

# **Imacon Flextight 949.**

## **A review of the grapes, as the fox sees them!**

**By: Giorgio Trucco**



### **Introduction:**

A lesson from the past: about 2000 years ago, an enslaved Latin poet, named Fedro, wrote a tale about a fox and some grapes.

One day a fox saw some grapes in a garden. He stopped because he was hungry and thirsty. "I want some of those grapes", he thought and tried to get them, but he was too small.

He tried again and again, but they were too high.

So the fox went away. "I don't think those grapes were very good after all", he thought. "I can find better ones in another garden".

How does such a tale relate to a review of an Imacon scanner?

Imacon scanners are regarded as some of the best scanners available on the market. But like the grapes, they also stand very high in price and everyone considering the purchase of an Imacon scanner will have to face the little fox that lives inside all of us.

How many times have we heard the question: "Will a \$15,000 scanner outperform 15 times my \$1,000 scanner? Is it really worth all that money"? I asked myself the same question a few times, and although I've successfully managed to justify the use of other scanners in some occasions, the central question remained unanswered.

Then Imacon kindly sent me their latest model, the Flextight 949, for review, and I had enough time to get intimately familiar with it. This review will try to answer the "fox question": "Is this scanner for me, and is it worth its cost"?

My review will not describe every aspect of the scanner. I assume that all readers interested in this article have a general knowledge of Imacon scanning philosophy and technology.

This review will be prime on the real use of the FlexTight 949, from the point of view of a creative professional willing to get the best scans of his/her color chromes.

### **Professional Build:**

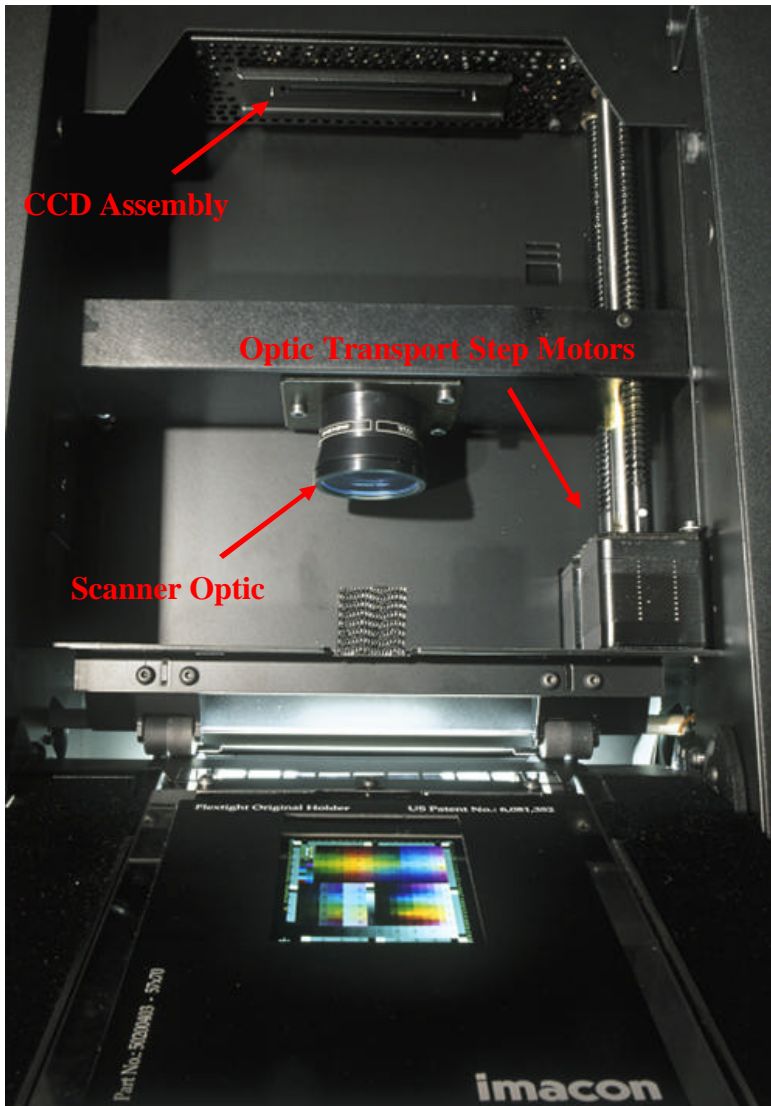
One thing you'll immediately notice about this scanner is that its design philosophy is probably derived from the military industry. This scanner is built, looks and weights like a tank.

Imacon certainly deserves a mention of honor for taking this approach. In a world of recycled plastic you will have a hard time finding a single piece of plastic inside this scanner, not even the power button is made of plastic! This is truly the first hint about the character of the 949.

Right out of the box (make sure to bend your knees before trying to lift 17kg/38lbs!) you'll realize that this is a professional piece of equipment that won't fit on a flimsy table. In fact, the scanner has a towering and commanding presence and it boldly claims its space.

By removing the front panel, access is gained to the optic transport mechanism and the CCD housing, as shown in Figure 1. The quality of both the components and the assembly speaks for itself and it shows that designers at Imacon didn't cut any corner in designing this unit.

The CCD is actively cooled by a Peltier element that ensures optimal operating conditions of the CCD at room temperature. By keeping the CCD at room temperature the noise is kept within spec, granting full employment of the maximum Dynamic Range of the scanner (more on this later).



**Figure 1: A view of the scanner internal assembly and components reveals uncompromised design quality.**

Similar to traditional enlargers, there are essentially two types of light sources for desktop scanners: collimated and diffuse light.

