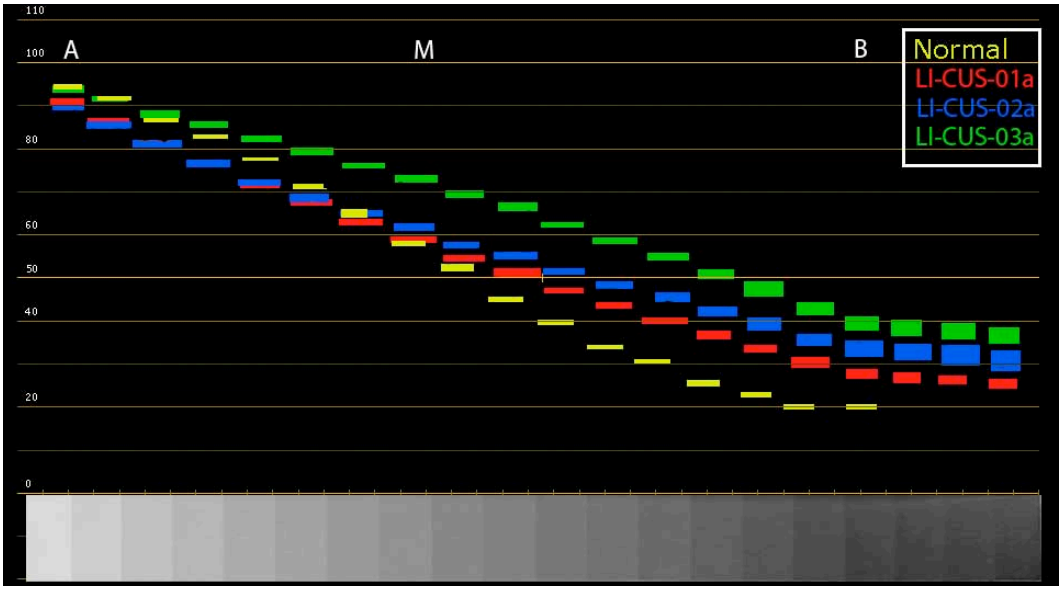
Light Illusion Curves for Canon's EOS cameras (5D and 7D among other ones)

by Alfonso Parra AEC

Light Illusion is a leader consultant within industry of digital cinematography, digital intermediate and workflow. It gives support a worldwide scale to the production, the postproduction and equipment manufacturers. Steve Shaw and Steve Reddy have an extensive curriculum that contains a large quantity of works about supervision and digital advice for feature films, TV series and commercial. As we expected, Light Illusion has designed specific gamma curves for Canon's EOS cameras (5D, 7D, etc). According to Steve Shaw, *"The curves were designed for the Canon EOS range of cameras due to market pressure. I received so many requests to generate curves for the cameras that I really had no choice but to make them... Other people had tried to make curves, but the results were not as users hoped."*

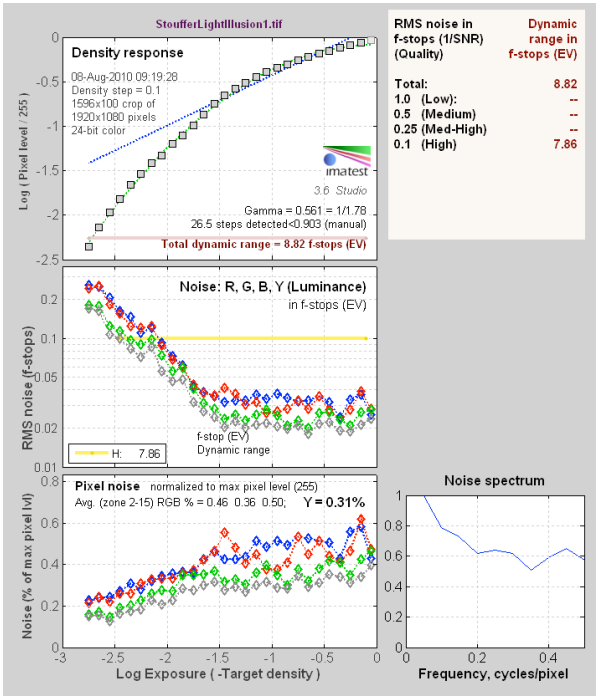
Curve design has resulted in three curves, because *"During the design process it became apparent that 3 curves would cover all the requirements for the cameras, based on the cameras limitations. I did make more curves, but eventually selected the three best that would maximise the camera's capabilities. The design process resulted in many different curves, some of which worked, some didn't..."* Light Illusion has a wide experience in the design of gamma curves for SONY's CINEALTA cameras; this magazine has already published large tests and articles about this topic. *"Previous experience in generating the now well known Light Illusion Gamma Curves for Sony's CineAlta cameras was a great help in generating the Canon EOS curves. I did refer to the previous design work a lot while generating the new Canon EOS curves"*. With this experience and comparison, the three curves put cameras abilities up to the maximum regarding DR. Embodying in the curves was not an easy work, *"the process used for generating the curves was very similar to that used for the Sony Gamma Curves - a lot of trial and error, until the best results were obtained."*

