Tracey ([00:01](https://www.rev.com/transcript-editor/Edit?token=2pWTnuaMAWUGS2KNoxEzI6txZKvIfAPwj4ur1nU2GDRxFtE5vMZkvJfWRI-jCaGjgXk5E2OR80OztIkANWPSnInUpI4&loadFrom=DocumentDeeplink&ts=1.1)):

Hello, and welcome to NC State's audio abstract. I'm your host Tracey Peak. It's 2022 and the official new color of the year, Very Peri is here according to Pantone. But how does this work? Is there a method to choosing the color of the year? Are there undiscovered colors out there still waiting to be found? And how do we make color nowaday anyway? We're speaking today with Renzo Shamey, Ciba professor of textile chemistry in NC State's Wilson College of Textiles about the science of color creation. Welcome Renzo.

Renzo ([00:38](https://www.rev.com/transcript-editor/Edit?token=motg051P4WOPF2mMhXNYeNvm_fAc_TaJ9RYrEt8Yklz8uyMfp4A7qMoizCI3zi8md3998Su9Y9sOURgorL831RugbPQ&loadFrom=DocumentDeeplink&ts=38.12)):

Thank you so much for having me Tracey.

Tracey ([00:40](https://www.rev.com/transcript-editor/Edit?token=Ilwu05PqgjSj8cVX6qlN8XnxMaErlr4CaErXUYBnUsJcmRDfI8ojZNhAr7Lcr2aCuEqgsi_CrV-RLusEZlkSb9e3WXg&loadFrom=DocumentDeeplink&ts=40.01)):

Let's start with why are we doing a color of the year? Is this just a thing, because we can, is it a PR thing? Is it created to fill specific needs in industries?

Renzo ([01:03](https://www.rev.com/transcript-editor/Edit?token=4wevcnCN0gKpl6ZwDSfWqY_tzglUz6CXyVzf3Kx-hSQ2jhi6E4x4qJYo25gxiP_mMj0QdQ5GUN6TiyIRs9lIvYuLggs&loadFrom=DocumentDeeplink&ts=63.18)):

Yeah. May I answer this question by briefly expressing what color means to me?

Tracey ([01:07](https://www.rev.com/transcript-editor/Edit?token=ABhST40RdMIt5lt27ePK8dCbrdHAnYv6w0mXXDd3DFk2r5dz8UuE8GINDXJWrARcxaQjg-EuwWL7NR8C4zlHww0BfSc&loadFrom=DocumentDeeplink&ts=67.9)):

Yes.

Renzo ([01:09](https://www.rev.com/transcript-editor/Edit?token=rAPoHg6W1bYckJrBtjkVPBmVlvH06Gob3JI_5kmcfT6aySPdYQDCCLncGJlFj3ROHKJxCyotL9KuSy-qTDMw8hK9K6U&loadFrom=DocumentDeeplink&ts=69.02)):

Carl Jung, who was a psychoanalyst, said "Colors are the mother tongue of the subconscious and they express the main psychic expressions of man." So color really plays a really important role in the retail sector. And it also plays a critical role in our psycho-analysis of things that we come across. You know, when I see you, I kind of evaluate you subconsciously. What you're wearing, how you're dressed. And one of the first things that I see is your color selection, color choices. So colors play a big, important role in our daily lives. And they also play a major important role in industrial decisions. Industrial production of material that are colored is in a very large way influenced by the color of the material that's being produced.

Tracey ([03:03](https://www.rev.com/transcript-editor/Edit?token=GSH54IIrVByFfhKmT48l0Rbxc2L_Zn8bGSPnCTdXQV-ajkDDCPLtg9Zs9LJhdPkFfCXTdY19qk5nzX3YqpgixLcrQUI&loadFrom=DocumentDeeplink&ts=183.27)):

Okay.

Renzo ([03:04](https://www.rev.com/transcript-editor/Edit?token=ORlYFI3Bx8yC4Kb45fqOFzaTZQkvlLP7M6rzS-OOj2nAYi1UZ2YWXHvJ8VcwIHnj1HZ95nbu3bt1rNNYapF1tLvKXP8&loadFrom=DocumentDeeplink&ts=184.18)):

So the Pantone color of the year really started in the year 2000, in 2007 they had a press release. And since then it's become a trend setting for forecasting decisions, for essentially talking about creative design and generating material that will sell better. So this affects our purchasing decisions in different industries, from fashion to home furnishings, to industrial design and different sectors of production. And this year's selection, the one that you just talked about Very Peri has the qualities of two different colors, blues that tend to create the impression of loyalty and calmness. We are living in a transformative period of time. And because of the fact that we are actually going through this COVID problem and issues, we are not really able to predict what's going to happen in future. The red undertone is meant to provide some creativity, some happiness and joy. So it's a combination of two colors and it's meant to, according Pantone it's meant to provide us with calmness and help us revision our future. So, that's the color of the year.