Collimated light is focused by a light condenser, which forces the source light rays into a parallel path. This type of light is known to extract every bit of information from the originals, but it can also emphasize the grain structure of the film and is more sensitive to film surface defects, like dust or scratches, because these defects bend and deviate light.

Diffuse light sources on the other hand, produce a more scattered light that creates softer edges around the finest details of the original. When the finest detail on the film is the substrate grain, this type of light, although less efficient than collimated light, helps keeping the grain structure of the film under control.

The light source of the Imacon 949 is a traditional light condenser that offers highly collimated light, but the design innovation lays in the fact that both flat surfaces facing the light tube and the film have been finely ground to produce a surface that resembles a groundglass screen (see Figure 2 and 3).

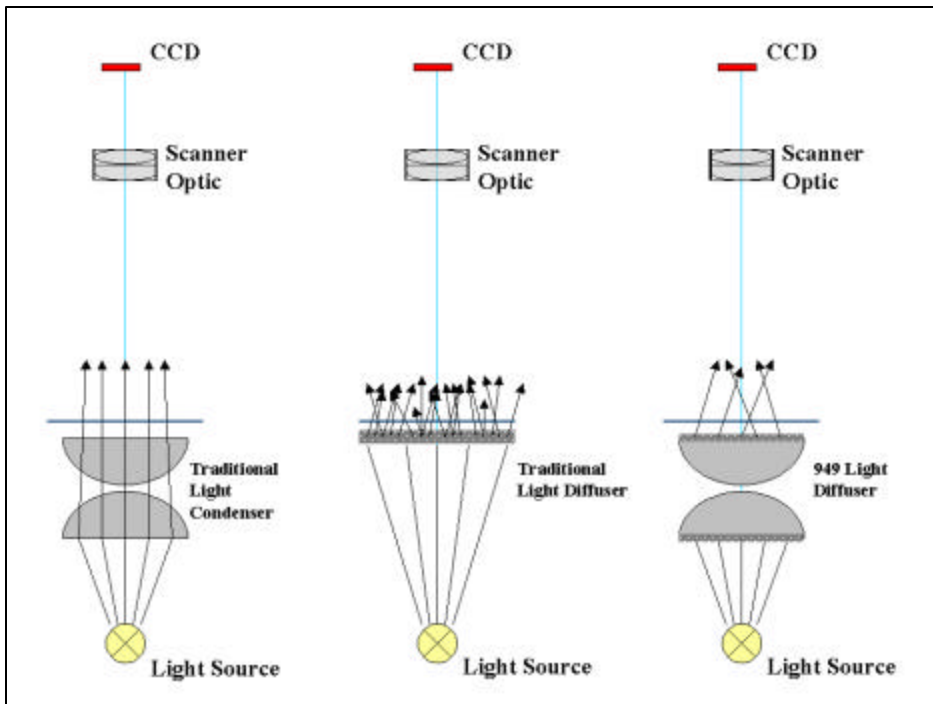
The outstanding build quality of the scanner is certainly reason for its high price, so this aspect is probably the first one to consider when the purchase of an Imacon scanner is being pondered.

The assertive mechanical qualities of the scanner will guarantee years of continuous operation with minimum risk of mechanical failure. Whether the extended durability of the scanner is something to invest on, largely depends on the type of business the potential buyer is running.

For the advanced amateur scanning a few chromes each week the answer is probably not (leaving aside the scan quality, which will be discussed later). But for photo-labs or professional photographers requiring a high-output production environment, the steep initial investment will soon be paid out by its reliability and uninterrupted operation.

### **Light Diffuser**

The Imacon 949 is the first model incorporating a diffuse light source. This is the most prominent refinement over its predecessor, the Imacon Flexlight 848.

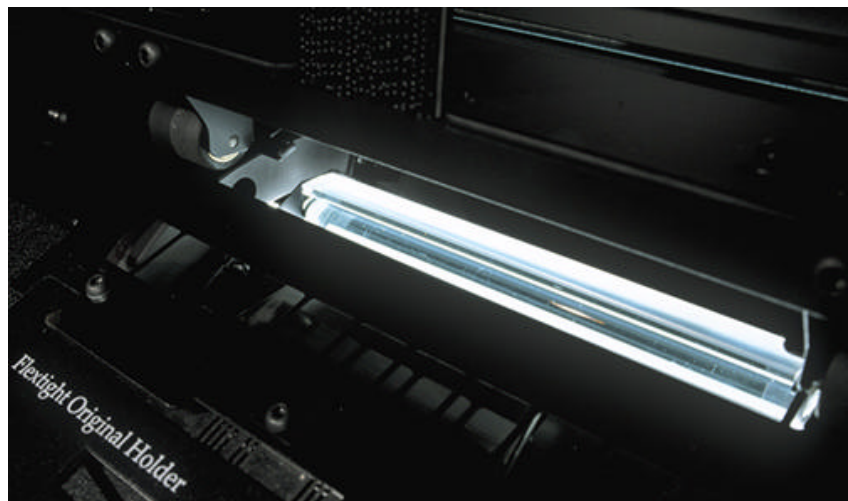


**Figure 2:** A review of the traditional light diffusers shows the split behavior of the Imacon 949 diffuser design.

(<http://www.scanhancer.com>) generated an idea that spread around very fast, to the point that Minolta has adopted the same concept in the Elite 5400 model, calling it the “grain dissolver”.

The light diffuser of the Flextight 949 works extremely well in my experience. The ground surfaces offer enough light smoothing to prevent exaggeration of the film grain, while the light condenser ensures high efficiency of the light source.

The diffuser introduced with the 949 model is in my opinion one of the highlights of this model. Diffusers will become more known and widespread in future models and Imacon has done a wonderful job at refining its own solution and making it available.



