

DIGIT

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The Royal Photographic Society
Digital Imaging Group

THE COLOUR FASTNESS OF INK-JET PRINTS (Part 1)

Lightfastness is a topic I have been associated with as an ink maker for over 30 years. Photographers have been concerned with archival properties since the beginning of the photographic process, and archival photographic techniques have preserved images very well. But now, with the advent of digital ink-jet prints, lightfastness has raised its head again, for such prints can be far from archival.

The fading of inks can be due to a number of factors:-

- 1. The action of light, which will be seen as a weakening, change of hue and dirtying of the print, or a combination of these.**
- 2. Interaction of the inks which may be stable in themselves, but can give a change of colour when mixed.**
- 3. The action of chemicals, from the atmosphere, from the paper, from adhesives and from any finishing processes such as film lamination.**

Before we discuss the above factors, let me say a few words on the testing and light fastness scales. When I first joined the Ink Making industry all inks were judged for the fastness to light against a permanent bright red pigment known as crimson madder; and the practice grew within the industry of comparing other colorants, pigments and dyestuffs against this permanent red. On an arbitrary scale it was given the number

10, with lower numbers for the more fugitive pigments. Over the years more permanent colourants have been produced and the "madder scale" was superseded.

The scale commonly used today is the "Blue Wool Scale" (BWS) which was accredited a British Standard (BS1006), and has been adopted as an International Standard (ISO), although there is still work going on to try and improve this Standard. **The Blue Wool Scale consists of samples of Blue wool dyed with various dyes, the best being 8; this is considered to be permanent.** The other seven dyes are graded to give a suitable scale by which less permanent colours can be assessed. It might seem difficult to assess a fading colour against a series of wools but in practice this is not the case. To help with the assessment, we also use a grey scale showing varying degrees of contrast.

The best way to test lightfastness might seem to be to place half the print in sunlight, expose for a period, and then assess the degree of colour change against the sample of blue wool under the same conditions; the fade can also be checked against the unexposed sample of print. However; there are two main problems with this method, time and varying lighting conditions. Both latitude and time of year will have an effect: tests results in the UK will be different to those carried out on the equator or the north and south poles!

To produce a more practical test, an artificial light source was made to simulate as closely as possible the radiation produced by the sun. The equipment can run for twenty-four hours a day simulating the action of sunlight, and can produce results within days rather than many months. The original light source used was a carbon arc, but xenon filled discharged lamps are now commonly used as they produce a more continuous light spectrum. Other lamps have been tested, but the xenon lamps are still preferred.

The Action of Light.

All pigment and dye manufacturers will give the ink maker a full specification on the particular colourant. It should be noted that having chosen a particular colourant the final formulation of the ink will have very little influence on the lightfastness. Lightfastness is a property of the colourant. The colourant absorbs light, and as light is a form of energy, the pigment/dyestuff will absorb the energy as heat. The molecular structure of the colourant will change as the molecules get excited and this will show in the form of a colour change. It has also been seen that the strength of the ink has an effect, generally the weaker inks showing a greater change than the stronger inks. Inks with a higher pigment level can absorb more light energy and therefore will degrade less. Pigment manufacturers will give lightfast readings for pigments at full strength and at 10% strength

and have seen many colours with full strength BSW reading of 6 and a tint version of the same pigment BWS 1. I am sure you are beginning to see that this is becoming a very complicated issue - especially as light is not the only factor that will effect a colour change.

The Action of Chemicals Acids, alkalies, common solvents, and the environment all play their part in the degradation of the print.

Only a few papers are absolutely neutral; generally speaking the uncoated stocks are very slightly acidic (pH 6.5) whilst the coated stocks are slightly alkaline (pH 7.5-8.0). When quoting lightfast figures, it is important that ink jet ink manufacturers should quote the paper tested. I am sure that many ink jet papers are not suitable for archival purposes. The adhesives used when mounting your ink jet print could also affect the fastness of the ink used.

Solvents and plasticers from the film used to protect your image from rough handling can also cause the ink to fade and under adverse conditions the colourant to "bleed". The film may filter out any UV light but the chemicals within the material could be causing more harm!

Pollution that we find in our towns and cities can contain quantities of acid vapours, sulphur dioxide and many other chemicals from the action of light on exhaust gases: all these will take their toll on the

fastness of ink.