The three curves work in the ways of changing camera abilities to see detail at shadows, and making reading at highlights as large as possible, all of that, as Steve points out, limited to *"the compression used; the limited DR; and the use of 8 bit recording*."

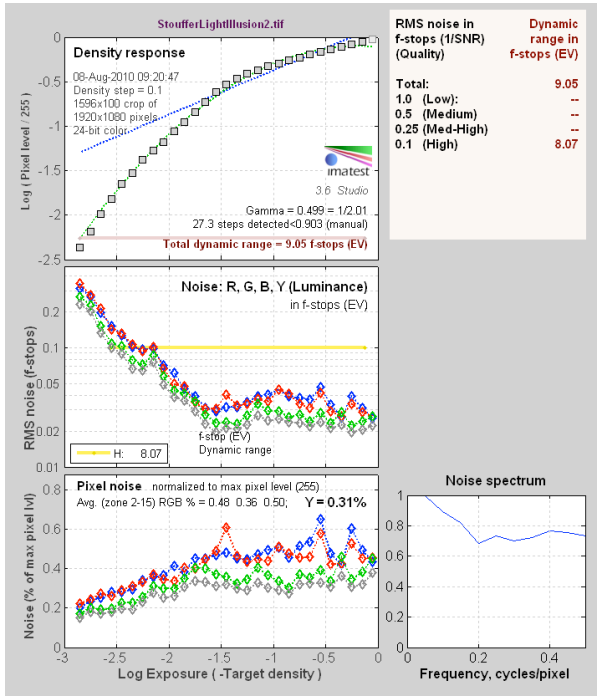


Previous graph: We show the three curves in comparison with the Normal one. Normal curve is already installed in the camera. Firstly, we have noticed that three curves are less contrasted than the Normal one; moreover, it does not represent the last three black values, as the other three ones do. Therefore, we see more detail at both shadows and middle tones, although it depends on each curve. Thus, LI-CUS-03a curve gives the greatest values at middle tones: 75% M value, and LI-CUS-02a curve gives 62% one, whereas M value of Normal curve is 55%. LI-CUS-01a and LI-CUS-02a curves allow showing a bit more texture at highlights.

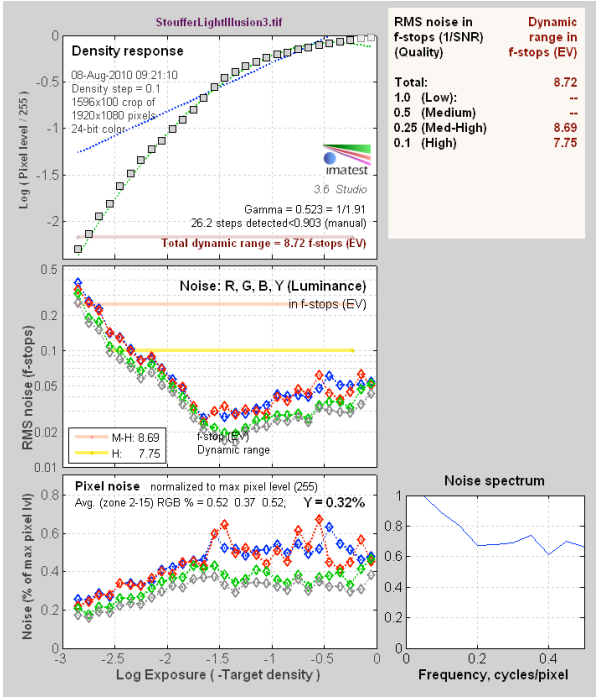
We can quantify theses results through the Stouffer strip and Imatest evaluation. Below, you find test outcomes.