**Figure 3:** A view of the 949 light diffuser, a clear plexiglass condenser with ground surfaces.

The result is a light source behavior in between a collimated and a diffuse light source that produces very sharp and high-acutance scans without exaggerating the film grain.

Light diffusers are important components in any scanner design, but they don't seem to get as much attention in marketing ads as they deserve.

Until recently, light diffusers were not available in high resolution desktop scanners, then, around October 2002, the hard-work and sleepless nights of my friend Erik de Goederen

## FlexColor:

As strange as it might seem, some desktop scanners come with drivers that don't allow the user to fully utilize the potential of the scanner. Most drivers tend to create an easy to use environment that replicates the various color controls found in Photoshop-like image editing softwares.

### Canned or Custom Profiles?

As already mentioned in the article, I've found Imacon canned profiles to be very accurate and reliable.

Despite this, there is still something to gain with a custom profile, but building one that offers advantages over the stock canned profiles, requires experience, patience and the right tools.

### Scanner Targets:

There are two types of scanner targets currently available: **IT8** and **HCT** targets.

IT8 targets are produced according to the IT 8.7/1 ANSI Standard and contain 288 color patches.

The bottom area of an IT8 target is made of 22 shades of gray plus  $D_{min}$ = white and  $D_{max}$ = black.

This area of the target is very useful when trying to gray balance the scanner response and is used as a numerical guide to optimize the device Tonal Response Curve (TRC) of the scanner.

HCT targets, on the other hand, are custom made targets designed by Don Hutcheson. They contain more than 500 color patches and most of the added patches sample the scanner response to dark colors and neutrals, resulting in better overall color accuracy and shadow details. I've consistently found HCT targets to produce better scanner profiles than IT8 targets, and I use them regularly for the creation of my custom profiles.

### Gamma Setting

The Gamma setting in the driver controls the way the scanner responds to the range of densities found on the original. Gamma settings affect mainly three-quarters tones and shadows, therefore the higher the Gamma, the lighter the scan we get from the scanner.

If the Gamma is set too low, shadow separation is lost; if it's set too high, then the Dynamic Range of the image will be compressed. Starting with a rich scan is key to the fine-art printmaker and finding the right Gamma setting is one of the most critical aspects of scanner profiling.

One can follow general rules or take a more time consuming approach and measure the accuracy of the profile created at different Gamma settings, picking the one that results in the lowest dE between the target reference Lab values and the target scan converted to Lab using the custom profile.

In my experience I had better results using a higher than normal Gamma setting. I've found the optimal Gamma to fall in the 2.6-3 range.

With regards to the custom vs canned profile, in my tests the stock profile yielded 2.28 dE (CMC/2:1) and my own custom profile yielded 0.68 dE (CMC/2:1). We can see that the difference is significant, but 2.28dE for a canned profile is actually very good!

Unfortunately this approach fails to suit the needs of power users.

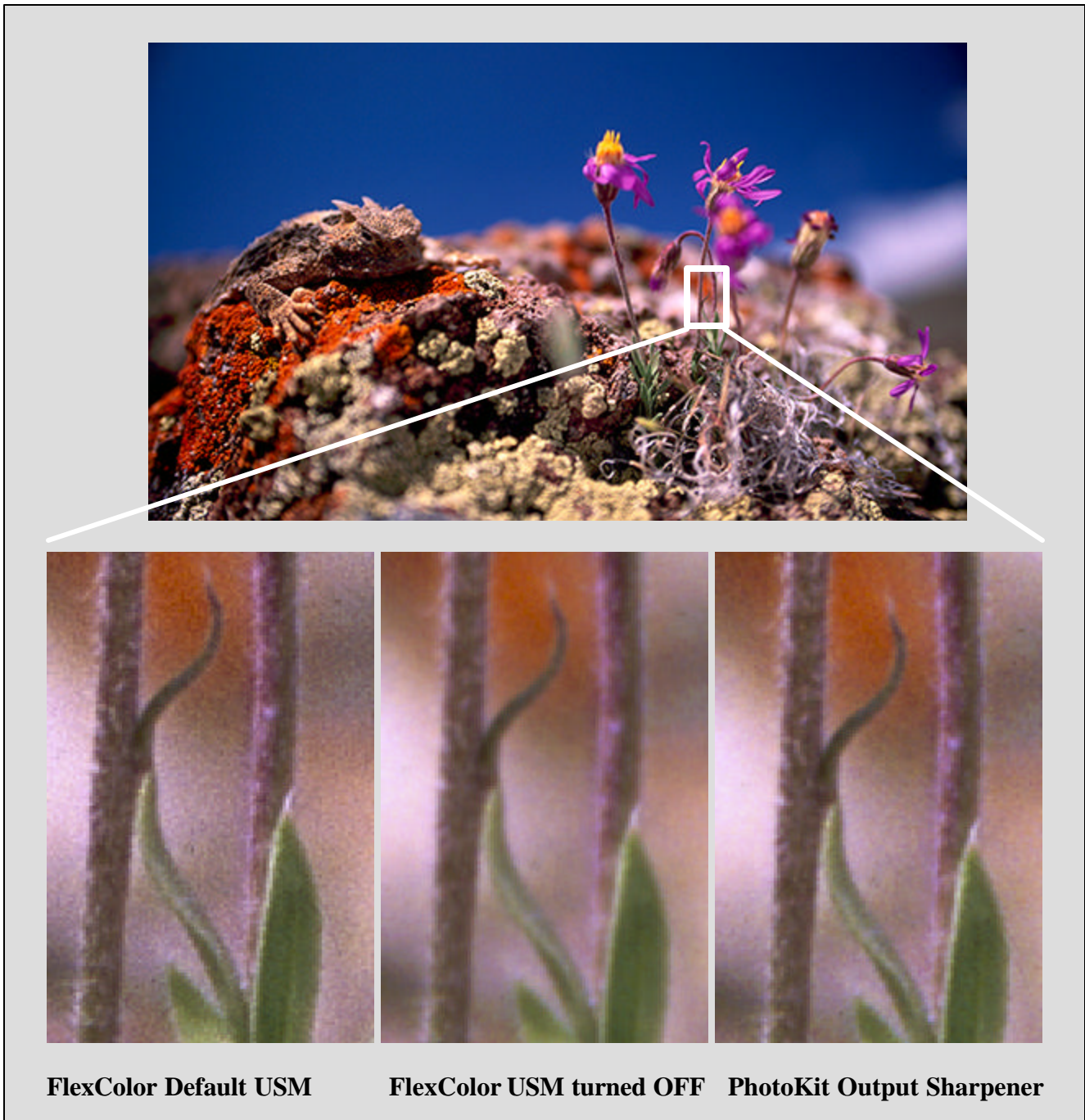
If the scanner is operated in a fully color managed workflow, there is almost only one thing it should be able to do, which is to export raw, gamma-corrected, RGB data. Strangely enough, some drivers don't allow this.