Renzo ([04:28](https://www.rev.com/transcript-editor/Edit?token=8ngEVxzcKjNWiRbxN7iFVd2XFzalX6Xg9kuKXFqCICe6lrnLmDGxu7JuWP8MOqCAUpDRhOLhDIJplpJX3bMNsmZsSTg&loadFrom=DocumentDeeplink&ts=268.86)):

So the answer to your question is, yes, we do this because we can, but at the same time, of course, our decisions are based on the societal needs, industrial needs, and we also try to express our subconscious mind. So going back to Carl Jung's quote, I think colors are always there because we think about them, and that they also influence our decisions, purchasing decisions included.

Tracey ([04:59](https://www.rev.com/transcript-editor/Edit?token=uKCqnmMzcPIytVEfJ-Wfbx5RzN9mzETUZUvvFoj8nJQhDVlSsuFfQejojUGONWprn9TWwSWS-HeiGHuK-VvD42oshUg&loadFrom=DocumentDeeplink&ts=299.35)):

That's really fascinating. I never thought that they went into psychological detail behind how they mix that particular color, or pick that particular shade. And that answered my second question, which is, why do they do what they do when you answered that with, because they're trying to meet the larger societal, or psychological needs of a particular moment. Do you know how exactly they go about that at Pantone? Do they have a committee of people inside the company, or do they solicit opinions from experts such as yourself?

Renzo ([05:34](https://www.rev.com/transcript-editor/Edit?token=y4HFmGmwWbIXCVPcYju9waiY-85tH4DQSmbkx2EcmRzFTfKG0dvIp2f89ECBhKUlUmA3D-7DnHw3WL7rMozFp2UNNww&loadFrom=DocumentDeeplink&ts=334.83)):

So the selection is made by a committee. I'm not an expert on the actual process and, but I've gathered from different sources that the entire process is actually a bit secretive. So they don't talk about the individuals involved. But I gather that there is an international committee of color experts and they examine color in every aspect of our lives, from movies, from sporting events, from fashion and industry and that new technologies, new arts, traveling destinations, even things like sandals in Brazil, or, I don't know, cars that are made in Korea. So they're looking at all of these features, trying to understand what will be the trend setting colors in future. How would these colors influence our decisions in general, and how the socioeconomic conditions as well as the societal conditions might influence such decisions. So they put all of these thoughts together, meet multiple times, and then they come up with a color that they decide is the representative of the year and how it might hopefully create a better mood for additional purchasing in future.

Tracey ([06:51](https://www.rev.com/transcript-editor/Edit?token=GDks5iZxHeVMXj6hVJtpJuOGg0CDuGlzZJOmf_AQuQM-D8-HklFDFZ_cneAhl4RL0iGQgXFReOeS1I9oKfnfVA3GW3A&loadFrom=DocumentDeeplink&ts=411.95)):

Okay. That is interesting. I like the top secret color committee.

Renzo ([06:57](https://www.rev.com/transcript-editor/Edit?token=Z-a-xyn1qVYXaD2LJ9HN8Td3nyAmuNVD4PovcxmSfTJoQe5L5UPTyLKzLTb54sitPAx-yCGnmiFe4ztCWClysPEQbQU&loadFrom=DocumentDeeplink&ts=417.4)):

It is a bit.

Tracey ([06:58](https://www.rev.com/transcript-editor/Edit?token=tPuuLzmHCtbaQbIqyHx1Pdv3cjIJ9S6ROIIB99-HtXph7wlcluvepcVGwYb40QB1cRTWi3WN3acXeX1GHGzMUf2KQWE&loadFrom=DocumentDeeplink&ts=418.65)):

Well, let's move into a more, I guess, hands on approach to color. How do we even make color nowadays? I know that you can go to the paint store and you give them a paint chip and they have a little mixing machine and stuff like that. But how are we getting the pigments? What are they made of now? Are we still squishing up beetles or plants to make dyes? How does that work?

Renzo ([07:25](https://www.rev.com/transcript-editor/Edit?token=KnrpfiQ6acyVQnSFSp_LjDvl3hborEyc_si6A2ROlcDgYAmYluDQQHL6kgzK13jtBlRMQX6WNeTsfS2Rn8PKkym4iEU&loadFrom=DocumentDeeplink&ts=445.02)):

Exactly. Actually we do still make colorants from plants and animal sources, biological sources. So you're absolutely right. Cochineal beetles are still being collected from cacti leaves so they get dried up and then converted into a powder form. And the powder becomes the base of a colorant that we apply in the coloration of textiles and other types of material. Cochineal beetles, by the way, are still being used today. And part of the reason for it is because some people have health and safety concerns about the colorants that are added to food and beverages, and they consider natural sources better representations of natural tolerance, essentially there might be considered safer. Having said that, at the moment, if you think about the resources required to produce a large quantity of beetles, it is not sustainable and it cannot meet the demands of the industry. So right now we don't really use these things in a large quantity, artists and people in the crafts industry might be using them, and the small industries might try to use these things, but in industrial quantities, they're not sustainable.

