A story behind the LAS & Amersham™ Imager 600 development

From today, at two different times, we will have Seishi Ikami of the Life Sciences Division of Fujifilm™ Corporation discuss the development of the Amersham Imager 600 series that he supervised.

Mr. Ikami, you have been involved in the development of the LAS series for several years, but at what specific time during the LAS series did you begin your involvement?

Actually, it was before the LAS was created. Approximately 20 years ago. Until around 1990, it was usual for Western Blotting with radiation to be used, and the BAS series had been received favorably. At that time, Amersham Corporation, one of the predecessors of what is now GE Healthcare, sold the ECL™ reagents, and chemiluminescence gradually became recognized as a safer and easier method for performing detection.

Fujifilm Corporation (then, Fuji Photo Film Co., Ltd.) was trying to develop the next product more suited to the times, and chemiluminescence detection using CCD became the focus, perhaps in part because the large CCD had just been developed in a separate project in the company.
This was the start of the LAS series. I think it was around 1994 or 1995. So, it has been exactly 20 years.

20 years? You really are one of the original developers of the LAS.
Well, the LAS series has continued to advance over the last 20 years, but could you tell us the steps involved in that advancement and the background behind it?

Yes. First, the first generation of LAS-1000 was created as a result of the large CCD being produced. In addition, an even larger CCD was developed in the next LAS-3000, increasing the width of the whole system.

More than anything else, we were helped by the advancement of computers. Increased power and processing speed, and the fact that large amounts of data could be handled easily, were huge steps.
In recent years, the much talked about iPad™ also became easy to use, and iPads can also be used with the Amersham Imager 600, which went on sale this year.

Then it was the LED. Blue LEDs suitable for practical use came on the scene around 1993. One of the ways blue LEDs were put to such practical use was by installation on the LAS-1000. At that time, technology existed that could be used to perform ethidium bromide staining and look at gel with UV light, but because

SYBR™ Green staining can be excited by blue light, the blue LED was a perfect match for this. Output increased after that, and the system became even more compact.

I see. I really see how the system has progressed with the times.
Conversely, were there any aspects that did not change or concepts that have been maintained since the LAS first went on sale? If so, please describe them.

Alright. Since the initial development of the LAS, we have focused on being able to reliably capture weakly emitted light images in a short period of time. In the case of chemiluminescence, originally, the fundamental principle involved contact exposure on X-ray film. In order to capture images comparable to that, I believe the most important thing is to have a large CCD and a bright lens. Therefore, since the first generation of the LAS-1000, the lens has been designed with an opening value (F-value) of 0.85 and combined with a large CCD.

What does that mean, specifically?

First, I will explain the CCD. Most CCDs used in compact digital cameras are 2/3-inch-type CCD or smaller, but a CCD larger than 1-inch-type CCD has been used in the LAS-1000 since 1997. The size of a CCD is represented by the diagonal length, so its size is actually 19-mm. In addition, since the LAS 3000, we have been using CCDs that are larger than 19 mm. Now they are very large at 28 mm.

What about the lens?

Yes. Since the LAS-1000, we have been using specially designed lenses with an F-number of 0.85. Fujifilm is also a camera lens manufacturer, so we excel at designing unique lenses. In the LAS-3000, we installed a large lens with a separate design to match the larger size CCD In order to achieve a mechanism in which a large CCD catches weak light, we needed a lens with a small F-number for a large CCD (= bright lens), but no such lens was commercially available. Therefore, we developed a special F0.85 lens for the LAS. Incidentally, 1.4 is the representative F-number of a bright lens for a single lens reflex camera. Using a simple calculation ratio, an F value of 0.85 is 2.7 times brighter than the F1.4 lens. This "large CCD and bright lens" combination is the heart of the LAS and Amersham Imager 600 series. It has been and still is the greatest attribute.

So as progress is made, you continue to maintain the important aspects of the system.
In the next session, we will ask you to describe the newest model of the LAS series, the Amersham Imager 600, in more detail. Thank you very much for everything today.

A story behind the LAS & Amersham Imager 600 development: Topic 2 "Points of Improvement in the Amersham Imager 600 Series"

Previously, you spoke about the steps by which the LAS series was developed. Today, I am wondering if you can speak in more detail as to the background behind the development of the Amersham Imager 600, the newest model in the LAS series.

Mr. Ikami, please first describe the points of improvement in the Amersham Imager 600 series.

The first point of improvement is that the system has been designed to be more integrated and smooth. Compared side by side with the LAS 4000 series (ImageQuant™ LAS 4000/4010 or LAS 4000 mini), you can quickly see that the horizontal width is very different.

Actually, when the first prototype of the Amersham Imager 600 was created, it was much larger than the LAS 4000. We continued developing the system with the concept of integration in mind, but adding a computer to the LAS 4000 and putting a monitor on top naturally increases its size.

Therefore, we performed various investigations, and we finally came up with the idea of changing the orientation of the CCD. Normally a CCD is rectangular and is used in a horizontal orientation. Therefore, in the LAS 4000, the CCD was placed in a horizontal orientation to allow images to be captured horizontally. However, most of the gel/membranes imaged by clients are actually in a vertical orientation. That made us realize that if the CCD were positioned vertically, larger images could be captured and it would be more logical. As a result, we used the same CCD as the LAS 4000, only changing its orientation to make the horizontal width of the Amersham Imager 600 smoother.

Also, in the Amersham Imager 600, you added the semi-auto feature, which did not exist in the conventional LAS 4000 series. Why did you do that?