Fortunately this is not the case with FlexColor, which is a very complete and well thought-out driver that can be used in a fully automated mode or can be customized to the taste of the most demanding users.

I won't cover the details of the FlexColor software (this would require a separate article, and I doubt it would be any better than the excellent Imacon Manual), but I want to emphasize that FlexColor is highly user-selectable and can be easily tweaked for accurate color managed scanning.

With regards to scanner profiles for slide scanning, I've found the canned profiles installed by the FlexColor software to be very accurate and reliable. I normally approach canned profiles with skepticism, but Imacon profiles can be effectively used out of the box and creating a custom profile that offers improvements over the stock ones requires significant time and effort.

My first scans with the 949 were done in fully automated mode, using the canned profile installed with the software.



**Figure 4:** *Horned Lizard sunbathing on a rock, Black Rock Desert, NV. This image contains both high frequency details and large out of focus areas. The white rectangle points out the enlarged area.*

**Left:** *the default FlexColor Unsharp Mask tends to over-sharpen the image and does a less than optimal job at separating actual image details from grain and noise in out of focus areas.*

**Center:** *the same crop with FlexColor Unsharp Mask turned OFF. The image is somewhat softer but maintains excellent smoothness. It's easy to work on this image and add a more selective and targeted sharpening.*

**Right:** *the center image sharpened using PhotoKit Output Sharpener for a 360dpi Glossy Inkjet printer. The actual image details are properly sharpened without increasing sharpen artifacts in unwanted (and unneeded) areas of the image.*

Although I was pleased by the color accuracy of the automated mode and the canned profiles, I wasn't impressed by the somewhat aggressive Unsharp Mask that is defaulted in the driver.

I found the level of default sharpening to compromise image quality rather than enhancing it.

The whole concept of sharpening has evolved significantly in recent years, and almost every respected sharpening solution today, employs some sort of intelligence that recognizes what is actual image detail, that should be sharpened, and what is just grain or noise that must be left alone. Moreover the sharpening of the image should be output-dependent and is better left to the final stages of image preparation. See Figure 4 for a side-by side comparison of different sharpening approaches.

Although the FlexColor sharpening does have some level of control (Dark Limit, Grain Limit and Radius) I found it to lack the level of control required to obtain a safe sharpening at scan time. More, the idea of sharpening at scan time is in my opinion questionable, and in fact it goes against the trend of the latest sharpening solutions, which sharpen the image for the specific output media and resolution at the end of the editing process.

I believe that Imacon could modify their approach to sharpening and let the users handle this matter in full autonomy with third party softwares.

In any case, for users handling their own sharpening, the Unsharp Mask can be completely turned OFF in FlexColor 3.9.3 by selecting:

USM Amount = -120

Apply Checkbox = checked

Set aside the Unsharp Mask flaw, I've found the FlexColor software to be easy to learn, very robust and consistent in all other respects. It perfectly matches the overall quality of the scanner and together create a seamless environment that will suit the needs of the most demanding users.

## **Image Quality:**

Image quality is the final test for any scanner, and though it might seem easily defined, the image quality of a scanner escapes a simple definition because it is made up of several and distinct aspects.

Among the most important factors there are: dynamic range and/or Dmax, noise level, edge-to-edge sharpness and optical flare.

There is no scanner on earth that handles perfectly all of the above facets of image quality and the Imacon 949 makes no exception. What is important though is the balance of the various elements.

I will analyze them separately and discuss my experience in these departments with the 949.

## **Dynamic Range:**

Knowing the published specs for a scanner Dynamic Range has very little meaning in real life, (see "Dynamic Range... dynamic what?" insert) the only reliable test for evaluating the ability of the scanner to separate fine shadow details, is to scan real slides and compare the results.

My experience with the 949 in this regard has been simply amazing. Leaving aside Drum Scanners, the 949 has no rivals in its ability to extract the finest shadow details from very contrasted slides.

In addition to its standard setting, the FlexColor software has also some useful features built-in to help users in scanning very dense originals.

The Adaptive Light control (found in the General Tab of the Setup window) increases the CCD exposure times and can significantly shift the resulting image histogram to the right, resulting in better shadow separation. If the original is very dense and we don't have a fully extended histogram, then the use of the Adaptive Light will help get nice open shadows without clipping highlights.

The combination of proper driver settings, accurate scanner profiles, the occasional use of the Adaptive Light control and a fully color managed workflow, creates a scanning machine with no limits to its ability to capture the finest shadow details.