Renzo ([08:47](https://www.rev.com/transcript-editor/Edit?token=n4me7z5cnwnKM1WgpDXJjPRmcZBV298jePePzvi7MqqeBQcB0mlRzzaHK_SlZMaA_bFZJzU_cvb258OjULv7b9lkGXw&loadFrom=DocumentDeeplink&ts=527.66)):

Another colorant with a natural root is indigo, which was planted here in North Carolina also from indigofera. So if you think about the denims that we wear these days, they're all usually colored with indigo. And, but that indigo is made synthetically right now. We don't produce it from plants, because again, it wouldn't be sustainable. It wouldn't be actually from an environmental point of view, it wouldn't be friendly. So right now the coloration industry's based on synthetic colorants, and these colorants are made with cost effectiveness application in mind, and they try to consider their toxicological issues as well as environmental issues.

Renzo ([09:35](https://www.rev.com/transcript-editor/Edit?token=Po6zQTbC0YJFv6Dq1ByYALePUBDdzLd3PybHcBQDAJyA_DfBRFcSSn8_bwBFSYhXVelNKRTYF_RvQY1eBVlxHsozHko&loadFrom=DocumentDeeplink&ts=575.42)):

And there's about hundred thousand colorants, registered colorants out there that we can use. And amongst these, there are a thousand commercially important ones. So yes, when you go to your Home Depots or Lowe's, these pigments, these colorants have been tested and tried. Of course, we keep testing these colorants all the time. But our current understanding is that synthetic colorants are more environmentally friendly and they actually are more effective. We use a small quantity of them to produce the same color that you would use with a large quantity of natural colorant.

Tracey ([10:13](https://www.rev.com/transcript-editor/Edit?token=1l8eGyaV3NS-xTMNckNKIvst47hRjELvTjHK9BJx9qBAoNQSNMwzPywWaBDHgD_N5KezNzfnkjinw2P9ushRQA54DmY&loadFrom=DocumentDeeplink&ts=613.44)):

Right. Because I was thinking, oh, my gosh, we would wipe out those poor beetles if we were trying to use [crosstalk 00:10:17].

Renzo ([10:18](https://www.rev.com/transcript-editor/Edit?token=Yzoci80XaByWk_PtiIG6gjtp5J-i_6VjAnXNWCinzgZ0xFftRQQCgExY79yETqYvyz_MUHXPAj0QJzjcaS1fFjfnPi8&loadFrom=DocumentDeeplink&ts=618.03)):

Exactly. Exactly.

Tracey ([10:18](https://www.rev.com/transcript-editor/Edit?token=CZB1BcXfaTn56CvjPsrzmBjJbxeNkH4e75nqYN3ima0hBMPYxczYw3rjCBQVeoVkj0UWOiwHqrNQypp-m-tTlv7RnzQ&loadFrom=DocumentDeeplink&ts=618.46)):

There would be no more beetles.

Renzo ([10:19](https://www.rev.com/transcript-editor/Edit?token=k3K0wxjdXRUYAYf8GfuhlxiSQoOBg3eDwjaX7_m-w6Z2vKvMBgQ2zDsy1n3rh2gVH1IB-ZDWmB7kTszbCPkP95JMGRA&loadFrom=DocumentDeeplink&ts=619.75)):

Exactly.

Tracey ([10:24](https://www.rev.com/transcript-editor/Edit?token=I-xRx6IEwiaUdeu2Dnyl8TWSrDmb5ELMbKwezgT8tWsmWDYvjnIjwJRf6d9zK8vITZuc2DkCpIcyZBRRQbTGyCsIzZA&loadFrom=DocumentDeeplink&ts=624.93)):

So with the synthetic colorants, they're put into different, I guess, bases that would stick better to particular things?

Renzo ([10:41](https://www.rev.com/transcript-editor/Edit?token=uk5IxyM1PeerOpx28EEWFnKaoU12UvIciQ2aAyCBS8ls9Mv_am9BoC_--1AN7-7wnHoDR_e5bXil0drGPoy2ClpEesU&loadFrom=DocumentDeeplink&ts=641.9)):

So, the actual material that's produced is called the colorant, but it can be divided into either a pigment or a dye. The idea being that you require some kind of a binder, you have to stick it to a surface, it doesn't stick on its own, it does require some kind of a glue. And we call those binder based pigments and they're applied to our vaults and our cars, our plastics, some of the material like that.