Semi-auto is a feature that truly arose out of feedback from our clients. We think many people capture several images using the increment function and select the captured images that meet their personal needs. Also, although the auto feature (auto exposure) has also become popular recently, we have heard that when the exposure is adjusted to match the thick bands, the target bands become weak and cannot be

seen clearly. We developed the semi-auto function in an attempt to correct this issue. With the semi-auto function, you can select your own target band from the images that were pre-captured and capture images by automatically adjusting to that band. Therefore, we think it is a feature that will reduce the hassle and time for researchers more that ever before.

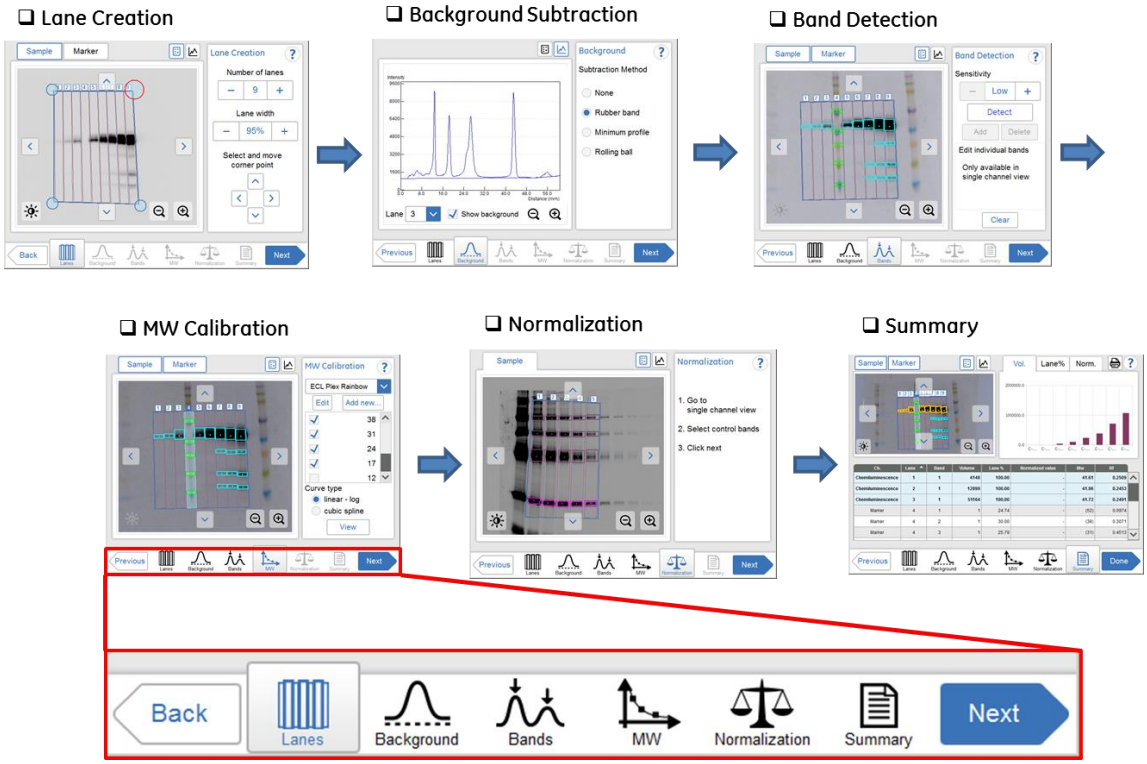
What are the aspects that have changed since the LAS 4000?

The LAS 4000 cannot perform color image capture using colored molecular weight markers, such as the well-received rainbow marker in the ImageQuant LAS 500 sold 2 years ago. However, this capability has been added to the Amersham Imager 600. With this capability, the molecular weight of a protein can be ascertained simply by looking, which reduces the effort that one has to make.

Please tell me the particular aspects on which you focused in the Amersham Imager 600.

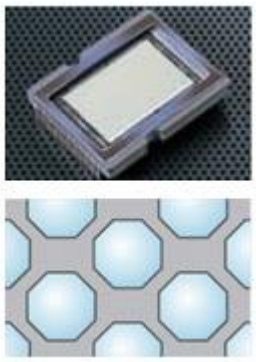
The software. The software is easier to use than it used to be. We tried to provide software with which users would intuitively know what [button] to touch to proceed to the next step. Another major difference from before is that an analysis function was added so that final analysis can be completed using only the compact, integrated Amersham Imager 600. For example, we were insistent about being able to make printouts of created images and perform concentration quantification, etc. even without special analysis software.

I see. So the imager became more compact while maintaining its "large CCD*1 and bright lens† 2" And the Amersham Imager 600 is also equipped with an analysis function. I really understood your explanation. Thank you very much.



Intuitive software

Since the icons are arranged in the order of the analysis steps, you can easily follow the process of analysis by pressing the icon one by one.



* 1 large CCD: "Super CCD", 320 million octagonal shaped pixels of the light-detecting elements are placed at a diagonal angle. The pixel size per unit area of this CCD is larger than conventional CCD and it has achieved the same level of high sensitivity with X-ray film. In addition, the image data is output at high resolution of up to 6.3 million pixels by unique technology developed by Fujifilm. This enables the imager to achieve both high sensitivity and high resolution.

† 2 bright lens: High sensitive FUJINON™ lens with F 0.85 and focal length 43 mm. It has been optimally designed to take full advantage of the features of the Super CCD. Excellent for close-up shots with tens of centimeter of distance, equipped with a remote focus and iris. The high sensitive detection is achieved smoothly without replacement of the lens.

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