This is an amazing result, quite different from my experience with other desktop scanners. I've often found a practical limit to the shadow details I could get from other scanners, and on a few occasions I've exposed my chromes to overcome the limitations of a specific scanner. This approach can work well, but it disturbs me.

With the 949 I can expose my slides the way I want knowing that whatever is on the slide will be faithfully reproduced in my master files.

Going back to the original fox dilemma, when it comes to shadow separation and Dynamic Range, my opinion is that there aren't any better grapes in other gardens.

Scanning negatives and low contrast slides, there isn't much difference between the 949 and other respected desktop scanners, but if we need a scanner that can easily extract every bit of detail from any slide we will ever feed to it, then the Imacon 949 has no rivals.

Again, this supremacy comes at a very high cost, but it is substantial and professional users will find several ways to exploit it to the last bit.

### Dynamic Range... dynamic what?

When it comes to manufacturer's spec sheets for scanners Dynamic Range, I picture a high-level meeting where engineers are kicked off the room and consumers gather outside the building waiting for the Senior Marketing Managers to emerge from the room and read out loud a sort of random number: "We got 4.6". What does this number mean, and should we care?

The concept of a scanner Dynamic Range is surrounded by many marketing claims, technical misconceptions and a lot of confusion, but some simple considerations will illuminate our understanding.

Let's start with the basic: Density and Dynamic Range.

The Density of a photographic media is defined as the logarithm of the ratio between the intensity of the light illuminating the media (a slide or a negative) and the light transmitted.

Let's consider Fuji Velvia, arguably the highest contrast slide film on the market.

The lightest portions of a Fuji Velvia have a  $D_{min}$  of about 0.01 (which means that about 98% of the light is allowed to pass:  $\log_{10}(1/0.98)=0.008$ ).

The darkest portions of the Velvia can reach an extreme  $D_{max}$  of about 3.5 (only 0.03% of the light is allowed to pass through the film deepest blacks:  $\log_{10}(1/0.0003)=3.5$ ).

The Dynamic Range is defined as the difference between  $D_{max}$  and  $D_{min}$ . With Velvia we can ignore the small  $D_{min}$  and use the term Dynamic Range or  $D_{max}$  interchangeably, in that they both equal 3.5.

Therefore, to be able to record all the details captured on a Velvia slide, all we need is a scanner with a Dynamic Range of 3.5 or more, and with lower contrast slides, or if we scan negatives, we would be safe even with a lower spec scanner.

If we take a look at the published specs of all major scanner manufacturers we will have a hard time finding one with a declared value lower than 3.6. Then, we are just fine, right? Well, the question is: "Is the declared Dynamic Range of a scanner its -true- Dynamic Range? Can we really trust this number?" Let's see...

Scanners use internally two stages: the **input** and the **output** stage.

The input stage is the CCD, the physical optical sensor. This component is an analog device that integrates the current generated by an array of photodiodes and returns a voltage proportional to the light received by the photodiodes. This voltage (a strictly analog signal) is then read and converted into a digital signal by an Analog to Digital (A/D) Converter. From now on the signal stays digital. Thus the scanner has a split personality: it's a digital device at the output but it's an intrinsic analog one at its input.

The A/D Converter used to read the CCD voltage codes the CCD response using a certain amount of bits. An 8 bit A/D Converter can code 256 ( $2^8$ ) levels of voltage from the CCD.

A 10 bits A/D Converter will do better: 1024 ( $2^{10}$ ) levels.

A 12 bits A/D Converter will do even better: 4096 levels, and so on, with the sky being the limit.

Is it possible to calculate the Dynamic Range of the A/D Converter as we did for the photographic film? Yes it is.

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## Dynamic Range... dynamic what?

(...continued)

The Dynamic Range of an 8 bits A/D Converter is:  $\log_{10}(256/1)=2.4$ .

The Dynamic Range of a 10 bits A/D Converter is:  $\log_{10}(1024/1)=3.0$  and so on.

We can summarize the above numbers in the following easy to read table.

bits of the A/D Converter	Number of discrete levels	A/D Converter Dynamic Range
8	256	2.4
10	1024	3.0
12	4096	3.6
14	16384	4.2
16	65536	4.8

If we pay attention to the relationship between the scanner color depth (and/or the A/D Converter type) and the declared Dynamic Range of most scanners, we will notice a close match with the numbers contained in the above table. This means that most scanner manufacturers don't publish the true Dynamic Range of their scanners (the ratio between the brightest and the darkest signal that the scanner can record), but only the theoretical Dynamic Range of the A/D Converter.

Bear in mind that this information is meaningless because the actual Dynamic Range of the scanner will depend on the actual Dynamic Range of the CCD, not the A/D Converter!

If the Dynamic Range of the CCD is lower than the Dynamic Range of the A/D Converter, the CCD itself becomes the bottleneck of the system, and all we get is what the CCD can see, not the theoretical limit of the A/D Converter.

Declaring the Dynamic Range of a scanner based on the Dynamic Range of its A/D Converter is like declaring the maximum speed of a car based on the speed rating of its tires.

If we want to know the true Dynamic Range of our scanner we need to know the Dynamic Range of its CCD. But, as you can imagine, these data are not published by scanner manufacturers and sometimes it's very hard to know what CCD is used inside the scanner.

The current best linear CCDs from Kodak have a true, "measured" dynamic range of about 4.1-4.3 (when used in the "High Dynamic Range Mode"). Anything above these numbers in any scanner spec, is likely to have very little real meaning.

## Noise Level:

The noise level of the CCD is the number one limiting factor of the scanner Dynamic Range and the one that the end user will certainly notice.