Renzo ([11:45](https://www.rev.com/transcript-editor/Edit?token=Yzl0W74lqe_8YODsnVjUQitVzpysG1tGbRLH_owXVtyhVHfwH-t1koqCzGB9QKWsGqwYeTwjO3O5WzK1vv-WXvVji68&loadFrom=DocumentDeeplink&ts=705.07)):

And then there are dyes, dyes interact on a molecular level with textile. So we apply them with a solution, and this solution penetrates the textile material, and the colorant goes in there and stays in there with chemical interaction with the substrate. So we don't need a binder anymore. So the success of each of these will depend on their application and their end use. If you are using a colorant to color your car, you want it to not fade under sunlight. You want it not to scratch easily, for example, the binder, if you're using a colorant for textiles, you're interested that it shouldn't create problems to human health, and anybody who is wearing it. We should also not create problems to the environment, because some of the colorants will be washed off and released to the waters and land, et cetera. And some of these colors have been problematic in the past. And we are trying to address that issue at this point in time.

Tracey ([13:11](https://www.rev.com/transcript-editor/Edit?token=pcs0CUgn3GRpNmMSwCEgXIe9CNZYavtdze4yoGU-nev6SZEmM7cbNRlsghVTfWkpSx1vGGKSh5rfOSEYjKPg26SjJ1o&loadFrom=DocumentDeeplink&ts=791.61)):

And as a follow-up, I know this is a weird question, but is it, are we still creating "new colors?" They're not colors outside of our visible spectrum obviously, but more like shades of color, or have we pretty much run the gamut of shades? And is there some master library of color out there with a certain number in it, or are there criteria that need to be met before you go willy-nilly creating a new shade?

Renzo ([13:50](https://www.rev.com/transcript-editor/Edit?token=DC5n7_Xt3nNLzHFW0o9ri1hdRDFqeZvdreit4TIJYxFdGMGVXAmFet-hfXWJY3dUOR-nUss_hDSSLjOZlo1GiA0N5TI&loadFrom=DocumentDeeplink&ts=830.95)):

That's fantastic question, but it's a multi-component question. So let's go with the first part of that question first. Obviously we can make new colorants, like I said, the molecule can be designed that will absorb certain rays of light and will convert that ray of light to a different form of energy, for example, with solar cells, those are some of the colorants that are made. We have colleagues in the college that, College of Textiles who are producing new dyes for solar cells. We can produce new dyes to treat cancer. We can produce new colorants that have industrial applications that will be used in watches, et cetera, for fluorescence and fluorescent applications. And we have also other simple application colorants and textiles, some dyes that have different properties, for example, they fade less, or they wash, for example, better.

Renzo ([14:49](https://www.rev.com/transcript-editor/Edit?token=Z_IYD4rzetCHY_CoIxnIvwZWoM2gZZLhwzEg7FPX-1BsvdD5XQfQ9F4HYzLCxWuST4LQg0mbhYUzLU9XAPfvTPgywdQ&loadFrom=DocumentDeeplink&ts=889.03)):

So it is definitely possible to produce a new color, new colorant. There was a new colorant, a new blue that was synthesized at Oregon State University, I believe, in 2009. And the only reason they called it a new blue was because it's a luminous color, a vivid color, even when you mix it with water or oil, and that is one of the features of blues, they fade a little bit in water or oil. So definitely possible to produce new colorants. But, of course, anything that is produced is still going to be in the visible range. So we are not going to be surprised with a new something that hasn't been seen before. We are just going to see a different kind of, if you like, angle to that color, so it's possible, for example, to generate new range of colors for different applications, but all of these would still be within the confines of human vision. So, that's part one.

Renzo ([15:49](https://www.rev.com/transcript-editor/Edit?token=I0YT5TbzDRk_PBKWEHJBn7cmbz2G8WwkBCHWFF5VlmAJcGOoILjN63TvJbIHuFa-wCV-psgKIdPDBEXiR9ZmUhE9NBw&loadFrom=DocumentDeeplink&ts=949.32)):

Now, about color libraries. Yes, there are more multiple color sorting systems out there. And some of these are based on physical samples, physical chips, and to name a few, you have the Munsell system, you have the Pantone system, you have the natural color order system. And these are going to categorize colors based on certain criteria, for example, from light to dark, from less colorful, to more colorful, from red to yellow, to reddish yellow, et cetera. So this classification, this library allows us to communicate color with each other, because there are notations that we can use to exactly specify which color we have in mind. And when we use notations, it removes the ambiguity, it removes the problems in communication of color. If I say something is sunnier, or something is warmer, you might understand it, but to translate that into a practical definition of color makes it very challenging.

Tracey ([16:49](https://www.rev.com/transcript-editor/Edit?token=V5LvsH6mAVwKlyjmeI9itCbMKlh7B5YjUZavW-AmAMhBt-mejxx4coRS1_9z8d-a1SiJc_CbQ5jumO7BmLuntfBhJEg&loadFrom=DocumentDeeplink&ts=1009.12)):

So these libraries of color, do they have chemical recipes that go with them so that anybody can make it?

