

MAKING SENS OF COLOR

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“Ridgway” was the only color guide available and used by mushroom collectors for a half-century ... American authors adopted the tradition of placing Ridgway colors between quotation marks, so everyone knew the ground rules.

The first section of this paper is a short quiz to show the importance of accurate citation of colors and their sources. The second section is a series of small vignettes about my own experience with color books and those of some others. The final part is an outline of color books throughout mycological history, through which to see what has been used and why the art is not as exact as might be desired. I suspect that, just as many of us collect mushrooms like charms on a bracelet or a life-list for birders, there might be some folks who collect color manuals and the outline which finishes the paper might be of interest.

One of the tenets of science is the reproducibility of data. If the same experiment is performed in the same way, with the same materials, the result should be the same. Inherent in this is that experimental conditions should be exactly the same—the result might differ if one worker uses mice while another uses ferrets. It’s a good thing to agree on the terms of the experiment, lest we wander from the straight and narrow.

For field mycologists (that’s most of us, just in case you didn’t recognize yourself), our goal is to arrive at the same name for a mushroom, but we must be careful to use the same features

of the mushroom to get there, and some of those features are expressed less accurately than we might wish. In this paper, I want to dwell on the variable of color. We could equally delve into odors and tastes, perhaps even less fastidiously reported as color.

So here we find ourselves with some mushrooms and a short bookshelf full of literature, with our life depending on the conclusion of our search (not usually, but now and then). We are confronted with the following: “cap the golden yellow of a tulip popular forest in the declining horizontal light of late fall.” What if you are an Oregonian and never saw a tulip poplar, much less in October on a clear day. Maybe something as simple as “yellow.” Lemon? Canary? Egg yolk (chicken or duck)? Banana? None of these brings the exact same color to the mental eyes of more than one person. In short, some codification, some shorthand, some system is needed to express colors so that all field mycologists can enter the search for names on a level playing field. For a somewhat different slant on this, including some deep history, see: Nicholson, R. 2013. *Natural History* 121(5): 18-27.

Here’s the quiz. How would you interpret each of the following actual citations:

1. “Tubes short ... a peculiar muddy yellow-brown (about ‘Isabella color’ to ‘Saccardo’s umber,’ Ridg.)” “Pileus ... bright yellow fading to pale yellow (‘cadmium yellow,’ ‘deep chrome,’ or ‘yellow ocher’ when moist, paler

when faded) ...” “Ridg.” Refers to *Color Standards and Color Nomenclature*, by Robert Ridgway (Fig. 1), where individual color chips (Fig. 2) are given names (as well as plate, column and row designations which have never been used). “Ridgway” was the only color guide available and used by mushroom collectors for a half-century. Understanding that color names dreamed up and bestowed by an author might be less precise than colors matched and selected from a color guide, American authors adopted the tradition of placing Ridgway colors between quotation marks, so everyone knew the ground rules. Source: Coker, W.C., and A.H. Beers. 1943. *The Boleti of North Carolina*. University of North Carolina Press, Chapel Hill; (p. 84 under *B. punctipes*).

2. “Pileus ... warm buff to honey brown when moist (5E4 to 5D4), drying somewhat lighter, especially at the margin (5C4 to 5B3) ...” This more popular and familiar code refers to Kornerup & Wanscher (a.k.a. *Methuen Handbook of Colour*). The English translations of this manual (Fig. 3) have been popular for many years but are currently out of print (although available through various online marketplaces). Pains have been taken by the publishers to have the colors printed by the same company using the same inks so that all editions, in whatever language, are consistent. Source: Lennox, J.W. 1979. *Collybioid genera in the Pacific Northwest. Mycotaxon* 9: 165; (under *Baeospora myosura*).

3. Here’s another try. “Pileus ...when

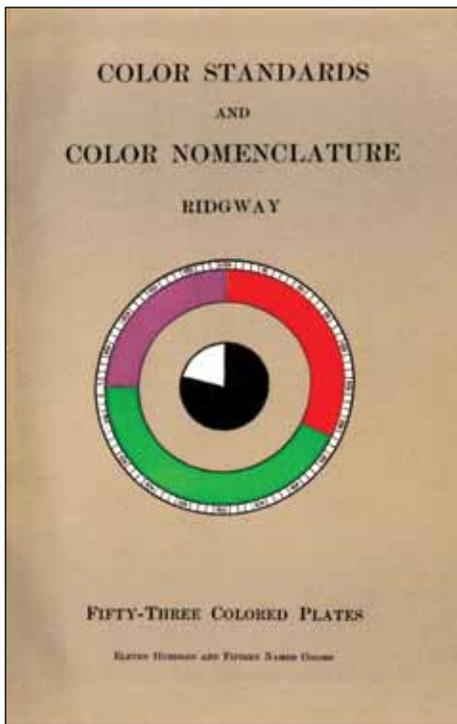


Figure 1. Soft cover of Ridgway's 1912 *Color Standards and Color Nomenclature*. In some copies, this cover has been deleted in favor of a buckram ("hard") cover. Note the color wheel in which the colors are not primary (red, blue, yellow).

moist dark yellowish brown (Mu. 10 YR 5/6), slightly paler towards margin (10 YR 6/6) and slightly darker at centre [there's a tip-off] (10 YR 4/4 to 4/6) ... The authors have given two clues: First, the "Mu" refers to Munsell (Fig. 4) (but not which of the scores of Munsell sources); and second, they're not from the United States. Source:

But later, I came to know that Alex [Alexander H. Smith] thought he knew Ridgway's color manual so well that he had "memorized" all the common colors and so didn't have to open up the book each time for reference.



Figure 2. One plate from Ridgway, 1912. Note colors are mounted on gray background and extend from white to black. Orange would come close to "orange cinnamon."

Antonin, V., and M.E. Noordeloos. 2010. *A Monograph of Marasmioid and Collybioid Fungi in Europe*.

IHW Verlag, Germany; (p. 257 under *Gymnopus bisporiger*).