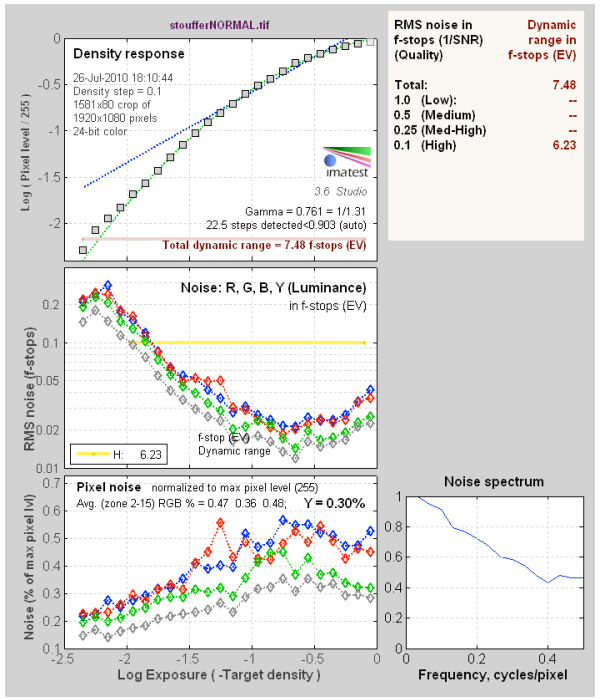
LI-CUS-01a



LI-CUS-02a



LI-CUS-03a



Normal (preset)

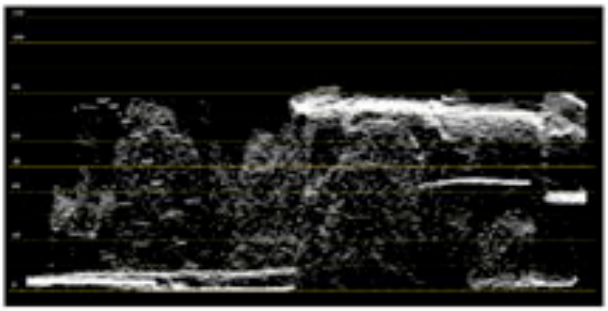
Evaluation results confirm that *captured* DR has increased without significant noise increasing. LI-CUS-02a curve gives larger range than the Normal one, 9.05 stops against 7.48 ones.

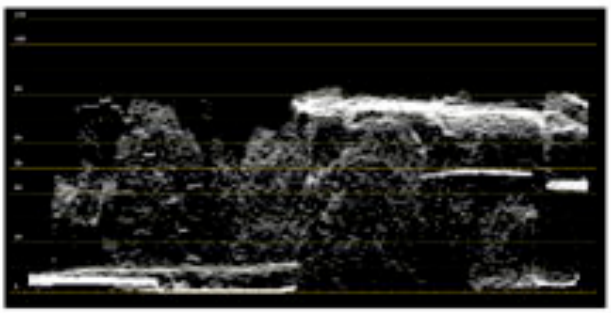


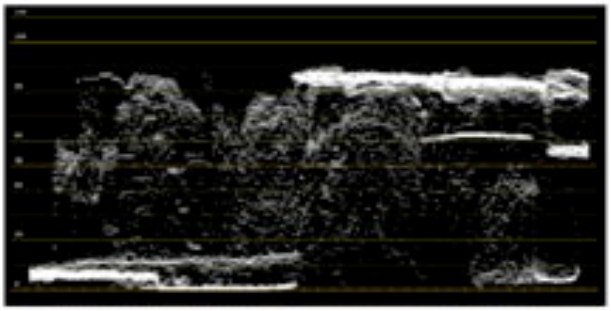
Reflected light values at Stops regarding Base Exp.

It should be to point out that if we use the Neutro curve (a camera preset too), DR through Stouffer strip gives 8.31 value, i.e., below Light Illusion curves values too; although above Normal one. In fact, LI-CUS-01a curve is the more similar to the Neutro one; it is a slighter contrasted than the last one.