Renzo ([16:55](https://www.rev.com/transcript-editor/Edit?token=34AFFYJUDxg6G3rgLxiUJtdreSSJXtG0PJbPSzSA4C8HHL0qFelmhGx4RoUWXYW_wrVJxozW7pg6Eiup4xw-FGwd0UQ&loadFrom=DocumentDeeplink&ts=1015.85)):

Some do, yes. Like Pantone, for example, they have their basic colors and they will give you a matching system and they will tell you in order to produce this particular color, these are the quantities of these basic colors that you need to use to mix and produce this particular color, but the other ones, other systems basically just tell you where this color sits in a mathematical space, and you can take that color in that point of space and another color in a different point of space and calculate the difference between them. And by doing this, we can actually determine whether we've achieved our target color or not.

Tracey ([17:54](https://www.rev.com/transcript-editor/Edit?token=5q3kJ_FUmhEFRoor6Lneq6fGZY4slgFdhyVPspMiUVsEOXdr1qWOwcHOcZGNtVjjXzpuJ38ZCn_qteLAv-U4vu0sTu8&loadFrom=DocumentDeeplink&ts=1074.87)):

Wow. Never thought of it that way. About measuring the difference, is it measuring the difference on a light spectrum? Is that what's happening with the amount of light being absorbed, or refracted, or?

Renzo ([18:05](https://www.rev.com/transcript-editor/Edit?token=yHK3EdrwKyF-sXX2UdV1B4_ALUs7tnazn1HFUJSKCePjF5NkekhsLGB2W3OaUJ6hp5wqJPSDNAg7XBUhTdeg-fteeq0&loadFrom=DocumentDeeplink&ts=1085.05)):

Yeah. So, to see color, we need light. Of course, without light, color has no meaning, but color is a multi component sensation. Light is only one of those sensations. Then the other component is the observer and the third component is the object itself. So the object is going to reflect some of that light and maybe absorb some of it. But the color that is seen is going to be detected by a human, or by a device. So it's going to be somewhat subjective if humans are evaluating it. And in terms of an instrumental evaluation, we use instruments because they provide an objective measure of color difference. So there are no differences, there are small differences, but these differences are just tolerance differences between machinery readings.

Tracey ([18:57](https://www.rev.com/transcript-editor/Edit?token=XlKLrajtr9e5Zp75dhnI15Eo9SygOeD5rvOZwZdZgQIbVp37kWwPM1Qb_JxZPagcehXjvu7IjAmQFym6EuAtlljC048&loadFrom=DocumentDeeplink&ts=1137.45)):

Okay.

Renzo ([18:59](https://www.rev.com/transcript-editor/Edit?token=6knjT1gx4yeeeVlQibdpRuiviV27Mjf1n4vVoCtfueH1jAKToQbdK-HjXOFaWDOpQL3IRc-5wtwdzdcboaKb9MuZObk&loadFrom=DocumentDeeplink&ts=1139.27)):

And it makes it so much easier to communicate how that difference can be translated back into the quantity of the colorant that is missing. So the measurement communicates with the reader in a mathematical form, the amounts of primaries that need to be present in the colorant, in the form of a colorant to generate that target color that you have in mind.

Tracey ([19:26](https://www.rev.com/transcript-editor/Edit?token=bfWl2qwnK5Lwjjm-cHfAogExjtQCvGTflmPZrfMrsscLDbd08qKIfTcy6h3lRI7Slx4QeY0QenglMWcgQO_ELo2nnzo&loadFrom=DocumentDeeplink&ts=1166.82)):

Okay.

Renzo ([19:28](https://www.rev.com/transcript-editor/Edit?token=ia2G-nwVqdmX2QG8k-z8Ixi01qXMV2GgX9y7yOv-PFDvUiYAaV9Jxy62Oh8P0x2Y1gpT088aEZ5ta1cF2SouZAjNQJI&loadFrom=DocumentDeeplink&ts=1168.46)):

I hope that makes sense.

Tracey ([19:29](https://www.rev.com/transcript-editor/Edit?token=1gNccwfxT7CeTNeNBiMIvxQUTnXMIcsPdEzY79covERARCpI8u8s3l5nm4P1s5MLBUBfZfNMhocGlwaRfL4_RPD5bmo&loadFrom=DocumentDeeplink&ts=1169.33)):

That does make sense. And if you're out there in the world, experimenting with colors and you produce something that's new, or different, or unique, how do you go about getting that included in the libraries? Is that just an automatic thing? Is there a testing process for a new color? Do they have to pass muster in some way? And I'm saying new color, obviously not meaning a color humans have never seen before, but this new creation.