4. "Pileus orange, orange-cinnamon,

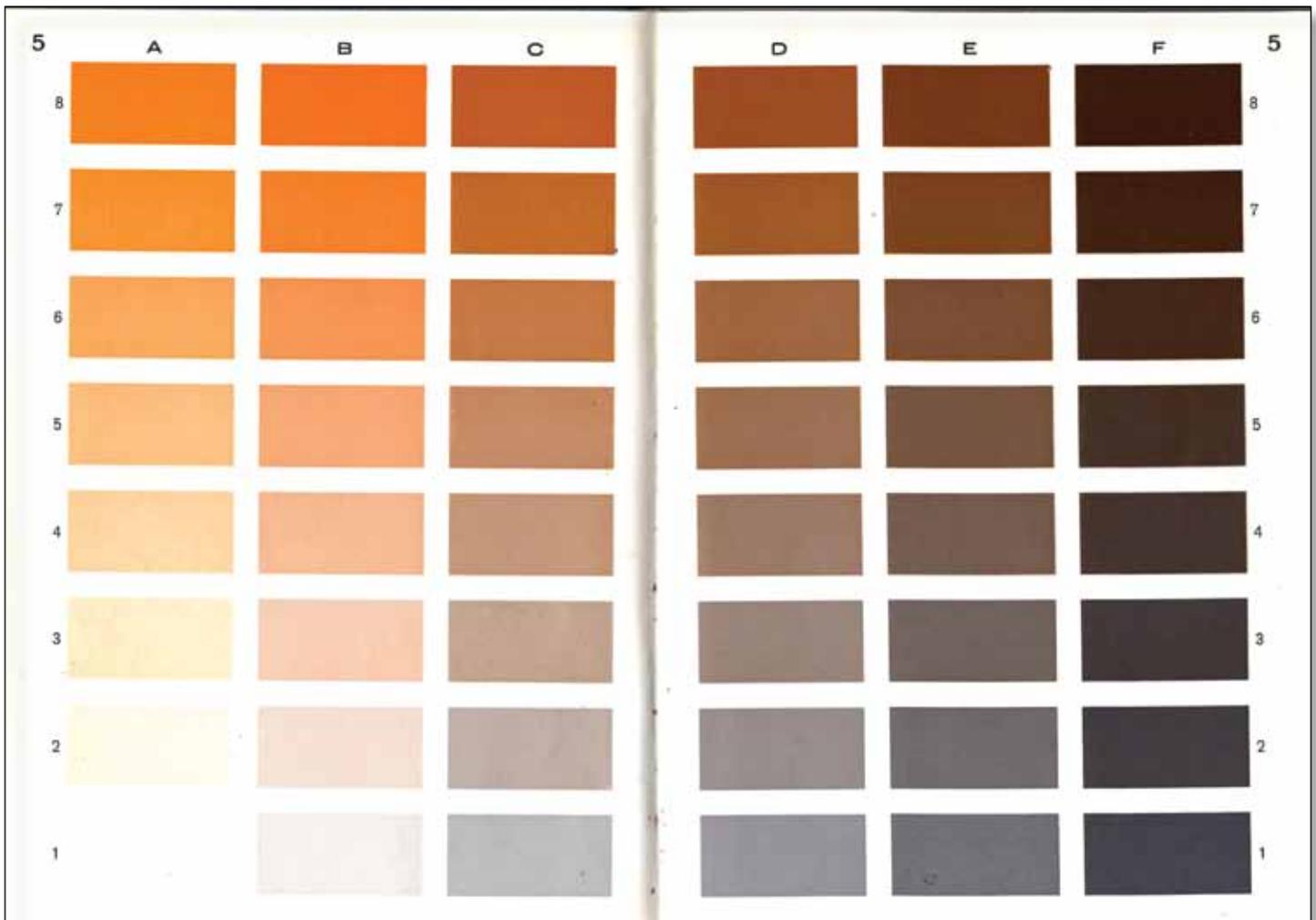


Figure 3. Two pages from Kornerup & Wanscher, 1967, English edition. Colors are cited as chart number followed by horizontal axis followed by vertical axis. Orange would be cited as 5A8.

salmon orange, deep brownish orange, ochraceous yellow, when fresh ("Morocco," "apricot," Ponce de Leon, 10-D-9, 10-H-7) ..." The former cannot be Ridgway colors: they do not exist in Ridgway (more on Ridgway below). The latter cannot be Methuen citations, for neither exists in Methuen. They are, in fact, as stated by Singer, from Maerz and Paul (1930. *A Dictionary of Color*). Source: Singer, R.1976. *Flora Neotropica, Monograph 17*; (p. 199 under *Marasmius pusio*).

5. Here's a tough one. "Chapeau ... typiquement pourpre noir K 580, S 41 et 56, Presque noir en centre, rarement avec des places jaunes K 166 comme che Turci ... jaune ochracé avec une pointe de verdâtre K 171 + 178 D, ou finalement jaune vert, K 177 dilué ou verdâtre, K 153 D ..." Romagnesi refers to a color scheme by Marcel Locquin, hardly known outside France, and even then only ephemerally. *Chromotaxia* was

a system of filters which in combination created a myriad of colors and hues. The filter combination could be cited as letters (signifying a subset of filters) followed by numerals (specific filters), often followed by the position of the filters in sequence. Thus "R 40 G 10 Y 05" produced a color, which happened to correspond to Ridgway's "cinnamon." Moreover, Romagnesi (pp. 149-157) furnished tables as concordances of Ridgway colors to *Chromotaxia* filter notations. Unfortunately for students of *Russula*, *Chromotaxia* never established traction in the US and disappeared as quickly as it had appeared. Source: Romagnesi, H. 1967. *Les Russules d'Europe et d'Afrique du Nord*. Bordas, Paris; (p. 452 under *R. torulosa*).

6. Finally, how about "Pileus ... color variable (pale carrot color to dull carrot-red or dull vinaceous-red to vinaceous brown) often sordid in age as the olive staining becomes apparent." Sorry, it's

a trick question. Regrettably, nothing here from any color guide. You're on your own. Source: Hesler, L.R., and A.H. Smith. 1979. *North American Species of Lactarius*. University of Michigan Press, Ann Arbor; (p. 92 under *L. deliciosus* var. *areolatus*).

In the late 1960s I found myself in northern-most Idaho as part of Alexander Smith's travelling mushroom entourage. Alex was fond of early morning fly fishing and like as not, would show up for breakfast having already bagged a couple of trout. One morning he reported that during the previous evening, he "wrote up seventy-four numbers." That is, he had processed (wrote notes, took photos, placed on the drier) 74 collections made the previous day. Now, I had trouble working up more than ten (at that time, colorful *Ramaria* collections). But later, I came to know that Alex thought he knew Ridgway's color manual so well that he

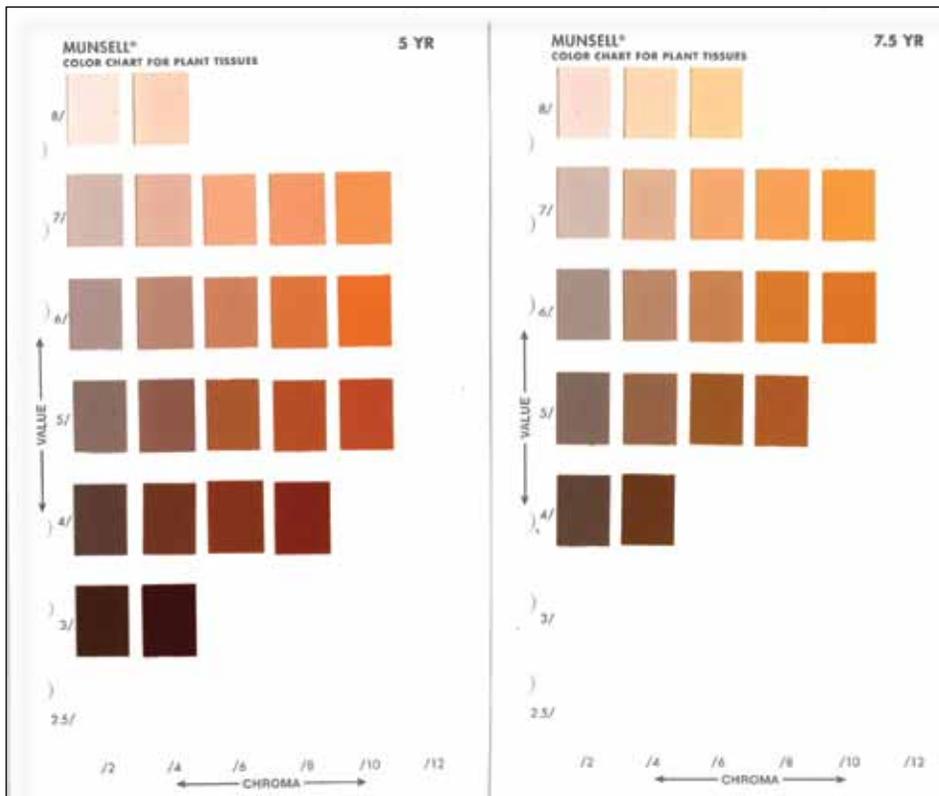


Figure 4. Two adjoining charts from the *Munsell Color Chart for Plant Tissues*. Colors are cited as chart designation followed by vertical axis, followed by horizontal axis. Orange could be 7.5 YR 7/10 (it would also be close to 5 YR 7/10).

had “memorized” all the common colors and so didn’t have to open up the book each time for reference. Just one of the ways he entered notes on his famous 6 × 8” index cards.