Y average value of noise keeps between 0.30% (Normal curve) and 0.32% (LI-CUS-03a one); therefore, we can state that the use of the curves does not imply a significant visibility of noise. In addition, as we have seen in Noise Spectrum graph, we have checked how Normal curve has the steepest slope, i.e., it has less resolution at high frequencies, and it loses more detail at high ones than LI-CUS-02a curve. LI-CUS-02a curve behaves very well at every frequency. Equally, we can contrast curves shapes on top graph (Density response)



Light Illusion Gamma Curve - LI-CUS-01a



Light Illusion Gamma Curve - LI-CUS-02a



Light Illusion Gamma Curve - LI-CUS-03a

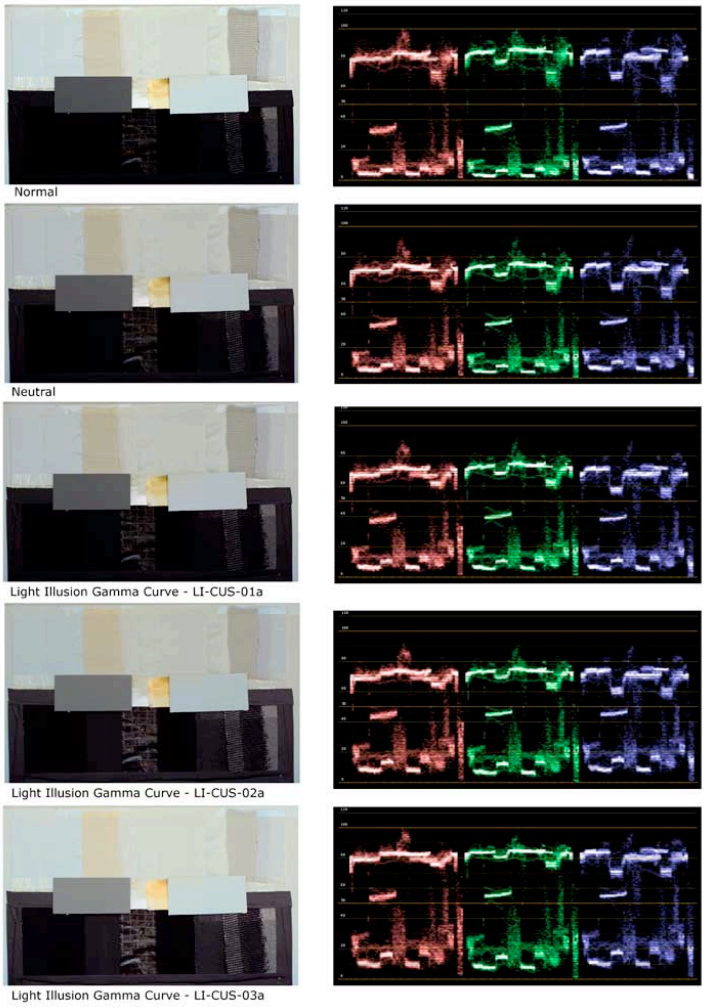
We have used a typical image of still life to compare the three curves. We have seen that LI-CUS-01a and LI-CUS-02a curves keep whites almost equal. Only LI-CUS-03a curve increases slightly these values; we have already seen it at the gray scale.

The three curves keep white background fabrics. LI-CUS-03a curve has more detail at middle tones and shadows (let us pay attention to the gray chart value, it is much higher than the middle value). LI-CUS-02a curve places gray at 50% and LI-CUS-01a curve at 45%.

With LI-CUS-02a curve, +2 whites are below 80%, thus, we can capture until 2/3 stops of detail at highlights. Therefore, we have lost a bit of texture at whites with 2 2/3 stops above middle value, although there is not still clipping on them. It should be remembered that Normal curve placed this value at 2 1/3 above middle gray, and Neutro one at 2 ½ (according to strip of exposures that we have made). We have increased until 2 stops at shadows regarding Normal one. We have been able to see until -6, but black velvet texture is lost and noise begins to appear at grading. Therefore, even though we have been able to see -6, I have marked the range nearly 5 ½ below; it means an increase of 1 stop regarding Neutro curve and almost 2 regarding Normal one.