If we manage to get a copy of the CCD Datasheet we will find information about noise under the term "Dark Current". This term refers to the average number of electrons that are created in the CCD elements (at room temperature) when no light illuminates them. These electrons are created randomly by thermal agitation, thus the two key elements of CCD noise are:

1. it is random, and
2. it is temperature dependent.

The temperature dependence is very strong and as a rule of thumb we can say that the noise level of a CCD doubles every +10C of temperature increase above room temperature (25C).

Every time the noise doubles, about 0.3 of the original CCD Dynamic Range is lost, therefore running a CCD at 25C or at 40C makes a lot of difference in terms of performance! The CCD should be isolated as much as possible from any source of heat. Placing the CCD close to the light source, and the power supply (a very efficient heat generator) inside the scanner, are both hints of poor design that won't lead to optimal performance.

Imacon scanners, by design, keep the CCD as far as possible from the light tubes and use a separate power supply that sits on the floor instead of inside the scanner. Finally, the Peltier element found in the 949 model keeps the CCD at room temperature.

Simple ideas are the ones that always work best and all I can say about Imacon approach to reduce CCD noise is this: smart, simple and hard to improve, virtually perfect!

This clever approach pays out in terms of image quality. The noise level I've seen in my scans with the 949 it's by far the lowest I've ever seen in a single pass scan.

But the single pass scan mode is the second thing I'd like the 949 to handle differently.

As we have seen, the noise is random and temperature dependent. Imacon eliminated the problem of temperature dependency quite elegantly, but they don't seem to have attacked the noise randomness.

The noise level, although very low, could in fact be further reduced by giving away something: namely scanning speed.

The Imacon 949 single pass mode, paired to its amazing transfer rate (more on this later), makes this scanner a speed demon but leaves the random noise unchallenged.

The traditional way to reduce random noise is to flatten out its time dependency by averaging multiple frames taken at different times. This method works extremely well but it also increases scanning times significantly. It appears that Imacon has decided to lower the noise as much as possible while keeping the scanning times at record levels by using the single pass mode.

Despite the inevitable increase in scanning time, I would very much like to see an option in the FlexColor driver allowing users not in need of high volumes to relax the scanning times and get multisampling in return.

To test the amount of residual noise reduction achievable with the addition of a multisampling option, I scanned the same frame 8 times and averaged the stacked layers down to a single image. The results are shown in Figure 5.

Due to its nature, random noise can also be effectively reduced via software, by averaging lighter pixels with their surrounding neighbors. This technique requires some subtleties to be able to discriminate between image high frequency details and actual noise in darker areas, but when properly tuned it can work amazingly well.

I've developed a custom Photoshop filter that does this through a Photoshop Action.

The action is tuned for three of the most popular resolutions: 3200, 5000 and 8000 dpi.

A real example of the noise reduction achievable through a custom software solution is presented in Figure 6. Anyone interested in this set of actions is free to contact me privately.

In conclusion I think that the level of noise from the 949 is incredibly low, due to its intelligent design and quality of the CCD. Still, some improvement would be possible with the addition of a custom filter or a multisampling option.

## **Edge-to-Edge Sharpness**

In my experience the lack of edge-to-edge sharpness plagues most desktop scanners.

Internet forums are filled with complains about soft edges, lack of depth of field and so on. Glass film holders can fix this problem but at the cost of increased complexity, light refraction and possible dust visibility.

Some scanners are better than others, but truth is that I've seen edge-to-edge sharpness problems with virtually any scanner I've used, including top brands like Nikon and Minolta.

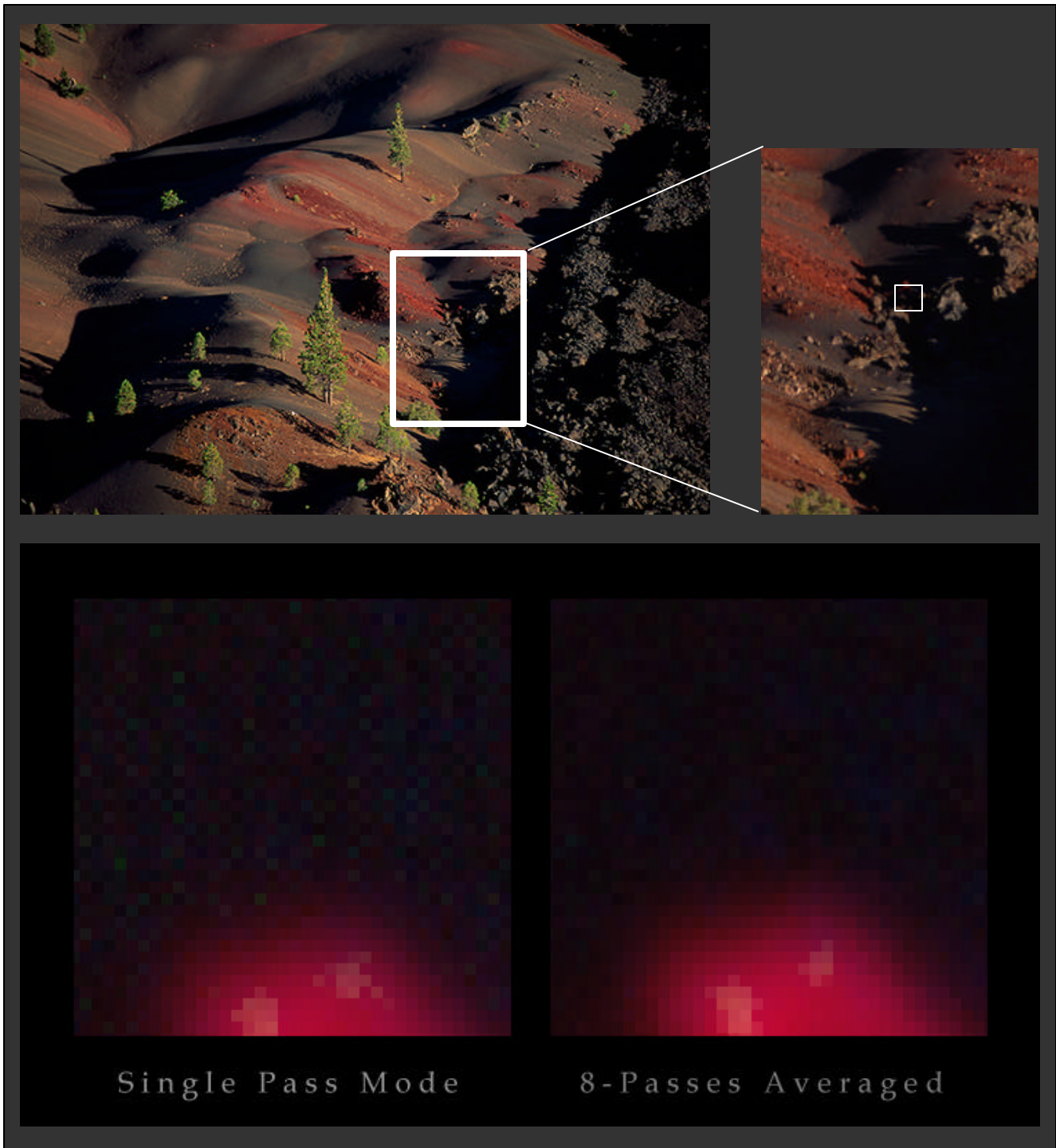
Imacon response to this problem is as simple and clever as it can be.