The estimable Dan Stuntz in the Pacific Northwest had his own methodology. Sifting through his specimen notes, one often is confronted by something like “l.o.b.” (Sounds a bit like something a teenager would text on a smart phone.) After some experience, this transcribes to “light ochraceous buff” of Ridgway. During a lifetime of mushroom research, Dan probably saved a couple weeks’ time by not writing color names in full.

In the mid-1980s, on one of my first trips to China, I brought along (as usual) my well-worn copy of Ridgway. Understanding that Chinese mycologists almost surely had never seen that color manual, I was amazed when two individuals said they also had Ridgway’s color book. Of course, I asked to see it, and what was produced was a facsimile of the book, with most plates closely (but hardly

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Figure 5. One fold-out plate from the *Online Auction Color Chart*. Colors are not named, but numbered alphanumerically. Orange might be Oac631 (but also would be close to Oac666).

exactly) approximating the originals. Of course, taking into consideration the age of the original at that time, Ridgway's admonition to keep the colors from prolonged direct light and the heavy use to which my copy had already been put, it is possible that the Chinese edition was closer to the original colors than my dog-eared copy. I have not been able to trace the Chinese book over the years, so I cannot report further.

In the 1960s, the redoubtable Kit Scates (-Barnhart) repeatedly hosted Alex Smith and his merry band for

collecting in northern Idaho and Pacific Northwest. Kit, in those years focused on "coral fungi" (*Ramaria*), which presented a wide variety of forms, statures, odors and colors. Her sense of color was stymied by lack of means of consistently citing colors, but her relationship with Smith, Stuntz and others afforded her opportunities to see Ridgway's color manual firsthand. Intent on possessing the guidebook for her own use, she gathered house-paint chips, scraps of cloth and yarn, clippings from magazines and any other object of appropriate color,

trimmed them all and glued them into a book to replicate Ridgway!

Toward the end of the decade of the 60s, Dan Stuntz had a student, Currie Marr, who took up *Ramaria* in western Washington. Recognizing that Ridgway was inaccessible (Stuntz's copy was closely held, for just at that time at least three of his students were working on fungi in which color was important), Currie turned to another color manual, the *Reinhold Color Atlas* (1962), later editions of which came to be called "Methuen" (for the publisher and short for *Methuen Handbook of Colour*, or "Kornerup & Wanscher" for the compilers). Once Kit saw this alternative to Ridgway, she acquired the second edition of Kornerup & Wanscher (1967). Michael Beug, who eventually "inherited" Kit's copy, reports that Kit paid \$9. Thereafter, she consulted copies of Ridgway (probably Stuntz's or Smith's copy) and assiduously and meticulously wrote Ridgway color names between the rectangles in Kornerup & Wanscher, again in an attempt to be able to understand color names in publications and to arrange her own notes so they could be deciphered later, either by herself or by future students. This vignette points up the need for standardization and codification of color designation.

L.R. Hesler (known respectfully as "Dean" for his years as Dean of the College) had a habit of wetting his thumb and forcing book pages back upon themselves when searching for an exact page. After many years of such treatment, his books accumulated black smudges at the lower right corner of every page. In particular, his copy of Ridgway not only exhibited the smudges of time, but many of the color plates were simply worn out, so the entire volume looked "dog eared." One can only imagine the quality of the colors after so much exposure and rough treatment. The one I remember was "clay color," which had flaked and chipped and bore little resemblance to Ridgway's original idea. But the Dean wouldn't "change horses in the middle of the stream," and he used Ridgway until his (Hesler's) last days.

To some extent, the world of professional agaricologists is somewhat dynastic (see the mycological genealogy by Blackwell and Gilbertson: Isb380.



Figure 6. An 18th century depiction of *Amanita muscaria* from Jacob Christian Schaeffer's book on Bavarian fungi.

plbio.lsu.edu/geneology). Although traceable through Calvin Kauffman (two volumes of *The Agaricaceae of Michigan*: 1918, vol.1 text, vol. 2 black & white photos) and E.B. Mains, Kauffman's

Michigan colleague, the effective scion of one dynasty was Alexander H. Smith, Mains' student. Smith was a died-in-the-wool devotee of Ridgway's *Color Standards*. Aware that only 500 copies

had been published (personally by Ridgway, without a publishing company), Smith nevertheless passed on his color preference to his students, among whom were Howard Bigelow, Harry Thiers,

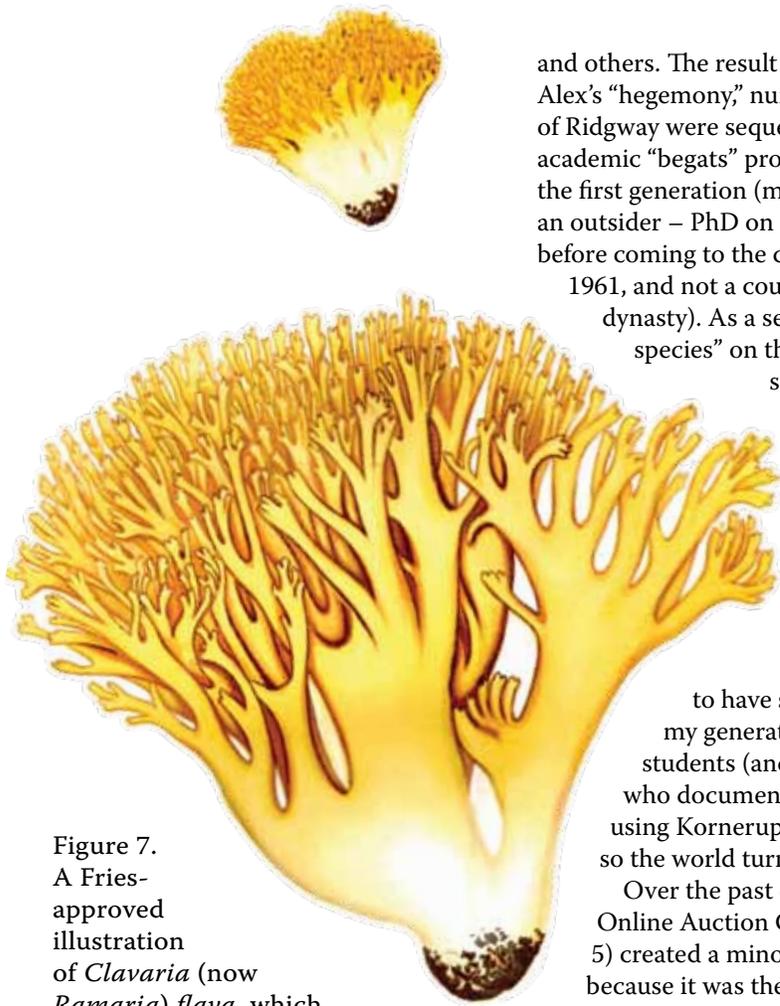


Figure 7. A Fries-approved illustration of *Clavaria* (now *Ramaria*) *flava*, which appeared in a popular Swedish volume on edible and poisonous mushrooms. Mid 19th century.