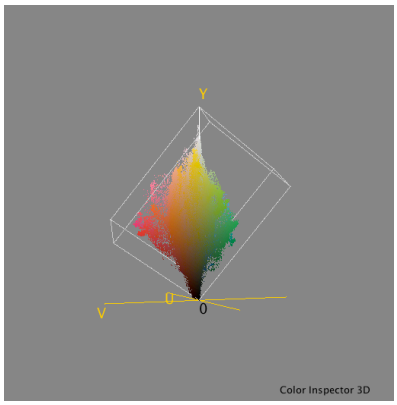
Nevertheless, LI-CUS-03a curve behaves in a total different way. It seems to us that LI-CUS-03a curve has been deliberately designed for situations with very low contrast. I believe that it is ideal for half-light, but I do not recommend for situations with normal or high contrast, because the curve loses detail at high lights. I believe that LI-CUS-03a curve pushes the limits of Canon cameras; it might be that some effects like posterization or other ones appear; camera deficiencies at both capture and recording process should cause these effects.

Let us compare now our Death Chart with the different curves. It is other way to evaluate the differences that we are pointing out in these previous pages.

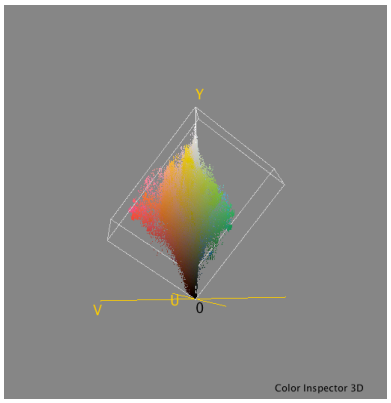


Cipriano Fenelón designed this chart, known as Death Chart. It shows a series of fabrics with equal or similar reflectation, but with very different textures. There is nothing more difficult for a digital camera. We have used Death Chart to record with the three curves of Light Illusion and the two preset curves of the camera. We can see how every curve sets its own middle gray value. They behave in the same way with white and black values. As we have already seen, LI-CUS-02a curve allows more capture at highlights, and Normal one less capture. LI-CUS-03a curve has more details at blacks.

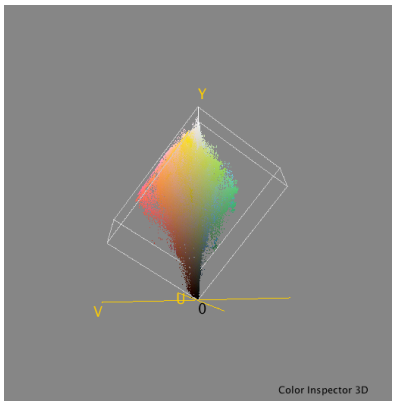
The use of the curves does not affect color tone. Nevertheless, since curves push the limits of camera abilities, they show more their weakness. As a result, we have to take care of them at postproduction, although according to Steve *"The curves don't so much help post-production as help capture - they maximise the camera's capture capabilities, but do therefore mean the image will usually require post-production grading to gain the best possible final result."*



LI-CUS-01a



LI-CUS-02a



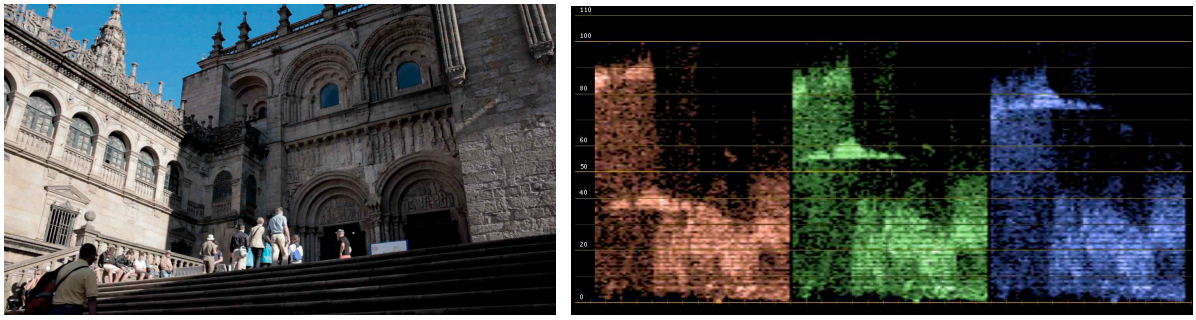
LI-CUS-03a

Representation of the still- life at YUV space of color with the three curves.