I have carried out tests on a "standard" ink jet using a xenon tester as described. The light fast figures, on a scale used in the printing ink industry, was 1-2 BWS. This would indicate very little resistance to light and certainly no archival properties. These figures would be unacceptable for all super-market packaging, as they demand a BWS figure of 4+. It is difficult to assess how long a print would last, as it depends where and how it is placed, but I would expect a digital exhibition print (printed with standard desktop ink jet ink) to show signs of degradation within 6 to 12 months. To be fair to the current manufacturers we are using their product in a way that was not envisaged when these inks were formulated, as they are designed to be used in brochures and as colour presentation point of sale material rather than prints for exhibition work by the serious photographer (Would you buy or sell an image to keep that has been produced using these materials?)

Unfortunately resistant pigments and dyestuffs are more expensive, and as with most things in life you only get what you pay for!

Some time ago I was sent a copy of an article on lightfastness evaluation, which was carried out by Samantha L. Kelly at the Department of Colour Chemistry, Polymer & Surface Coatings Research Group, University of Leeds. It

was reassuring that her article was similar to the above.

However, I noted with interest that a new standard will be launched very shortly as the replacement in the U.K for the Blue Wool Standard and that the scale will be expanded to 0 to 9, instead of 1 - 8. The measurement of fading or colour change will be carried out using colorimetric techniques. This work is still ongoing, and certainly in the ink industry at the turn of the 21st century we are still using the Blue Wool Scale.

You will remember that when I tested "standard" - the original equipment manufacturers (OEM) ink jet ink - under BS1006 conditions, the Blue Wool Scale reading was 1-2. This was poor and certainly not suitable for inks to be used in the packaging industry, and I considered that images made with these inks would only have a "shelf" life of a few months before colour change/fading would take place. I also talked about the influence of the substrate and the coating on the paper. **I was more than interested therefore in an article I read from Lyson about their Fotonic inks, which claimed that the inks would last an estimated 25-30 years displayed indoors before any noticeable fading would take place. This is even longer than most conventional colour prints!**

A member of Bury PS purchased a set of these colour inks for his Epson Colour Stylus 1520 and produced a set of patches so that I could carry

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out a fadeometer test using a xenon arc lamp. The inks were printed on Epson photo glossy paper and tested. The results for this type of ink were really outstanding as they were all between 6-7 BWS (on a scale of 1 - 8), which certainly in the ink industry would be classed as lightfast. I would be reluctant to put an actual time span on the results as this would depend very much on the storage/hanging conditions, but such prints would certainly last longer than a conventional neg/pos colour photograph.

The cyan and yellow were similar in shade to the "standard" OEM ink used, but the red was slightly more yellow in shade, however this was easily adjusted with the printer software.

Lyson actually go one step further by offering copies of the Certificate of Performance for Lyson Fotonic Professional products. However this certificate is only valid if you use Lyson Fotonic Professional Media. This reinforces my view that when considering lightfastness the actual substrate must be taken into consideration. Those of you who have used fancy matt texture papers be warned, lightfast inks on these papers may not have the longevity of those prints produced on other media. I am sure there may be other manufactures who are offering similar products but to date I have not come across them. However, having discovered these inks, I found a wealth of information on their

web site at <http://www.marrutt.com/lyson.html> Fotonic are also marketing a unique "four density inkjet" system for monochrome printing; this is claimed to have a display lifespan in excess of 100 years. These inks are designed to give a wide tonal range and by adjusting the colour curves in your image software you can take the maximum advantage of these tonal properties.

As with most things in life you get now't for now't so as you would expect these inks carry a premium, they are about 40% more expensive than the standard OEM inks, but they are more permanent. So for that exhibition masterpiece or the sale of any of your images I would recommend their use. One small point to note Lyson recommend the use of their cleaning cartridges when changing over ink types, this not only avoids cross contamination with the original inks but will also help to keep the nozzles of your printer clean.

Gordon E.Jenkins

Originally published in the Western Counties Photographic Federation Newsletter and reproduced with the kind permission of the author.
[The author is the PAGB Webmaster. He is professionally Northern Technical Manager for Coates Lorilleux Printing Inks (Offset Division), and writes with authority on the increasingly important subject of the light fastness of inkjet prints]



**"By appointment"
Don Trott ARPS**



Bill Henley LRPS

Some of the colour images are from the list server folio and some are second choices from submissions for the members' exhibition.