Dick Homola, Orson Miller and Joe Ammirati. But Smith's gravitational attraction was wider, and brought in Ken Harrison, Lex Hesler, Dan Stuntz

and others. The result was that among Alex's "hegemony," numerous copies of Ridgway were sequestered. But the academic "begats" proliferated beyond the first generation (mine was that of an outsider – PhD on aquatic fungi before coming to the coral fungi in about 1961, and not a courtier in the Smith dynasty). As a self-taught "invasive species" on the landscape, I

succeeded and lauded Hesler, and following him adopted Ridgway as my colorometric bible. Unremarkably, the Ridgway regimen seems to have stopped with my generation and my ex-students (and their students) who document mushroomoids using Kornerup & Wanscher. And so the world turns.

Over the past decade or so, the Online Auction Color Chart (Fig. 5) created a minor fad, not only because it was the only available color guide for Americans, but because it sold for 75 cents! Folks with students and friends bought them in some quantity and passed them out as gifts. Unfortunately, the company has disappeared and its color chart can no longer be found at its original price.

Faced with the problem of remembering and communicating

exact colors exhibited by a particular mushroom, some mycologists have attempted to illustrate the colors they see. Even before the "modern era" of mycology, 18th century workers depicted the mushrooms of their areas. Jacob Christian Schaeffer was one (Fig. 6). No less a "Founding Father" than Elias Magnus Fries commissioned literally thousands of watercolor mushroom portraits and published many of them (not nearly the whole treasury) in color lithography (Fig. 7). These tomes have been revered for well over a century. The famous Danish mycologist, Jakob Lange, followed suit in 1935 with five sumptuous volumes of plates and descriptions. The wonderful book, *Mr. Jackson's Mushrooms* is a collection of beautiful, true-to-life watercolors (Fig. 8). Such pursuits have survived the incursion of black & white photography, color images on film and most recently even memory chips. All these techniques, however, require skills beyond the uncomplicated use of color guides—for watercolor images, color pigment mixing, eye-to-hand coordination and extended time (a single painting takes me 2-4 hours); for photography, lighting, positioning, exposure and Photoshop-ing. All of this is beyond the scope of the present writing, but remains a serious occupation especially in Europe, where the most popular mushroom field-guides use watercolor illustrations of the species.

Using my cover as Historian of the Mycological Society of America, I've



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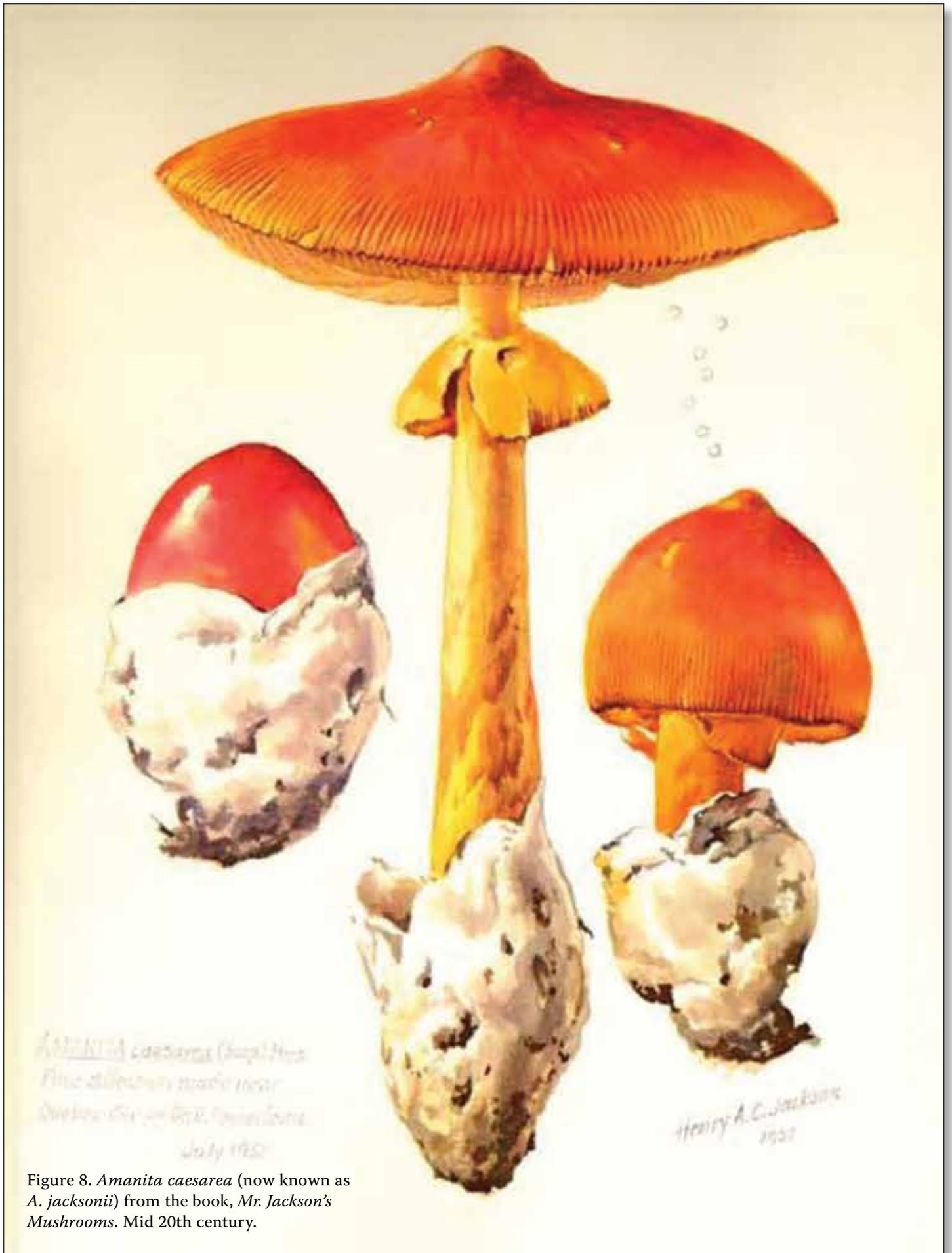


Figure 8. *Amanita caesarea* (now known as *A. jacksonii*) from the book, *Mr. Jackson's Mushrooms*. Mid 20th century.

carried out a strictly unofficial, off-the-cuff, uneven survey using an insufficient sample of friends and associates to see what color guides are being used around the world.

A regrettably very weak sampling of North American mushroom enthusiasts indicates that most do not use a color guide at all, relying on keen eyes and memory. It is thought that good photos supply sufficient information. Reliance on eyes and memory seems also to be the case in much of Asia, where use of Kornerup & Wanscher (1967 and later) is sporadic at best. Dennis Desjardin reports that in South America, a few labs use the Spanish edition of Küppers' (1979) color guide.

Understandably, in the British Isles and elsewhere across the former British Empire, a color guide in popular use is the *Flora of British Fungi: Colour Identification Chart* (1969) part of the British Fungus Flora series, published by the Royal Botanic Gardens, Edinburgh. Neale Bougher in Australia reports that it is in general use there (alongside the color chart in *Fungi Down Under*, 2005; Fig. 9). I know of no one using these resources in the United States, perhaps because it has been some time since we were part of the British Empire(!).