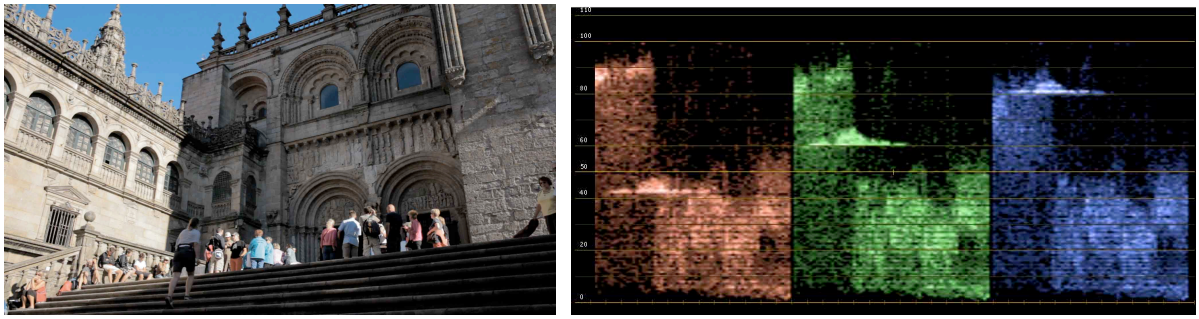
With Color Inspector, we have seen how still life color representation is through the curves. We can see how apparent saturation and bright increase, above all at LI-CUS-03a. Under certain circumstances, LI-CUS-03a can show skin tones flat.
Finally, let us see images shot on outdoor location.



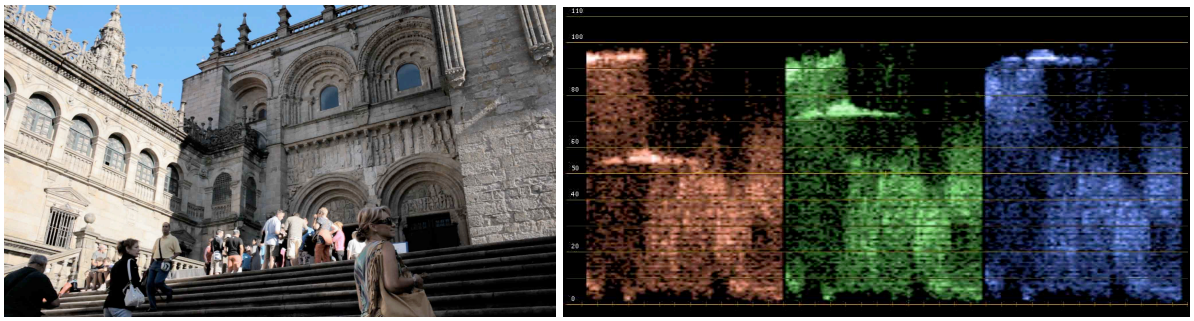
Below, the three curves in comparison. Let us pay attention to (B) point that is +3 (previous image). At red channel, LI-CUS-03a curve compresses it, whereas LI-CUS-01a and LI-CUS-02a ones keep its texture, although they both are near to the limit. Thus, with LI-CUS-02a we can keep texture above 2 2/3. Nevertheless, we can check how we appreciate detail of steps (D) and Platerías façade (C) with the LI-CUS-03a curve as opposed to the two other ones.



Zeiss Planar F 28mm lens. ISO100 1/50 25fps T 11. Exposure with LI-CUS-01a. Highlights are adjusted to the right of histogram



Zeiss Planar F 28mm lens. ISO100 1/50 25fps T 11. Exposure with LI-CUS-02a



Zeiss Planar F 28mm lens. ISO100 1/50 25fps T 11. Exposure with LI-CUS-03a

Conclusions:

As usual, Light Illusion supplies us with new devices of great accuracy; they improve the capture of our images with the Canon's EOS cameras. To my taste, LI-CUS-02a curve is more balanced at highlights, shadows and middle tones. Its *recoverable* DR is 8 stops as opposed to 6 ½ ones that the most generous curves of the manufacturer. LI-CUS-01a curve gives a more moderate solution at shadows. LI-CUS-03a curve gives us help under those circumstances where we need to show information at shadows and middle tones, e.g., when we are working at half-light or nights with low contrast.

Acknowledgments:

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