



Whenever we are asked whether fat over lean applies to Pigment Sticks, we are usually also asked just what is fat over lean? Here are two explanations, a simple one to give you the bare basics, and a more involved explanation for those of you who want to get into the technicalities.

### A SIMPLE EXPLANATION

First of all, fat over lean refers only to oil painting and not to any other medium. It is a rule of traditional oil painting whereby fat colors (those with high oil content) should be laid over lean colors (those with low oil content).

The reasons for this are:

- Lean colors are less flexible and can crack when applied over fat colors during the drying process, and
- Fat colors can dry to a glossy surface that is difficult for another paint layer to adhere to.

### HOW DO I KNOW THE OIL CONTENT OF A COLOR?

The answer is a little confusing. Manufacturers don't list the oil content of their colors. Nor do some of the artists' handbooks. And the handbooks that do contradict each other on several colors. So, while it helps to know which colors are very fat and which colors are very lean, there are a number of variables that make it difficult to know the oil content of every color [see page 2]. At the end of this technical sheet is a list of R&F colors, in the order of lean to fat. It is based on the pigment manufacturers' specifications and on the way we formulate and mill our paint. Note that other brands of oil paint may vary from this. Note also that if you add a medium to your paint you are changing the oil content.

### HOW IMPORTANT IS THE RULE OF FAT OVER LEAN?

The lack of specific oil content numbers does not make the rule unimportant. The rule still should be understood. But the good news is that the fat over lean rule is not as rigid as it sounds. Part of the answer depends on your method of painting. Here are points to keep in mind:

- Fat over lean pertains to the traditional technique of building up layers of paint after each lower layer has dried. If you are painting wet into wet, the fat over lean rule is of little or no importance.
- Fat over lean is most important when you are applying thick layers of paint. If you apply a lean color over a thick layer of fat color, that upper layer can crack.
- If you add an oil medium (such as linseed oil or stand oil) to your paint, you are making the paint fatter. This is a way to compensate for the fact that you may not know the oil content of a color. Even then, fat colors

should not be used in lower layers, except in very thin or dilute coats. Additional oil medium should only be used in the upper layers of your painting.

### DOES FAT OVER LEAN APPLY TO PIGMENT STICKS?

Pigment Sticks are oil paint, but with a percentage of wax. As oil paint they too are subject to the rule of fat over lean. The wax, however, provides additional solid to the paint, which makes for some differences with oil paint from the tube:

- The wax gives the film a higher proportion of solid to oil. Because of this, the swelling and shrinking of the drying process [see page 2] is less than that of tube oil paint. So while cracking can indeed occur when a lean Pigment Stick color is layered over a fat layer, it is less likely than with paint that has no wax in it.
- On the other hand, the wax makes the Pigment Stick leaner than tube oil paint. So applying a continuous coat of Pigment Stick over a dried thick coat that has been painted with tube oil paint is risky.
- Light drawing marks made over a dry surface are already more broken and less of a continuous film, therefore less likely to crack even if painted over a fat color.
- It is safe to underpaint with Pigment Sticks and overpaint with tube oil, especially if your underpainting is not very thick. If you have underpainted a thick coat with a fat color, however, you may need to fatten your tube oil paint to prevent cracking.
- The wax contained in the dried film of a Pigment Stick lessens the formation of highly glossy surfaces that are hard to adhere to.
- Greatly transparentizing a color with the blending stick, even in heavy coats, will not cause the film to wrinkle, as it does when you add too much linseed oil to tube paint. This is because the wax provides structure to the oil even without pigment.
- Again, if you are working wet into wet, even combining Pigment stick with tube oil paint, do not worry about fat over lean.

### A MORE THOROUGH EXPLANATION

The previous explanation briefly summarizes fat over lean in relation to Pigment Sticks. But many of you who call us have wanted a fuller explanation of the principle as it applies to oil painting in general. So here is ours from the perspective of being both artists and manufacturers.

### FAT COLORS & LEAN COLORS

Pigments absorb different amounts of oil, based on the size, shape, and texture of their individual particles. As a result, the amount of oil needed to achieve a certain workable consistency of the paint varies from color to color, making some colors fat and others lean. This difference in oil absorption can occur even between two pigments of the same color. For example, one cobalt blue pigment can differ in its oil absorption (and shade) from another cobalt blue depending on how it is manufactured. The oil paint itself, depending on how it is milled and the use of additives, can also vary in its oil content from one brand to another. These are some of the reasons why the various artist's manuals differ over which are fat colors and lean colors. Nevertheless, for most of the colors there is a generally accepted progression of lean to fat. As suggested above, you can fatten

your oil paint by adding an oil medium. By doing this you can make a lean color fatter. This is a good idea if you are not sure whether a layer is leaner or fatter than the paint you are applying over it. Keep in mind, however, that adding too much oil can cause yellowing of the film. It can also cause the film to wrinkle as it dries, because the ratio of oil to pigment is too great. These problems of yellowing and wrinkling do not occur with glazes, even though the ratio of oil to pigment may be very high, because a glaze layer is quite thin.