For Asian workers, there are, of course, multiple obstacles affecting use of common color manuals with English titles or color names, namely language and accessibility. Kentaro Hosaka (Tsukuba, Japan) reports that perhaps the majority of Japanese mushroom collectors do not use a color manual, approximately parallel to the situation in the United States. But he also furnished some Japanese color resources about which I had never heard. At least one comprises the color charts for house paint, a suggestion which might be attractive to mushroom enthusiasts in North America. Of course, just the reverse obstacles stand in the way for English-speaking workers; how to read even the publicity about these products and how to obtain them (given the language problem). Here are a couple web sites which are self-explanatory: <http://www.dic.co.jp>, apparently a small company whose colors are expressed in long, complicated designations (e.g. green = C100Y0M80K30). It is suggested that mere reference to the use of the



Figure 9. A single page from the color charts of *Fungi Down Under*, 2005. Many colors are less relevant to those usually found in mushrooms, but help make the spectrum more complete. Orange could be “Brown-orange 40” (but could also be close to “Red-Orange-Yellow” 107).

catalog is sufficient, without citing the particular designations. *JPMA Standard Paint Colors* are accessible at <http://toryo.or.jp/jp/color/index.html>. Less-used Japanese resources include Iro-no-Techo (2002. <http://www.shogakukan.co.jp/books/detail/>. ISBN 4095040025) and *Concise Manual of Color Names* (1996, Dainippon Insatsu. ISBN 4901355023). Otherwise,

several of the English language manuals and guides are used sparingly: *Flora of British Fungi* charts; Munsell (in Japan sold as *Pantone Plus Series Color Bridge*), Rayner; Methuen; and *On-line Auction Color Chart*. Thanks to Kentaro for this fine report.

The mycology lab at the University of Washington seems unusually richly endowed with color guides. Joe

Ammirati reports “I use Ridgway and Methuen the most, sometimes Munsell, most often the *Munsell Soil Color Charts*. I have the 1961 version of the *Reinhold Color Atlas*, which we called ‘Korernup and Wanscher.’ For reference I have Maerz and Paul and also *ISCC-NBS Color Guide*.” It could be imagined that Dan Stuntz amassed the nucleus of the collection and passed it on, as he did the rest of his fabled mycological library, to the University with the proviso that it be housed in the mycology lab there.

I suppose that after such a discussion of color codes, some recommendation is owed. What is available, how readily, and at what cost? Some thoughts follow.

At the outset, I am sorry to report that I attempted to contact the Methuen Publishing Company, which listed the latest printing of its *Handbook of Colour* as November, 2014. Was this true? If so, rescue was on the way. Regrettably, I have not received anything from them—not even acknowledgement of my message.

In the use of a color code, two audiences must be served. The first, the collector him- or herself, has a readily available code of color names. A trip to Lowe’s or Home Depot can produce the color palette of house-paint companies (as is sometimes used in Japan). Color chips can be harvested and assembled into a very complete spectrum, almost always with catchy names as memory aids. These chips are quite stable and can be used for years. Because paint companies constantly change color names, care must be taken to date the chip collection.

The second audience, however, is the rest of the mushroom-collecting world, and it has no idea of what such color names mean unless they are told of the source. The source must be repeated every time a color name is used (e.g. in quotation marks, but only if this usage is clearly explained, lest it be confused with the tradition surrounding Ridgway colors). These days, whole personal collections of specimens may be donated to reputable institutional herbaria, where they can be preserved intact, examined by future mycologists and specimen data added to databases toward distribution patterns and other “meta-data.” If specimen notes accompany the specimens, and if they cite colors from some public source, the source should be

repeated for each specimen.

America does not lack for mycological (or mushroom) societies and/or clubs. One interesting project might be a discussion of the color problem and agreement that all members of a club use the same color source. In this way, at least some local commonality can be attained.

In the absence of a universal color guide, current photography offers an alternative. While photos in nature can be informative and provide excellent materials for PowerPoint shows, archival photos—fruitbodies on a standard gray card with a specimen number inserted as a metric scale—can be invaluable for future workers. These days, such images can be bundled with notes and collection data in a herbarium database. The result

is a 21st century mushroom collection ready for the future.

The final part of this paper comprises a bibliography of color manuals which have been used by mycologists over the years. It is heavily annotated to make it more informative and readable. In reality, it can serve as a reference source.

Supplement to “Making Sense of Color,” by Ron Petersen

In the outline below are listed color guides with two qualifications: 1) I know about them; and 2) they have been, or are being used by taxonomists of fleshy fungi. They are arranged by the date of their earliest appearance (e.g. Kornerup & Wanscher’s earliest

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color manual was a German edition, not English, and appeared a couple years before the one with which we are most familiar).

In the list below, names of authors of color manuals are in **bold** face, while articles ABOUT these color manuals are in normal type face.

NOTES ON COLOR GUIDES USED IN MYCOLOGY

Chevreul, M.F. 1839. *De la loi du contraste simultané des couleurs et de l'assortiment des object colorés*. Paris, A. Hope und M. Walsh.

Chevreul, M.F. 1860. *The Laws of Contrast of Colour*. Henry G. Bohn, London.

Gage, J. 1993. *Colour and Culture, Practice and Meaning from Antiquity to Abstraction*. Pp. 173-176. Thames and Hudson.

From web page: www.colorsystem.com/?page_id=792&lang=en
“The purpose of the system is to establish a law of ‘Simultaneous Contrast.’ Leonardo da Vinci had probably been the first to notice that, when observed adjacently, colours will influence each other. Goethe, however, was the first to specifically draw attention to these associated contrasts. Chevreul designed a 72-part colour-circle whose radii, in addition to the three primaries of red, yellow and blue, depict three secondary mixtures of orange, green and violet as well as six further secondary mixtures. The resultant sectors were each subdivided into five zones and all radii were separated into 20 segments to accommodate the different brightness levels. This is the first time that we have been confronted with the active role of the brain in the formation of colours, and we should once more remind ourselves that colours are also effects which are created in the world inside our heads.”

Prang, L. 1897. *The Prang Standard of Colors, Special edition*. Published privately, Boston. Preface + 41 plates [digitized by Google, 8.VIII.2008]. The compiler became well-known for a line of “Prang’s Crayons” which utilized Prang’s system of color.

Lloyd, C.G. 1899. *Mycological Notes* (No. 2): 10-11. A review of “Prang’s Standard of Colors” published by Louis Prang, Boston, MA. Price 50 cents.

Includes 1176 separate shades of color. Formula citations (“20Y03”) seem close to Methuen system.

Klincksieck, P., and Th. Valette. 1908. *Code des Couleurs à l’Usage des Caturalists, Artistes, Commerçants et Industriels*. 81 pp., published privately, Paris [720 plates of color classes, adapted and simplified from the Chevreul method]. Klincksieck was “a member of diverse botanical and zoological societies” [transl.], and Vallette was “chemist à Manufacture Nationale de Gobelins.”

Notices in *Bulletin of the Botanical Society of France* and *Bulletin of the Mycological Society of France* 22 (1906) preceded appearance of the color manual and advertised the methodology of Chevreul. As part of that introduction, the authors wrote [transl.] “The Swedish savant, E. Fries, died in 1878 at the age of 84 years, and consecrated the existence of all work on mushrooms, using 840 names to designate the colors of these fungous vegetables. From this considerable number, there are 16 denominations for nothing more than white!”

