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Imaging

Chromaxion™

The Newsletter of Interesting Imaging Stuff

Color in the Time of COVID¹

During this time of sheltering in place, many people are using the extra time to improve their baking skills, learning how difficult a teacher's job really is, and some are contemplating the deep mysteries of the Universe. I am not referring to such things as a Unified Field Theory, or why General Relativity does not apply well to Quantum Mechanics, but even deeper questions. Where do all those missing socks from the dryers go? Why dropped toast always lands butter side down? And the really deep question of how many colors of M&M'S^{®2} are there?

While some of these questions may have easy answers; socks go to the Island of Lost Luggage, (duh!) and toast landing is a thermodynamics problem, it lands on the side that maximizes entropy (i.e. inconvenience), thus minimizing the system's energy requirement. The M&M question is more challenging. To answer it requires getting out the L*a*b* coat, warming up a spectrometer and possibly some dental drilling.

Before we can begin to count colors, we need to decide which M&M'S to use. M&M'S are sold in many flavors; Chocolate, Peanut, Peanut Butter, Caramel, Fudge Brownie, Hazelnut Spread, Peanut Butter Eggs, Pretzel, Dark Chocolate, Almond, Dark Chocolate Mint, Crispy, Hot Cocoa and White Chocolate Pumpkin Pie, and possibly, other flavors. Most of these flavors share candy shell colors with other flavors, some have their own unique colors. Some of these flavors have patterned coloration such as the Peanut Butter M&M eggs which have a speckled pattern, with the flecks too small to easily measure, and so



closely spaced there might not be large enough background color areas to avoid the speckles.

To simplify the project, and reduce the strange looks at the grocery store when buying a dozen different types, let's restrict the task to only the traditional chocolate flavor.



Let's dig in! Here are the colors found in a standard 47.9 gram package of chocolate M&Ms; red, orange, yellow, green, blue and brown. Six colors.

However, this count does not include the colors released for some holidays. For Valentine's Day, there are packs of white, pink and red M&M'S. At Easter the colors light violet, light blue, light green, light yellow and pink are released. For Halloween the colors change to orange and black. Christmas colors are red and green. Removing duplicates, the colors now number 12, they are red, orange, yellow, green, blue, brown, white, pink, light yellow, light green, light blue and light violet. That seems to be the list!

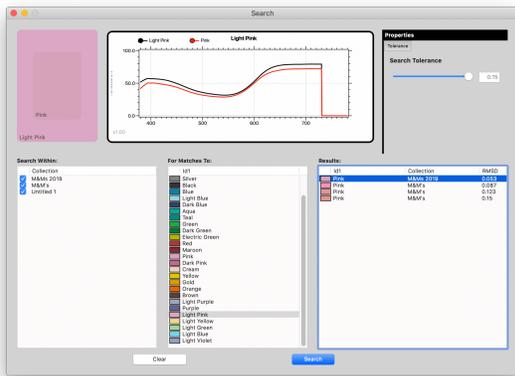
Not so fast, Bucko! Anyone who has been to one of the M&M'S retail stores has probably seen their wall of color, which has many more than the 12 colors listed so far.

[Check out the candy wall image on this page!](#)

As it happens, the number of colors that may be individually ordered, according to the M&M'S store website, are 26, but the minimum order is about 1/2 kilo per color. So to get all the available colors requires ordering about 11.8 kilograms of M&M'S! That is around 26 pounds (in U.S. customary units). Dentists are smiling in anticipation.

We here at Chromaxion Labs are willing to sacrifice ourselves to provide you with the answer to the cosmic question of how many M&M'S colors are there, so we ordered them all. That is just the way we roll! At first glance the total colors should now be 38, but once again, that would be jumping to conclusions. We need to remove any duplicates from the total. An easy way to do this is to measure each color spectrophotometrically, compare the results, remove the duplicates, then count the results.

This is where we can get some help from SpectraShop™, since it provides a count of the specimens in a collection automatically. This saves us having two people remove their shoes and socks so we could count on fingers and toes up to the 38 tentative total color count.



SpectraShop also has a spectral comparison feature which might be useful for winnowing down the color list. In this case, using the Spectral Search Tool combines numeric color differences with spectral graph comparisons, making the task much easier. Putting the suspected duplicates into the *Search For* list will produce more than 1 result if the color is a duplicate. Our result: 29 colors. Are we done?

Once again, rushing to conclusions will get you into trouble. According to the Discounted list on the M&M'S website, 8 colors are available at reduced prices. Are these colors being discontinued? Who knows?

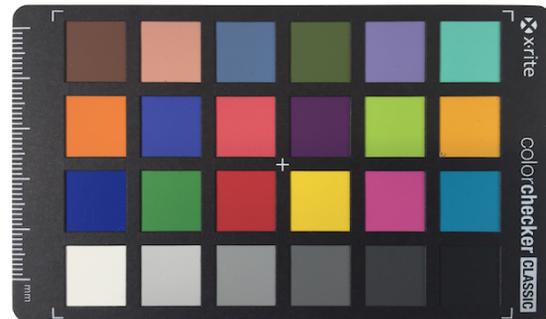
So, is the answer to our initial question; 38, 29 or 21 colors of M&M'S? We may never know since Mars keeps changing the color lineup. But it will be a tasty job keeping the count current.