Renzo ([19:59](https://www.rev.com/transcript-editor/Edit?token=zphFngUcHwcLKfeYS7WSOqhoW5haooQA7z_JT7o7EzAz7z17FKcrkWTtrj9PHfOHiAiDdaw6XX8gtJQZtqCUlOvuJU4&loadFrom=DocumentDeeplink&ts=1199.49)):

So there are organizations like the American Association of Textile Chemists and Colorists that's in the US, or the Society of Dyers and Colorists in the UK. And they collect information about all new colorants, and these colorants are first tested by the manufacturer and the manufacturer will provide the organization with information about the molecular constitution of the colorant, it's properties in terms of performance against the washing, against the rubbing, against sweat. And all of these characteristics are combined to generate the overall performance structure of the performance characteristics of the colorant. And that they are indexed in a, something called color index. So that's for colorants.

Renzo ([20:54](https://www.rev.com/transcript-editor/Edit?token=QJlKXR875glcH93SXUfrp9Ff2ar-bcF0Ufi8J3KT-hYa3uK9huTQ6CTVpT_hgIOU-RmQowsecQMsOlvr8qkMmLvFnUQ&loadFrom=DocumentDeeplink&ts=1254.56)):

In terms of the color libraries that I was just telling you about. Color libraries essentially tell you there are components that are required for the definition of color and they cover the entire range of visible colors. So there isn't something missing there as such. If one chip is present and another chip is present and you want something in the middle, you can interpolate, you can sometimes that interpolation is an simple linear interpolation, or some other complex form of interpolation, but essentially the space covers all the possible colors. And we simply find a way of communicating that and different libraries have different ways of communicating that with the reader.

Tracey ([21:40](https://www.rev.com/transcript-editor/Edit?token=vappMyiEqB8sTGIFREK_RLg2-3IlmwkmgBscX2dI2gKlFcZuG1YzwGQnLWbEfXbh2CmjYAfhazckEi89JQwogdGaP98&loadFrom=DocumentDeeplink&ts=1300.23)):

Okay. And I don't know if I asked you this already, but if not, how many colors are in these libraries?

Renzo ([21:48](https://www.rev.com/transcript-editor/Edit?token=96ehQPcb56086EbaHRYpmCpj8-FQ9JZUGiv6QJLB-lwLLEe61d4_WP3EtUw6pcJTtaVnVeSvmThSAR7XSnxMksz5x4g&loadFrom=DocumentDeeplink&ts=1308.38)):

Yeah. So some of these libraries will have physical chips that represent small samplings of this space, for example, a very important color library is the Munsell color order system. And that has about 1,500 chips in it. All right. And today Pantone system also has something less than 2000 chips or something like that. They have different types of arrangements for different sectors, they have something for textiles, something for fashion and home furnishings, et cetera. But these all encompass something in the range of 2000 chips or so. So it's a limited range of samplings from a much wider area of colors that are visible to humans and then total number of colors that are visible to humans that's the subject of another conversation I think.

Tracey ([22:41](https://www.rev.com/transcript-editor/Edit?token=snhDbVJfUNnuJg8nXb5H8kNuxWtx0NnyNMymSXKRHsaVeqfjD7GfsnYy7ntkmPFFCk5uo_b49ulKBB8nvX_xmshEbQI&loadFrom=DocumentDeeplink&ts=1361.31)):

I don't really think about color beyond picking out paint chips. So, this is really interesting to think about all the work that goes into the stuff that you see on a sofa, or a shirt, or the wall.

Renzo ([22:57](https://www.rev.com/transcript-editor/Edit?token=H-G8WF3xQoHHWgFIYcFq_VLdoiPhg6g_6XVhfFyJhnfiBVawoRVetI90beg_7FEnavhsd_z2F8MOzrNrEMMm2LyxeU4&loadFrom=DocumentDeeplink&ts=1377.18)):

Yeah.

Tracey ([22:58](https://www.rev.com/transcript-editor/Edit?token=Iq0zJ-3fLu9vodfyz1KxoxnK3bJivypHxK6yHrz3tbj8Ia-ZZ3Nyp3hcI0MzqKR4nIpAd62uQABoJ0zlQe07RP4uNUE&loadFrom=DocumentDeeplink&ts=1378.19)):

And I always ask people this question, which is, what is the coolest thing you know about color, or your favorite thing about working with color?

Renzo ([23:12](https://www.rev.com/transcript-editor/Edit?token=8W9YOStzLW8m3pMyR0akJgvqpKyqAsCxZbIuL8bZK7_Cs2inZlT7RP9nGdf9RiNm6W-0fmlLxwsK5qjrszhC49H6Mps&loadFrom=DocumentDeeplink&ts=1392.21)):

So the first thing that comes to mind is the discovery of the first synthetic colorant. And that was made in 1851, I believe, by a gentleman called William Henry Perkin. But the reason it's important is because he was an 18 year old lad working in a lab trying to produce an anti-malaria drug called quinine or quinine. And essentially during that process, he discovered this new purple color that was, remember purple, or mauveine it's called that was a royal color. It was very difficult to produce nice purple colors that lasted a long time. So whenever I talk about this discovery to our budding color chemists in the college, I see the spark in their eyes and that's fantastic, and it's amazing to see that.