Lloyd, C.G. 1906. *Mycological Notes* (No. 21): 245-260. [Notice on new color book by Klincksieck, Paris.]

Lloyd, C.G. 1909. *Mycological Notes* (No. 33): 426-444. Lloyd was enthusiastic when he learned that Klincksieck was planning a new color book, but Klincksieck abruptly died, and the book which appeared was, in Lloyd’s estimation, inadequate. Too few colors, all numbered, not named. Lloyd called for a better reference book.

[*Tableau de Concordance Entre le Code des Couleurs de Saccardo, et Ceux de Klincksieck & Valette et de Seguy*, pp. 507-508, In: Kühner, R., and H. Romagnesi. 1953. *Flore Analytique des Champignons Supérieurs*. Masson et Cie, Pais. 554 pp.]

Early monographs by Singer cited color notations followed by “K,” signifying Klincksieck.

Ridgway, R[obert] P. 1886. *A Nomenclature of Colors for Naturalists and Compendium of Useful knowledge for Ornithologists*. 131 pp +10 cl. pls. Boston, Little, Brown & Co. An online facsimile can be viewed at: <http://lhldigital.lindahall.org/cdm/compoundobject/collection/color/id/12274/show/12101/rec/3>.

Inspection shows that color blocks were painted individually (significant

brush-stroke imperfections are evident, many rectangles were not fully filled, and no evidence of cut-and-glued papers.

Ridgway, R. 1912. *Color Standards and Color Nomenclature*. Published privately, Washington, DC. 43 pp + 53 pls. An on-line facsimile can be viewed at: <http://lhldigital.lindahall.org/cdm/compoundobject/collection/color/id/23684>.

My copy has evidence of being originally soft-bound, with a slightly heavy-duty paper cover bearing the information above. The outer, dark green buckram hard cover incorrectly cites the title as “*Color Standards and Nomenclature*.” My copy has autographs of two notable former owners: S.M. Zeller, 1919, \$8.00, and Helen Gilkey, 1949, \$25.00 as well as mine, 1991, \$125.00. An excerpt from an e-mail from Jim Trappe (Oregon State University), dated 28.X.2011: “Dr. Gilkey gave her copy to me but we already had one (which since has disappeared). I lent it to someone—this was 30 yrs ago and I don’t remember who. When our other copy went missing, I wanted to get the other one back but didn’t know who it was. So, now I know its journey and am happy to see it’s back in good mycological hands.” In addition to the mycological signatures above, my copy (RHP) bears two additional names: E.J. Larrison and W.H. Baker, both in ballpoint pen (for dating purposes) and printed by the same hand. Recently (about 2012), a more or less pristine copy was appraised on “Antiques Roadshow” at \$750.00 and an advertisement from a contemporary used book dealer has the same price.

An eyeball concordance of Ridgway versus Methuen colors may be found at: <http://www.bio.utk.edu/mycology/color/color-intro.htm> (A similar concordance of Ridgway colors and Munsell notations, devised by Bill Cibula, exists. Thanks to David Lewis, I have seen a copy, which is an Excel file not reproducible here.)

Illman, W.I., and D.H. Hamly. 1948. A report on Ridgway’s color standards. *Science* 107: 626-628.

Hamly, D.H. 1949. Robert Ridgway’s color standards. *Science* 109: 605-608.

Hamly, D.H. 1949. The Ridgway color standards with a Munsell notation. *Journal of the Optical Society of*

America 39: 592.

Much useful information can be gathered from Ridgway's (1912) introduction. On page 3 he referred to the "color wheel and Maxwell's disks," figured on the soft front cover, and indicating the roots of Ridgway's system. Numerous other sources were listed on page 11, together with sources of the plates of previous color guides (pp 11, 14). The method of production of the 1912 plates was outlined on page 13, and on page 17, Ridgway referred to "A color notation by A.H. Munsell." The most direct philosophical provenance is related on page 26 in the title of a table: "Dyes and pigments used in the preparation of the Maxwell discs, representing the thirty-six colors of the pure spectrum scales, forming the basis of the color scheme of this work."

Saccardo, P.A. 1891. Chromotaxia: seu, Nomenclator colorum polyglottus additis speciminibus coloratis ad usum botanicorum et zoologorum / exposuit P. A. Saccardo. (Patavii : Typis Seminarii) (page images at HathiTrust; US access only).

Saccardo, P.A. 1894. Chromotaxia: seu, Nomenclator colorum polyglottus additis speciminibus coloratis ad usum botanicorum et zoologorum / exposuit P. A. Saccardo. (Patavii : Typis Seminarii) (page images at HathiTrust; US access only).

Saccardo, P. A. 1896. Chromotaxia: seu nomenclator colorum polyglottus additis speciminibus coloratis ad usum botanicorum et zoologorum: exposuit P.A. Saccardo. (Patavii: Typus Seminarius) (page images at HathiTrust; US access only).

Munsell color guides. (see also ISCC-NBS centroid color charts) The Munsell Company has made a niche industry out of color, color identification, color matching and color standards for many industries and crafts. Here, surely some of their books and charts have been missed, mostly because they would be relatively irrelevant to mycological pursuits. Some of the more fanciful color ensembles – for mycologists – are those which furnish color swatches for USDA frozen French-fried potatoes, canned ripe olives, grade A & C tomatoes, frozen red tart cherries and pumpkin/squash. Appropriate chips for these standards are available on-line at somewhat more than \$100 each.

Likewise, several online entrepreneurs sell Munsell books of color, some of which are noted below.

Anonymous. Undated. *Color Measurement by the Disc Spinning Method*. Disseminated by Munsell Color Company. 2 pp.

Munsell Color Co. Undated. *Munsell System of Color Notation*. (Pamphlet distributed by Munsell Color Co.) 10 pp.

Munsell, A.H. 1922. *A Color Cotation*. Baltimore. (Listed in bibliography by Maerz & Paul, 1930).

The Munsell Color Company produced several lines of colored products, one of which was the Munsell Crayon Company, bought in 1926 by the Crayola Co. and incorporated into its line of wax crayons. In text, the following editions of Munsell color guides are outlined as follows:

Library edition, vol.1. 1929 as the "Standard Edition" from Kelly, K.L. 1976. *The Universal Color Language*. U.S. Dept. Commerce – see below under ISCC-NBS. "All Munsell notations determined from the Munsell Book of Color up to and including the 1929 edition, were called Munsell Book notations. After the publication in 1943 of the OSA (Optical Society of America) study of the spacing of the Munsell colors, all Munsell notations determined on the basis of the respaced colors in the 1943 Report were called Munsell renotations. This was to distinguish them from Munsell Book notations. After all Munsell colors were brought into conformity with the 1943 Report, and after sufficient years had lapsed that the term Munsell renotations had become of academic interest only, the term Munsell renotation has been replaced by Munsell notation." Two references pertain:

Dade, H.A. 1943. Colour terminology in biology. *Mycological Papers* 6. Imperial Mycological Institute, Kew.

Newhall, S.M., D. Nickerson and D.B. Judd. 1943. Final report of the OSA subcommittee on the spacing of the Munsell colors. *Journal of the Optical Society of America* 33.

Munsell Book of Color, Library Edition, vol. 2. 1942.

Pocket Edition (of Munsell Book of Color). 1942. (A combination of Library Edition vols. I and 2).