Just for Fun

With the question answered, and kilos of M&M'S laying around, what can we do with them (other than the obvious)? After consulting a Magic 8 Ball, a Ouija Board, and consuming several adult beverages, the answer appeared; make a camera color chart! Duh! (Well, at least to a color geek). But which one?

The obvious choice is the iconic chart which has been around for decades; the ColorChecker®2.

As a visual reference, here is a ColorChecker.



Carefully matching our bags of M&M'S with the ColorChecker patches, the result is: the Colorlicious™ Checker.



Using 21 of our 29 colors, and weighing in at 1.5 kilos (about 3.3 pounds), this chart is a scrumptious way to have some fun while doing time in Gulag COVID 19.

Oh, before we get inundated with orders for the Colorlicious™ Checker, we will not be putting this idea into production. We tried to make some but the materials kept disappearing from the assembly line, making the production yield so low as to be not economically feasible.

And now for something different...

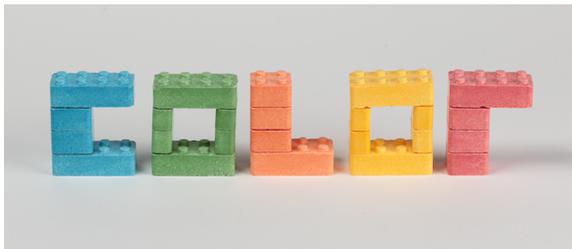
Is working with M&M color charts too two-dimensional for your tastes?

Some people are getting in touch with their creative side by assembling Lego® projects. But we could take that idea to another level by using [Candy Blox](#)®⁴. Made by Tootsie Roll Industries, these Blox resemble slightly smaller versions of traditional Lego blocks, but they are made from pressed sugar.



The Blox in my milk carton came in five flavors; cherry, lime, blueberry, orange and banana. They assemble just like Legos, and you can eat your creation!

Here is a small sculpture I made.



Another sweet way to occupy your time while locked down.

Oh, these are very hard candies, so I suggest you let them dissolve in your mouth rather than crunch them, unless you like visiting the dentist!

M&M History

In researching the M&M'S colors, I discovered that M&M'S were not an original idea to Mars. They were actually a copy of a British candy, Smarties.

It seems that Forrest Mars, the son of Mars Candy founder Franklin Mars, was sent to Europe to run their overseas operations. While there he observed soldiers in the Spanish Civil War eating chocolate encased in a hard sugar candy shell. At this same time, H.I. Rowntree also noticed these candies.

The candies both of these gentlemen saw were probably Lentilky, made by the Kneisl Company in Moravia since 1907.

Rowntree went back to England and in 1937 started producing his version called Milk Chocolate Beans. The next year they were renamed to Smarties.

Meanwhile, in 1941, Mars, in partnership with Bruce Murrie, son of Hershey president William Murrie, began production of M&M'S. Mars had a patent on producing the candy, Murrie had access to the chocolate, a rationed item in WWII. Originally available in six colors; brown, red, orange, yellow, green and violet; they were only available to the military. With the end of WWII, civilians could now get the sweet treat.

Eventually, Mars bought out Murrie, but the M&M'S name was so well known it was retained for the product.

Back in Europe, Nestlé bought the Lentilky brand and also the Smarties brand. Both brands are still manufactured by Nestlé.

If copying is the sincerest form of flattery, then the Kneisl Company should be very proud. Not one, but two companies copied its Lentilky idea.

Why have we not seen chocolate Smarties in the USA? Because the Smarties Candy Company has a trademark on the name Smarties®⁵ for their sour candies. However, the chocolate Smarties are available in Canada and some have been sneaked across the border.

Originally, Smarties were available in eight colors; red, orange, yellow, green, violet, pink, light brown and dark brown. The light brown was replaced by blue in 2007 to commemorate the 50th anniversary of the brand.



In Closing

We hope you have enjoyed this little excursion into sweet color science. Perhaps you too can find a project to make your sheltering in place more colorful.

Postscriptum

If you would like to examine the spectra and colorimetric data for all these candies, go to our [Spectral Library](#) where you can download the spectral data files for your personal use. Both text and SpectraShop files are available. If you are one of the few people without SpectraShop, you may download it from [here](#).

Footnotes

1. Apologies to Gabriel García Márquez who wrote *Love in the Time of Cholera* (*El Amor en los tiempos del cólera*).
2. M&M'S is a registered trademark of Mars Inc.
3. ColorChecker is a registered trademark of X-Rite, Inc.
4. Candy Blox is a registered trademark of Tootsie Roll Industries.
5. Smarties is a registered trademark of Smarties Candy Company.

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