Renzo ([24:04](https://www.rev.com/transcript-editor/Edit?token=DZmbW1Je1npQWT2JO4v5jignA7KZzyESOW7KZwMhcCAgjCWvEAdG_XZWYdbu2DetPJpKO9YFyIgtAfAeRHKYekc2410&loadFrom=DocumentDeeplink&ts=1444.68)):

The other thing that really fascinates me is the so-called structural color. You don't need a colorant to be present. So if you have micro indulations on the surface of a material, depending on how light it hits it and the angle of viewing you'll get different color sensations from that surface. And this is something that you might come across when you're looking at the wings of a butterfly and, or an oil slick that is, of course, interference from waves. So these are becoming more and more important from an industrial point of view. There's a lot of interest recently to try and recreate structural colors on a large scale, because that would eliminate the use of colorants in the first place. So you don't really need a colorant. You just need to change the optical properties of material.

Tracey ([25:01](https://www.rev.com/transcript-editor/Edit?token=8OH4gdRZ0IXkzfvrcNyOyiNB_vnuusbaUphPeSV4giUmVUE5moai8v-2acXZ4-oJBrOoH8Uyb6EI2T6OQYm1OOF_clI&loadFrom=DocumentDeeplink&ts=1501.75)):

Wow.

Renzo ([25:03](https://www.rev.com/transcript-editor/Edit?token=qoAij_F0d-ovAMrUkKeEIY0jUDsOAtvWVfD9t4bOm7--h25C6n6ygubtOLIylBeSVknt50VBDSEFY6PfkqBJwZwtOis&loadFrom=DocumentDeeplink&ts=1503.07)):

Yeah.

Tracey ([25:03](https://www.rev.com/transcript-editor/Edit?token=8KIsRhjXFpIxQiUzDYdJoXNbHsIHVml3tXxGk1uVDfFViwCGTo4y3gIYWP28bH8VQy1vmaLiTdTGtf5HQlV6i7Wm0tY&loadFrom=DocumentDeeplink&ts=1503.7)):

So would that, let's say that you could do that and you could paint it on a wall, would you be able to change the color of the room based on the light that you shown on it, or the direction that someone was standing in the room, they might see a different color wall than somebody else, is that [crosstalk 00:25:27].

Renzo ([25:26](https://www.rev.com/transcript-editor/Edit?token=WlsHLF_Wckx0BpeH8UpQsepn_6tREYO2tT0wVL9i45Hm7t2Pf34BLYOhzCFQC2M3oWRMeZSvcCqYn700hkaeX5lWSEU&loadFrom=DocumentDeeplink&ts=1526.55)):

Exactly, yeah. So you can change the angle of your viewing and the color would be completely different. So depending on one angle, you might see blue, another angle you might see green. And so that is also possible with something called E inks or Electronic inks. And I believe you might have seen the ads from BMW, there are coming up with their new concept cars where you can press a button and the color of the entire car is going to change.

Tracey ([25:53](https://www.rev.com/transcript-editor/Edit?token=qHcVieqGVtbRUTd-wA3RD7iRSnX64Yrc1r9_dkh1952o2vFb9Nb50BRMuj0KrMqoBhKA9SHqrO2lsFELRaKrOt-fKUg&loadFrom=DocumentDeeplink&ts=1553.24)):

That's really cool.

Renzo ([25:54](https://www.rev.com/transcript-editor/Edit?token=GXODXUfTqCR6ETyZCoveA4OkvySrQTNoDCbhdyNFs9GWgoMtThj5prVyywyPfHs2rgVZIlLUlMY26KRkZutqZhNdPsk&loadFrom=DocumentDeeplink&ts=1554.35)):

Yeah.

Tracey ([25:55](https://www.rev.com/transcript-editor/Edit?token=zX0WFdABAeL2pmRkWr4NG1SSV4zdXS5_cmZBK_uhy32RRQ0eUEcrmnWUaqQ7Ez5inrTU46lTYwuCwGT9LiWwGNeScWM&loadFrom=DocumentDeeplink&ts=1555.29)):

That's something that I saw in cartoons when I was a kid.

Renzo ([25:58](https://www.rev.com/transcript-editor/Edit?token=7hsi2h1xaB8RfeYO135L3RpfdGltf59fEO_CMpeAODMqa-PcWckkBssYSd3YBQQvXkNE2wwNKR5Vz7dCZ6hpnrI7TcI&loadFrom=DocumentDeeplink&ts=1558.48)):

Oh, yes.