Auxiliary Charts of the Pocket Edition. 1942.

Neighboring Hues Edition. 1950. (All colors of *Library Edition* + *Auxiliary Edition*).

Opposite Hues Edition (of Munsell Book of Color). 1950.

Munsell Student (sets of color chips for assembly. Undated. In 6, 11, 21, and 42-chart groups.)

Munsell Soil Color Charts. (Editions as follows)

1946. Regular Format

1949. Special Format

1954 (untitled edition)

Munsell Book of Color. 1976. (Glossy finish collection of some 16,000 color chips on 40 plates.) A six-ring binder. The *Book of Color* was also produced in a matte version. David Lewis bought his glossy set for \$600 in 1981; it is still on the market for \$1025 in 2014, but the matte version is unavailable.

Munsell Color Chart for Plant Tissues. 1977 Edition (Six-ring binder with numerous color charts).

Wilde, S.A., and G.K. Voigt. 1952. The determination of Color of Plant Tissues by the use of standard charts. *Agronomy Journal* 44: 499-500.

Hamly, D.H. 1949. The Ridgway color standards with a Munsell notation key. *Journal of the Optical Society of America* 39: 592-599.

Judd, D.B., and D.H. Hamly. 1948. *Science* 107: 626-628.

Munsell, A.H. 1961. *A Color Notation, 11th Edition*. Munsell Color Co., Baltimore, MD.

Maerz, A.J., and M.R. Paul. 1930. *A Dictionary of Color*. 207 pp + 56 pls. McGraw Hill, NY. No overt mention of previous works, but they possessed the "magnificent" Munsell *Book of Color* (Standard edition, 1929). Also mentioned: "Chevreuls' classic works."

Maerz, A.J., and M.R. Paul. 1950. *A Dictionary of Color*. 208 pp + 56 pls. McGraw Hill, NY.

Singer, R. and A.P. Digilio. 1952. (Review) *A Dictionary of Color*, 2nd edition, by A. Maerz and M. Paul. *Mycologia* 44: 267-269. Actually a comparison to Maerz & Paul's 1st edition. A weakly supportive review pointing out glaring inadequacies. Thereafter, Singer began using Maerz & Paul—abbreviated as "M&P"—in mycotas and monographs.

Seguy, E. 1936. *Code Universal des Couleurs*. 68 pp + 48 pls. LeChevalier, Paris.

In scattered use in Europe through the

1960s, but relatively little-known. (See also under Klincksieck.)

Pastac, L.A. 1942. Les matières colorants des champignons. *Review of Mycological Memoirs*, hors ser. 2, 88 pp.

Plochere, G., and G. Plochere. 1948. *Plochere Color System, a Guide to Color and Color Harmony*. Fox Printing Co., Los Angeles. (See under Kelly, 1976, Illustration.)

Jacobson, E. 1948. *Color Harmony Manual, 3rd edition*. Container Corporation of America, Chicago. (See under Kelly, 1976, Illustration.)

Granville, W.C., C.E. Foss and J.H. Godlove. 1950. *Color Harmony Manual*. (Colorimetric analysis of third edition. *Journal of the Optical Society of America* 40: 265A.)

Dade, H.A. 1949. Colour terminology in biology. *Mycological Papers* 6 (2nd edition). (See also under Munsell.)

Locquin, M. 1953. Les colorations et les pigments chez les champignons supérieurs. *Bulletin de la Société mycologique de France*. 69: 326-331.

Locquin, M. 1977. *Repertoire des couleurs naturelles, Français, Allemand, Anglais, Latin, avec correspondances entre les codes: Chromotaxia et Guide des Couleurs Naturelles*. Ined., distributed by the author.

Locquin, M. 1977. *Guide des Couleurs Naturelles*. ODIMY 1(2): 25 pls. Distributed by the author.

Locquin, M. 1978. *Guide Abrégé des Couleurs. I. Verte et ocreas*. 6 pls. Distributed by the author.

1978. *Guide Abrégé des Couleurs. II. Bleus et Orangés*. 6 pls. Distributed by the author.

1978. *Guide Abrégé des Couleurs. III. Rouges et violets*. 6 pls. Distributed by the author.

1978. *Guide Abrégé des Couleurs. IV. Bleus et pourpres*. 6 pls. Distributed by the author.

Data on Kornerup & Wanscher, German edition, furnished by Jesko Kleine, Leipzig; on Reinhold edition by Joe Ammirati; other data from Andy Methven; and also from the web.

Kornerup, A[ndreas], and J[ohan]H[enrik] Wanscher. 1961. *Taschenlexikon der Farben. 1440 Farbnuancen und Farbnamen*. Zürich, Musterschmidt.

Kornerup, A., and J.H. Wanscher. 1961. *Reinhold Color Atlas. Guide to Accurate Color Matching*. (1st

English edition.) Reinhold Publishing Co., Printed by Politikens Forlag, Copenhagen with inks by Sadollin Holmblad Ltd., Copenhagen.

Kornerup, A., and J.H. Wanscher. 1963. *Farver I farver*. Politikens Forlag, Copenhagen, Denmark.

Kornerup, A., and J.H. Wanscher. 1963. *Taschenlexikon der Farben. 1440 Farbnuancen und Farbnamen*. Zürich/Göttingen, Musterschmidt.

Kornerup, A., and J.H. Wanscher. 1963. *Methuen Handbook of Colour*. (1st English translation.) Methuen & Co., London.

Kornerup, A., and J.H. Wanscher. 1967. *Farver I Farver*. (2nd Danish printing.) Politikens Forlag, Copenhagen, Denmark.

Kornerup, A., and J.H. Wanscher. 1967. *Methuen Handbook of Colour*. (2nd English edition, revised.) Methuen & Co., London. Plates were printed in Denmark by Anton M. Jensen, with ink from Sadolin and Holmblad, probably to preserve consistency of color and paper (Fig. 6).

Kornerup, A., and J.H. Wanscher. 1975. *Taschenlexikon der Farben. 1440 Farbnuancen und Farbnamen*. Zürich/Göttingen, Musterschmidt.

Kornerup, A., and J.H. Wanscher. 1978. *Taschenlexikon der Farben. 1440 Farbnuancen und Farbnamen*. (No detailed information found.)

Kornerup, A., and J.H. Wanscher. 1978. *Methuen Handbook of Colour*. (3rd English edition, revised.) Methuen & Co., London. This is 3rd English edition: reprinted at least three times; 1981, 1983, 1989, by Methuen & Co., London.

Kornerup, A., and J.H. Wanscher. 1981 (January). *Taschenlexikon der Farben. 1440 Farbnuancen und Farbnamen*. Zürich, Musterschmidt.

Kornerup, A., and J.H. Wanscher. 1998 (Okt.) *Taschenlexikon der Farben. 1440 Farbnuancen und Farbnamen*. Zürich, Musterschmidt.

Kornerup, A., and J.H. Wanscher. 2014 (Dec.) *Taschenlexikon der Farben. 1440 Farbnuancen und Farbnamen*. Zürich, Muster-Schmidt. (Apparently anticipated, but not yet available in February, 2015.)

(Some data on the following contributed by Andrew Methven, Charleston, IL.)

Inter-Society Color Council – National Bureau of Standards (ISCC-

NBS). 1965. *Centroid Color Charts. Standard Sample. No. 2106*.