It's not based on a fancy technology or a highly engineered solution. It's pure and simple axiomatic geometry: "The shortest distance between two points is a straight line".

By bending the film along the virtual drum cylinder, a straight line is created between the two clamp points of the film holder, and it is this moving line that is read by the CCD.

This idea is so simple and effective that it simply can't be improved, not even in theory.

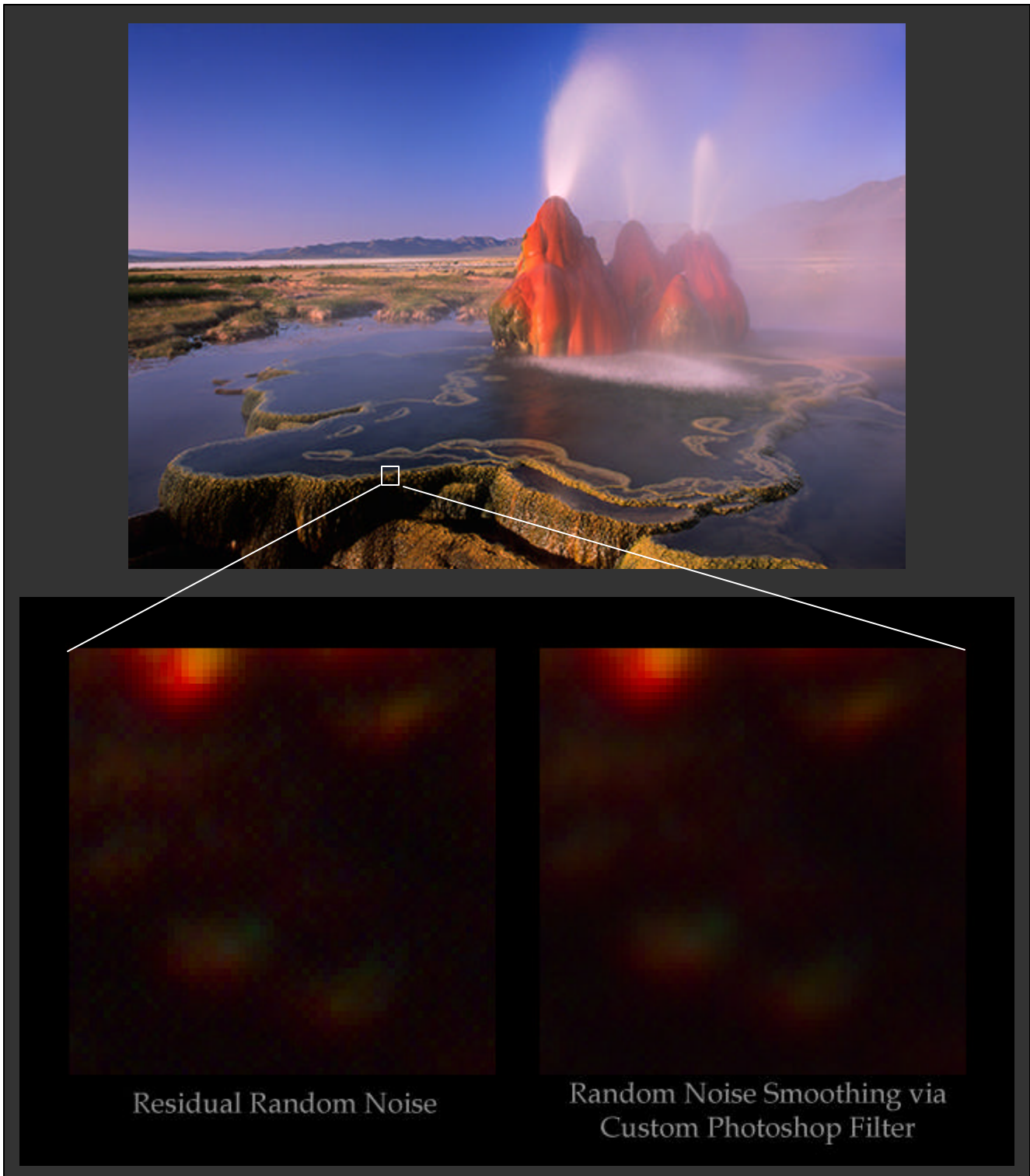
The results speak for themselves. The edge-to-edge sharpness of any scan from Imacon scanners is simply perfect and unquestionable.