Tracey ([25:58](https://www.rev.com/transcript-editor/Edit?token=kA2q102PsOY_B-yp7KNzL_UUkV0hNo3vii06ITdmREmBFcj_dleH0dJ60d7diG1cM8ioXPxDtbmuLvJ20dl6ZGYMJP0&loadFrom=DocumentDeeplink&ts=1558.49)):

It's fantastical. Well, okay. One final question for you. Do you have a favorite color?

Renzo ([26:03](https://www.rev.com/transcript-editor/Edit?token=iicKGgdfUXHBbbpybUSTB7slP6ShzPFJTgJz0FrdnRp4ip2Ow7yrnQ5uKE2ZKWkQ3K3Z_ss9O1nsbRPmrHyxHTsDMlw&loadFrom=DocumentDeeplink&ts=1563.78)):

My favorite color is purple.

Tracey ([26:37](https://www.rev.com/transcript-editor/Edit?token=6EDf2su37T_kG9pEUjY4PFoK4xnFQXLNdLA2beVNGH5YA-LAIc84uQoMD9hMwDbTm-N55Wd1g8jgc8OCCEs-pgXiyYs&loadFrom=DocumentDeeplink&ts=1597.24)):

I think purple's a good choice. So Very Peri is not too far off from your [crosstalk 00:26:42].

Renzo ([26:41](https://www.rev.com/transcript-editor/Edit?token=SFLBQwSz1jqMVHV-YZSSIDKS79r2eaWopv9i8g0QTcxQ81YZtRjliC_7WI_id68vOGPDjE6qSqbK8L4hUYvRRJAd4xY&loadFrom=DocumentDeeplink&ts=1601.56)):

Not too far off.

Tracey ([26:41](https://www.rev.com/transcript-editor/Edit?token=M3E2zCpR9c_94Kekz1PEPD0J7BL7b-dBsf9hz1ug6E9pOiFIMHGvvuoAVECL3CP56wvQsWwTwmJorcLPyeXN9zQuAZ4&loadFrom=DocumentDeeplink&ts=1601.87)):

... your preferred color [crosstalk 00:26:42].

Renzo ([26:42](https://www.rev.com/transcript-editor/Edit?token=N2mp5RWNaBNZxY8i1Esn8_PhnkCVIqvIeOK8qVtKroQY5NxZQrJD_SxL3FW9YfVnAzU0LgkigvsXpQpUiTOyPxRRqVY&loadFrom=DocumentDeeplink&ts=1602.32)):

Not to far off. Yeah.

Tracey ([26:43](https://www.rev.com/transcript-editor/Edit?token=OSnVvBfIKsHiQlE_6uDjsXPZBXQSERt8sM5Yf1H-ugc7WxsN4SkN8uJniefq---EqBpc2BxBsSXJ6cIiudH4W0OFYxk&loadFrom=DocumentDeeplink&ts=1603.44)):

Excellent.

Renzo ([26:44](https://www.rev.com/transcript-editor/Edit?token=DJVrzbItR5BrUb3YXVLtpjpAPkvW-ZH1wF00a5WcTuaYhOzzhiAmXg3fy0oes2g37XAQkr6trMkCIePInRvpInbf9OY&loadFrom=DocumentDeeplink&ts=1604.1)):

Yeah.

Tracey ([26:44](https://www.rev.com/transcript-editor/Edit?token=p2DRrAYbNWHox4t4SxKBtsRNb4fMSCqXpnfdSWw4RVFe_qgwPrPT77SgRU4li4cSE0nj1nYbo6Pg3obsWps3wV9sO5Y&loadFrom=DocumentDeeplink&ts=1604.36)):

Excellent. Well, thank you so much for being here today.

Renzo ([26:49](https://www.rev.com/transcript-editor/Edit?token=gyVwL06s6kkAU-iPFufJtsYkHTxjY4OoMCt0dU9EogXUEW0pnH3Zn7Rp4zD4KCuKEwFXkZ8cm8buc7aCQDRvv2FLXCY&loadFrom=DocumentDeeplink&ts=1609.45)):

It's been a pleasure. Have a fantastic and colorful day.

Tracey ([26:51](https://www.rev.com/transcript-editor/Edit?token=uZHuN_tOfHywYjE4qhWxkS2Q7UKA33bRXHGX1_DXkgR1DxAsh2Wt9yeSaZhk7-YldksmD9eCtL-Row433LNTlIFd804&loadFrom=DocumentDeeplink&ts=1611.38)):

Oh, thank you very much.

Tracey ([26:53](https://www.rev.com/transcript-editor/Edit?token=dZkmVapWCN12FPQNAzL5_ZRE1qObfRDattAC8O_un0qvx_wQFVwkIIlj4xzMaNpqzpZ0Kf46eRUBP9QXULH051LlRts&loadFrom=DocumentDeeplink&ts=1613.37)):

We've been speaking today with Renzo Shamey, Ciba professor of textile chemistry in NC State's Wilson College of Textiles. This has been audio abstract. I'm your host, Tracey Peak. Thank you so much for listening.