand passport to perception.”28

By the beginning of 1968 *Interaction of Color* had sold out. Most of the two thousand copies had gone to museums and collectors or to schools and libraries, where they were invariably treated as precious objects. In many places, if students were allowed to consult them at all they were required to wear white gloves and submit to the vigilant supervision of an instructor or librarian.29

Although complete German (1972) and Finnish (1978) editions of *Interaction of Color* were published subsequently, these did not satisfy the demand for the book from the English-speaking world, and so in 1971 Albers adapted it into a smaller pocket edition for Yale University Press (reprinted in 1974). This edition and later paperback versions reproduced the entire original text but with only ten color plates. The book was used frequently as a textbook in schools, where students often had access to the original publication in their libraries, and sales soared. Editions in Japanese, French, Spanish, Swedish, and Italian followed German and Finnish paperback editions. With the exception of the Japanese and Swedish editions, all remain in print. The paperback has been revised and expanded and currently contains many more color plates than the original one. Portuguese, Korean, basic (or simplified) Chinese, Hungarian, and Norwegian editions have been added. With the publication in 2014 of Estonian

Close to a half million paperback copies of *Interaction of Color* have been sold worldwide since 1971, and demand shows no signs of slowing. In 2009 Yale University Press published a deluxe two-volume “New Complete” edition—one volume containing the original “Text” and “Commentary,” the other containing all the original plates reproduced by a four-color digital process. Most of the students, artists, designers, architects, and members of the general public who now buy and study *Interaction of Color* do so without ever having seen the original edition or having the screen-printed color plates to guide them. Many are unaware of the existence of the 1963 portfolio.

The App

In 1994, after several years of development, Yale University Press, in collaboration with the Josef and Anni Albers Foundation, published an electronic version of *Interaction of Color* with software available on floppy disk and CD-ROM. Although for its time this was a groundbreaking effort, it was problematic. The program was clunky and cumbersome; it was created for the Macintosh computer—the only hardware that could support such an effort—at a time when very few people besides graphic designers used Macs; and technology was changing so rapidly that the cost of updating the software was financially unsustainable. Though welcomed by teachers of color courses and their students, it was technically and economically unviable.

As a result, in 2010 the publishers of *Interaction of Color* decided that the fiftieth anniversary of the original edition, 2013, was the perfect time to reincarnate Albers’s now classic masterwork in digital form. With a concerted effort and substantial investment the new App was born, taking advantage of all the ca-
Seamlessly woven into the App is an introduction with a video of Albers, short video explanations of some of the more complicated studies, and testimonial videos by artists, architects, and designers. Text and plates run side by side so that the commentaries are easily integrated into the viewing experience. There is also a complete section titled “Create” in which users can select from five hundred and twenty-six colors to create, save, and share their own studies. The beauty of this new *Interaction of Color* is the elegance with which all the parts of the original have been layered, with no loss of design or content. Retaining Albers’s design had been an absolute requirement, and the developers embraced the challenge in true Albersian spirit.

**Conclusion**

The idea at the core of Albers’s educational philosophy, that learning is a collective and social process, is enshrined in *Interaction of Color*. It is expressed from the very beginning in Albers’s dedication of the book to his students and in his acknowledgement of their role as the original creators of the color studies. Nevertheless, the belief persists that *Interaction of Color* is a book about Albers’s color “theory” and that the color plates serve as demonstrations of that presumed theory.

But *Interaction of Color* is not a theory, a treatise on color, a textbook, or a teaching manual. It is the demonstration of a method of sharpening the eye toward increased color perception and discrimination so that readers will come to a nuanced understanding of how color behaves. In Albers’s own words, it is simply “a record of an experimental way of studying color and of teaching color.”

**Notes**


7. Albers, who had quickly risen from being a student to the position of Geselle, or journeyman, in Weimar, was made a Jungmeister (junior master) when the Bauhaus moved to Dessau in 1925. See Danilowitz, “Teaching Design,” 25. Although Hirschfeld-Mack, a former student, was not officially a Bauhaus master, it was he who gave the first, and unofficial, color course at the Bauhaus in Weimar in the winter semester of 1922–23. See Rainer K. Wick, Teaching at the Bauhaus (Hatje-Cantz: Ostfildern, 2000), 113, cited in Andrew McNamara, “The Colour of Modernism: Colour-Form Experiments in Europe and Australia,” in Europa! Europa? The Avant-Garde, Modernism and the Fate of a Continent, ed. Sascha Bru et al. (Berlin: Walter de Gruyter, 2009), 502.


9. For a more detailed discussion of color systems and theorists of this period and their relevance to Albers, see Horowitz and Danilowitz, Josef Albers, 195–97.


16. Josef and Anni Albers Foundation archive, Josef Albers Papers Box 80, Folder 44 (2).


29. The information in this and the following section is based on the author’s own experience while collaborating with Yale University Press and from conversations with staff members of the Yale University Press.

30. For information on the App developed for the Apple iPad, see the iTunes Store or http://yupnet.org/interactionofcolor/.