## HISTORICAL DIFFERENCES IN PAINTS

Before the development of modern synthetic pigments and modern machine methods of pigment grinding and paint milling in the 19th century, most mineral pigments had a larger particle size than their synthetic counterparts and required greater amounts of pigment to absorb the oil. Modern pigments have a smaller particle sizes and are more thoroughly dispersed in the oil, so that less pigment (by weight) is necessary to reach a proper paint consistency. But the smaller particle size and better dispersion of pigment mean that a greater surface area is covered by the oil. Because of this factor, the rule of fat over lean is perhaps less rigid than it used to be.

## HOW PAINTING METHOD EFFECTS FAT OVER LEAN

As we mentioned above, the way you paint has an important affect on how much attention you should pay to the oil content of your colors.

There are two classic approaches to oil painting. One is direct, or wet into wet, painting, which evolved from the plein air landscape painting of the 19th century. The other, more traditional approach, going back to the original use of oil paint in the 15th century, is sometimes called indirect painting. In that method, layers of opaque and transparent colors are built up, each one after the lower layer has sufficiently dried.

Paintings are often executed with a combination of the two methods. But it is particularly with indirect painting and building up distinct layers that the fat over lean rule comes into play. This is because of what happens when oil paint dries. Unlike acrylic paint, which dries by the evaporation of water, or encaustic, in which the wax solidifies, the drying of an oil paint film is a process of slow, complex, irreversible chemical changes in the oil.

## HOW OIL PAINT DRIES

The drying process of oil paint takes place in stages. In the early stages, the oil turns from wet to sticky as it absorbs oxygen and moisture from the air. The paint film swells and increases in weight from the oxygen. As the paint further oxidizes, it becomes touch dry, forming long molecular chains (or polymers) on the surface. The drying of an oil paint film starts at the top and works its way down. Very soon after the surface dries, the oil begins to shrink around the pigment particles, at first quickly, then more and more slowly over time, as it fully polymerizes and becomes dry throughout.

The rate at which the oil grabs oxygen in its initial drying stages is greatly influenced by the catalytic effect of the pigment. Some pigments (such as umbers) accelerate this oxidation, others (such as cadmiums) have little effect, and some (such as pure carbon blacks) retard the oxidation. As you can see on the drying rate chart below, umbers dry fast, cadmiums slowly, and intense carbon black very, very slowly.

## APPLYING PAINT LAYERS

When oil paint is applied, it is always affected by what is under it. If you paint wet into wet, that is, paint directly into paint that is still wet, the new paint will mix in with it and become part of the same layer. Even though the colors dry at different rates, there is much less stress on the overlying colors than if you apply them in layers. So the rule of fat over lean is much less of an issue.

If you paint onto a layer of dry paint, the new layer will not mix in but simply adhere to the dry one. But it would be wrong to perceive that dry underlayer as a dead, inanimate object. Long after it is touch dry on the surface, the paint film is still going through changes as it continues to dry through. Indeed, these changes can continue for hundreds of years. The early stages of swelling and shrinking are by comparison rapid and dramatic. This is mainly when problems arise that are caused by applying lean colors over fat colors. But there is no set timetable for these problems to occur. Much depends on the thickness of the two films. For instance, if a thick layer of lean paint is applied over a thin layer of fat paint, it may take a long time to crack, or it may never crack at all. Temperature and humidity also play a role in the rate at which an improperly applied paint film can crack. Drying time is as important as fat over lean in building up layers of paint. But the drying rate and the fatness of a color are not related and should not be confused. Cadmium colors are lean and very slow drying, umbers are somewhat fat and very fast drying. On the other hand, cobalt yellow is lean and very fast drying, while alizarin crimson is very fat and slow drying. Unless painting wet into wet, a paint layer should be properly dry before painting over it, well beyond touch dry, especially with thick coats. Paint that is applied over an inadequately dried layer can crack, remain tacky, or its color will sink.

## WHY FAT OVER LEAN?

Even when it is dry, the oil film is only a semi-solid, a kind of hard gel, which gives it a certain flexibility. Lean colors are less flexible than fat colors, because they have more pigment and less oil. When you lay one layer of paint over another, even one that is properly dried, the lower layer is still going through a swelling and shrinking as it continues to dry internally (remember, this is a long process). The fatter the color, the more this movement will take place and the greater the stress it will have on any film over it that is less flexible. Ralph Mayer in *The Artist's Handbook of Materials and Techniques* uses the analogy of brittle casein paint on a sheet of rubber flying off when the rubber is stretched. The analogy is extreme, of course. But, so too, it is especially in extremes where fat over lean needs to be heeded. Colors that are not far apart in oil content are far less likely to crack when you place the leaner one over the fatter one. It is when you paint a thick coat of, say, titanium-zinc or cadmium yellow over a continuous coat of alizarin crimson or viridian that you are inviting trouble.