**Figure 5:** *Painted Dunes, Lassen Volcanic NP, CA. This image has some large areas of pure black where signal falls down to noise level. Multisampling can lead to visible improvement in these areas. The image was scanned at 5000 dpi. The crops were lightened up a bit to make the noise visible in the small size JPEGs for the article.*

**Left:** *the single pass scan presents some typical, yet quite low, random noise in black areas.*

**Right:** *averaging 8 passes reduces the random noise and yields a darker, smoother background black.*



**Figure 6:** *Fly Ranch Geysers, NV. Another example of a high contrast image with a few areas of highly saturated dark colors. Image scanned at 5000 dpi.*

**Left:** *some random noise is visible. Lighter than normal pixels pop-up randomly creating a “dotted” pattern.*

**Right:** *higher than background pixels are selected and averaged with their surrounding neighbors. The selective averaging results in smoother dark areas, very similar to an actual multisampling.*

## Optical Flare

Optical Flare is another serious problem of many desktop scanners. It's due to the bleeding of the light from regions of low density to adjacent regions of high density along high contrast edges within the image.

Optical Flare can result in simple lightening of dark areas or, in the worst cases, in disturbing ghost images, as shown in Figure 7.

Optical Flare can be generated in two regions of the CCD assembly: the array of photodiodes and the glass cover.

When the light intensity reaches high levels, the charge generated by the photodiodes can diffuse to adjacent CCD elements increasing the background noise of the signal. This leads to a general increase of the signal level and consequent degradation of details separation.

This type of light bleeding can only be limited with a careful design of the CCD. Light smearing can be reduced by increasing the distance of the CCD elements, but increasing the CCD elements distance also reduces the maximum resolution of the system, and a design trade-off must be found.

Another important factor to prevent light bleeding is the quality of the CCD cover glass. The CCD should always be covered with a high quality antireflective coat. I've seen CCDs covered with uncoated glasses and I can guarantee that this is a recipe for disasters!

Imacon scanners use high quality Kodak inline CCDs, and these sensors are effectively coated with a high quality antireflective layer.

My experience with the 949 has been completely satisfactory in this department. In all my scans, even in areas where I saw ghost images with other scanners, I got perfectly clean edges on the 949.



**Figure 7:** *A typical ghosting effect along a high contrast edge. The area circled in red is lighter than normal due to the flare defect. This type of defect reduces image quality and can significantly compromise the accuracy of custom scanner profiles.*

## FlexTouch:

FlexTouch is Imacon's response to dust and scratches on the film. It's a software-based solution and I have mixed feelings about it.

I've found it to work just fine to some extent, but I've also found it to misinterpret image details with dust in some occasions.

The FlexTouch intervention intensity can be controlled within a 0 to 100 range. It's not recommended to set it over 60.

FlexTouch can be safely used at lower values (40 and 50) and at these levels it will take care of about 50% of the required dust busting.

I'm a big fan of Digital ICE and my opinion is that ICE remains superior to FlexTouch in terms of both effectiveness and safety of use.

ICE is a patented technology and to include it in a scanner costs the scanner manufacturer about 20% of the final price of the unit in royalties.

To avoid the added cost (and surely for other reasons unknown to me), Imacon decided to develop an independent solution. The effort is generous and the results worth noting, but I've yet to see a software-based solution that works better than ICE, and I'd certainly like to see ICE added to the next Imacon model.

In my opinion this would be in line with Imacon philosophy of delivering high volume, reliable production scanners. Dust and scratch removal can take a significant amount of time and I think that many users would be happy to pay the additional cost of ICE if this cost will buy them a solution that takes care completely of the dust and scratch removal step.

## **Speed:**

The Imacon 949 is the first scanner I tried that doesn't cheat on the speed spec.

There isn't much to comment about the speed of this scanner. It is simply amazing.

There's also no need to write about my own tests here, because I got exactly the same numbers that are printed on the scanner brochure.

The speed of this scanner is a strong selling point for all businesses and photographers that need high output volumes.

To complete the high volume character of this scanner one can add a batch feeder, available for both 35mm mounted slides and for up to 10 medium to large format originals.

## **Conclusion**

I promised to answer the fox question at the beginning of my review, and it's now time to do it.

I believe that the FlexTight 949 is worth every penny of its cost, but certainly its cost doesn't fit many pockets. And this is certainly what Imacon has in mind for their entire line of scanners, because it's quite clear that these scanners are not designed to serve as general-purpose scanners.

So the question: "Is this scanner for me?", can only be answered after answering the preceding question: "Who am I?"

Photo enthusiasts, advanced amateurs, or even creative professionals who don't have high volume requirements, will not be able to justify the cost of this scanner.

Photo Labs, Printing Bureaus and professionals that need to scan hundreds of chromes each week or day, will find in this scanner their perfect partner.

The combined supremacy of image quality, shadow details and speed, paired with the powerful FlexColor driver and a color managed scanning workflow, makes this scanner a dream to work with.

This scanner is surely not for everyone, but at the same time there's nothing better at any lower price and in my experience the FlexTight 949 has turned out to be the best desktop scanner I've ever used.

It's one of those pieces of equipment that will change forever your approach to scanning. Once you try it you will never be happy with anything less, so if you can't afford it, don't try it!