From: en.wikipedia.org/wiki/ISCC-NBS_system. Includes the following:

“The ISCC–NBS System of Color Designation is a system for naming colors based on a set of 12 basic color terms and a small set of adjective modifiers. It was first established in the 1930s by a joint effort of the Inter-Society Color Council, made up of delegates from various American trade organizations, and the National Bureau of Standards, a US government agency. As suggested in 1932 by the first chairman of the ISCC, the system’s goal is to be ‘a means of designating colors in the United States Pharmacopoeia, in the National Formulary, and in general literature ... such designation to be sufficiently standardized as to be acceptable and usable by science, sufficiently broad to be appreciated and used by science, art, and industry, and sufficiently commonplace to be understood, at least in a general way, by the whole public.’ The system aims to provide a basis on which color definitions in fields from fashion and printing to botany and geology can be systematized and regularized, so that each industry need not invent its own incompatible color system.

In 1939, the system’s approach was published in the *Journal of Research of the National Bureau of Standards*, and the ISCC formally approved the system, which consisted of a set of blocks within the color space defined by the Munsell color system as embodied by the *Munsell Book of Color*. Over the following decades the ISCC–NBS system’s boundaries were tweaked and its relation to various other color standards were defined, including for instance those for plastics, building materials, botany, paint, and soil. After the definition of the Munsell system was slightly altered by its 1943 rennotations, the ISCC–NBS system was redefined in the 1950s in relation to the new Munsell coordinates. In 1955, the NBS published *The Color Names Dictionary*, which cross-referenced terms from several other color systems and dictionaries, relating them to the ISCC–NBS system and thereby to each other. In 1965, the NBS published *Centroid Color Charts* made up of color samples demonstrating the central

color in each category, as a physical representation of the system usable by the public, and also published *The Universal Color Language*, a more general system for color designation with various degrees of precision from completely generic (13 broad categories) to extremely precise (numeric values from spectrophotometric measurement). In 1976, *The Color Names Dictionary* and *The Universal Color Language* were combined and updated with the publication of *Color: Universal Language and Dictionary of Names*, the definitive source on the ISCC-NBS system.”

Judd, D.B. 1933. I.C.I. standard observer and co-ordinate system for colorimetry. *Journal of the Optical Society of America* 23: 359.

Judd, D.B., and K.L. Kelly. 1939. Method of designating colors and a dictionary. *Journal of Research of the National Bureau of Standards* 23: 355. RP1239.

Nickerson, D., and S. Newhall. 1941. Central notations for ISCC-NBS color names. *Journal of the Optical Society of America* 31: 587.

Nickerson, D., and S. Newhall. 1943. A psychological color solid. *Journal of the Optical Society of America* 33: 419.

Kelly, K.L., and D.B. Judd. 1955. The ISCC-NBS method of designating colors and a dictionary of color names. *National Bureau of Standards Circular 553*. Gov. Printing Office, Washington DC. Two webpages (Tx4.us/nbs-e.htm; tx4.us/nbs-1.htm) from the Texas Precancel Club references color names from the ISCC-NBS system with the colors themselves.

Kelly, K.L. 1958. Central notations for the revised ISCC-NBS color name blocks. *Journal of Research of the National Bureau of Standards* 61(5): 427-431.

Kelly, K.L. 1965. ICSS-NBS color-name charts illustrated with centroid colors. Standard sample #2106 supplement to *National Bureau of Standards Circular 553*. Gov. Printing Office, Washington, DC.

Kelly, K.L. 1965. A universal color language. *Color Eng.* 111(3): 2-7. (With biographical sketch.)

Kelly, K.L., and D.B. Judd. 1976. Color. Universal language and dictionary of names. *National Bureau of Standards Special Publication 440*. 158 pp. Dept.

Commerce, Washington, DC.

(Also instructive is: en.wikipedia.org/wiki/Portal:Color.) The 1976 document states that it “supersedes and combines” the 1955 document (Circular 553) and the No. 2106 supplement (1965). It contains a thorough introduction to the ISCC-NBS system, some examples and a lengthy concordance of color names from a variety of sources with ISCC-NBS color chart designations.

McKnight, K. Undated circular. A note on the ISCC-NBS centroid color charts. (Includes a table converting centroid color abbreviations into full words.) With the increasing unavailability of Ridgway and before the publication of Kornerup & Wanscher, the Mycological Society of America saw the need for a standard color guide for mycologists. A committee was appointed to begin conversation on the form, printing and cost of such a new color manual. As time passed, the committee’s meetings became sporadic and little was accomplished. With little fanfare, at least the German and Danish editions of Kornerup & Wanscher were published, and then the English version, and the urgency of producing a mycological color guide was obviated. Finally, after protracted delay, the ISCC-NBS color charts made their appearance. The MSA committee reported that these color guides could be used by mycologists, and with that, the committee was disbanded.

Moser, M. 1967. *Basidiomyceten II. Teil. Die Röhrlinge und Blätterpilze (Agaricales)*. Vol. II b/2 of Gams, H. Kleine Kryptogamenflora. G. Fischer, Stuttgart. 443 pp. (Inside the back cover is a single card with 56 color blocks mostly in the ochraceous to brown hues and many with indefinite shades within the same block. This is accompanied by a white card with a cut-out fitted to one color block, and also including a centimeter ruler partially divided into millimeters.)

Romagnesi, H. 1967. *Les Russules d’Europe et Afrique du Nord*. Bordas. 998 pp. Bound as extra pagination in the rear of the book is a single page with 10 color blocks ranging from off-white to deep ochraceous for comparison of *Russula* spore prints. Other contributions on spore color in *Russula* include Crawshay, 1930; Kibby and Fatto, 1990 and Buczacki, 1992. These are specialized, and are not covered further here.

Flora of British Fungi: Colour Identification Chart. 1969. Royal Botanic Garden of Edinburgh. One chart, triple-folded, with a total of 84 colors. Included are separate blocks for spore print color.

Rayner, R.W. 1970. *A Mycological Colour Chart*. Commonwealth Mycological Institute & British Mycological Society. 34 text + 9 color charts + 8 graphs (Fig. 9).

Küppers, H[arald]. 1979. *DuMont Farbatlas*. 268 pp, 116 pls. Barron’s Education Service, Inc. (Spanish language edition, Barcelona.) Original: German; other translations, English, Japanese.

Küppers, H. 1982. *Color Atlas. A Practical Guide for Mixing Colors*. 170 pp. Barron’s Education Service, Inc. Apparently digitized by University of Michigan, 2007.

Kueppers, H. Date unknown. *Die grosse Küppers-farbenatlas*. 225 pp, 96 pls. Collway, München.

Online Auction Color Chart. 2004. *The Online Auction Color Chart. The New Language of Color for Buyers and Sellers*. 12 color charts + 2 pp text (Fig. 10). A small flurry welcomed this set, which sold for 75 cents. Several mycologists bought multiple copies and distributed them to worthy students. The charts have not established traction, however, and their use is hardly noticeable. Patrick Leacock adds: “The Online Auction Color Chart (OAC) was inexpensive and could have been useful but went out of production about 2013 and the website is gone. Online records show that the 2013 filing for Trademark status was cancelled Oct. 5, 2012. There is a nice review of it here: <http://boletales.com/2011/01/new-colour-chart-for-mycologists/>.

Grey, P.M., and E.J. Grey. 2005. *Fungi Down Under: The Fungimap Guide to Australian Fungi*. Royal Botanic Garden, Melbourne. 146 pp + one-page color chart (Fig. 11). †