Other factors play a role, too. Fatter colors will dry to a glossier film that makes it harder for a succeeding leaner layer to adhere to, causing over time the leaner layer to creep and eventually crack. Thick paint coats are at greater risk than thin ones if painted lean over fat. One can stretch the rule more safely with scumbles and glazes than with impastos.

## A FINAL WORD

If all this seems intimidating, don't let it drive you crazy. It's good to know about fat over lean, but know that the artist's manuals themselves do not treat this subject uniformly. Experience in the method that you work in will be your ultimate

guide. If your paintings after several years aren't cracking, don't worry. If they are, perhaps the above will be some help.

### LIST OF FAT & LEAN COLORS

In R&F Pigment Sticks

VERY LEAN: Cobalt Green, Cerulean Blue, Neutral White, Mars Violet, Titanium-Zinc White, Jaune Brillant, Brilliant Yellow, Dianthus Pink, Naples Yellow, Azure Blue, Cadmium Orange.

LEAN: Turquoise Blue, Chromium Oxide Green, Cadmium Yellows & Reds, Mars Orange, Red, & Black, Cobalt Violets, Cobalt Yellow, King's Blue, Veronese Green, Manganese Violet, Neutral Grey Pale & Lt..

AVERAGE: Warm Pink, Siennas, Umbers, Indigo, Courbet Green, Ultramarine Blue & Violet, Cobalt Blue & Turquoise, Graphite, Cadmium Greens, Neutral Grey Med. & Dp., Ivory Black, Prussian Blue, Mars Yellows, Viridian, Payne's Grey.

FAT: Iridescent Colors, Warm Rose, Sanguine Earths, Sepia, Green Earth.

VERY FAT: Brown Pink, Alizarin Crimson, Phthalo colors, Quinacridone Magenta, Rose Madder.

SUPER FAT: Lamp Black, Intense Carbon Black

### LIST OF FAST & SLOW DRIERS

Here are the R&F colors grouped according to their drying rates. These may differ slightly from those of tube oil colors because of varying amounts of wax content. The drying range is based on paint thickness and absorbency of the surface painted on.

VERY FAST(1-4 days): Umbers, Cobalt Yellow, Indigo, Neutral Greys.

FAST (2-10 days): Cadmium Green, Cerulean Blue, Cobalt Blue, Cobalt Green Light, Cobalt Turquoise, Cobalt Violet Dp., Courbet Green, Manganese Violet, Neutral White, Payne's Grey, Phthalo Green, Prussian Blue, Sanguine Earths, Siennas, Viridian.

AVERAGE (6-17 days): Brown Pink, Cadmium Green Pale, Cadmium Lemon, Cadmium Yellow Lt. & Med., Green Earth, Iridescent Pearl & Pewter, King's Blue, Mars Yellow Dp., Mars Orange, Mars Violet, Mars Black, Sepia, Titanium-Zinc White, Turquoise Blue, Ultramarine Violet, Veronese Green.

SLOW (7-27 days): Alizarin Crimson, Azure Blue, Dianthus Pink, Iridescent Silver,

German Silver, Brass, Gold, Copper, Bronze, Ivory Black, Mars Yellow Lt., Mars Red, Phthalo Blue, Phthalo Turquoise, Rose Madder, Warm Rose.

VERY SLOW (10-50 days): Brilliant Yellow Extra Pale, Cadmium Orange, Cadmium Yellow Dp., Cadmium Reds, Chromium Oxide Green, Cobalt Violet Lt. Graphite Grey, Jaune Brillant, Naples Yellow, Quinacridone Magenta, Ultramarine Blue, Warm Pink.

SUPER SLOW (45-90 days): Lamp Black, Intense Carbon Black.

### ARTIST HANDBOOKS THAT DISCUSS DRYING AND FAT OVER LEAN

A.P. Laurie, *The Painter's Methods and Materials*, Dover; Gettens and Stout, *Painting Materials: a Short Encyclopaedia*, Dover; Ralph Mayer, *The Artist's Handbook of Materials and Techniques*, Viking; Kurt Wehlte,, *The Materials & Techniques of Painting*, Van Nostrand; Reed Kay, *The Painter's Guide to Studio Methods and Materials*, Prentice-Hall; Mark David Gottsegen, *A Manual of Painter's Materials and Techniques*, Watson-Guption.