National Meeting at the RPS Octagon on 1st July

(see back page)

The speakers are:

David Brims FRPS
Michael Brown ARPS
Mike Lindsay ARPS
Robin Mellor LRPS
Colin Street ARPS

Bill Henley LRPS



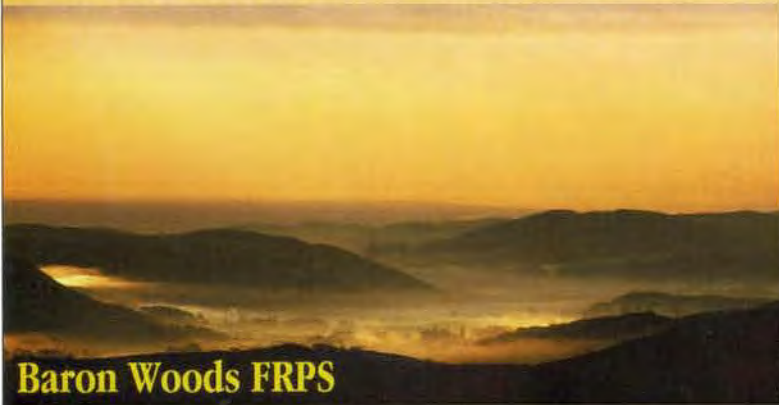
Glenys Taylor ARPS



Stanley Newton ARPS



June Steel



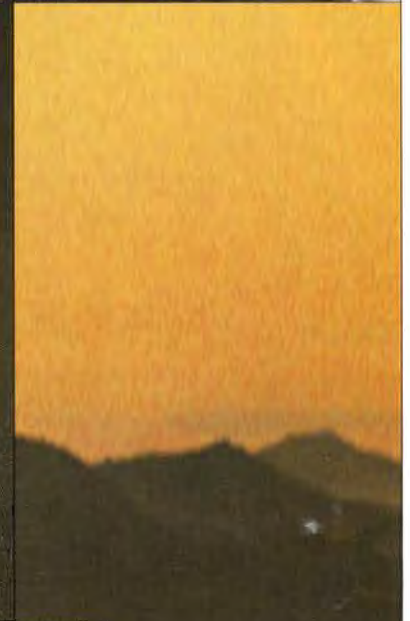
Baron Woods FRPS



Maureen Albright LRPS



Fiona Alison FRPS



Miles Audas FRPS

John Long ARPS



Don Trott ARPS

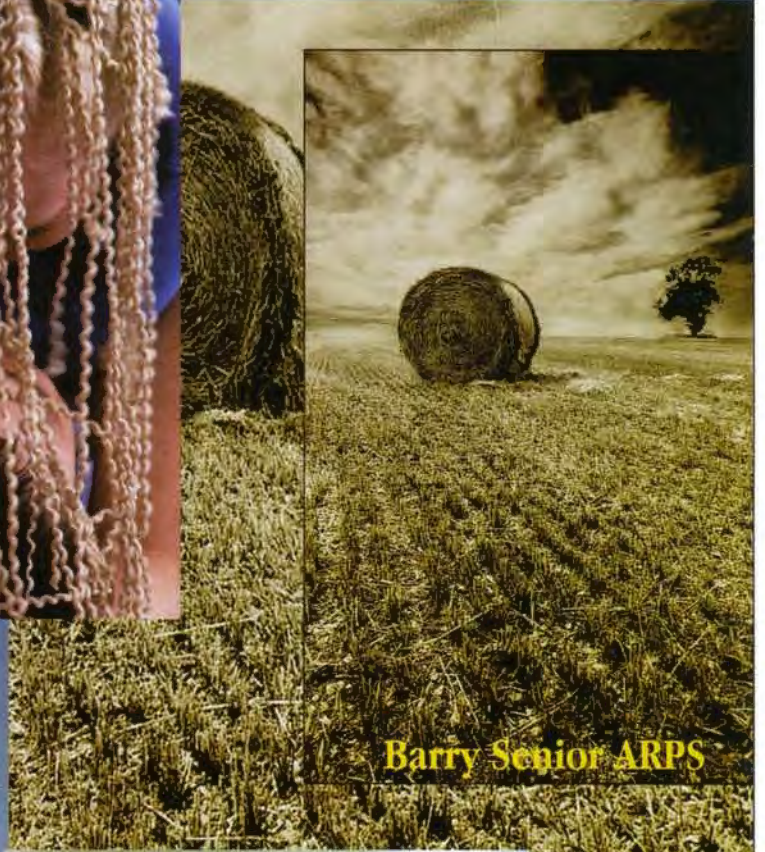
Stelio Stefanou



Maureen Albright LRPS



Ron Gafney LRPS



Barry Senior ARPS

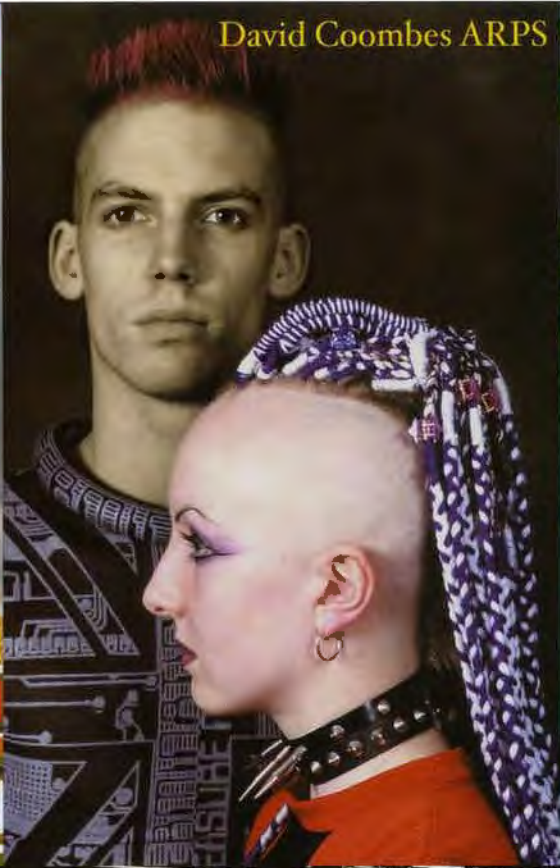


Mike Lindsay ARPS

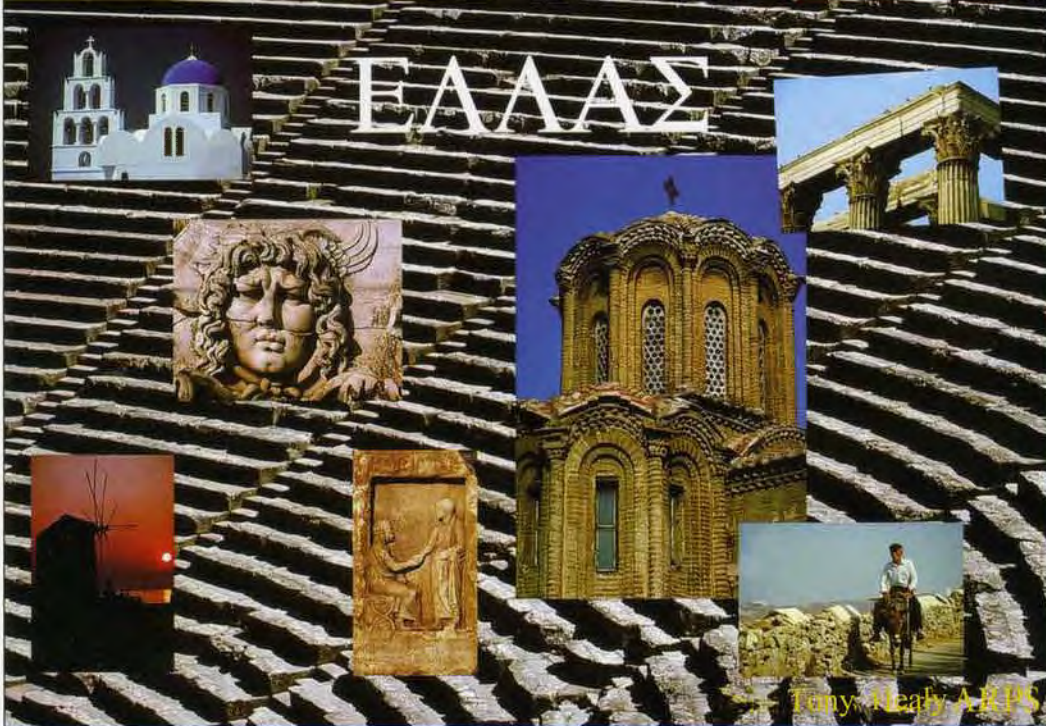


Bangkok

David Coombes ARPS



Mike Brown ARPS detail



Tony Healy ARPS



John Colmer ARPS



DIG Folios & History Brush

Probably many, if not all DIG members, will be aware of the Listserv; a means of showing images to other like-minded members with the ability to view and comment upon their images. It is a thriving forum with information on how to subscribe mentioned frequently in DIGIT. However, there is also another folio in existence that I would like to draw your attention to. This folio works by members passing images to each other on floppy disks via snail mail. The images are usually accompanied by a small text file outlining the processes involved in creating the images (where appropriate) and general chit-chat. The method is somewhat akin to the UPP for those of you who know how that works. There is room in the folio for new members and the present members would welcome your inclusion. Should you be interested in joining this small select circle then please get in touch with me, by phone, email or letter.

Additionally, I think there may be room for another folio circle; a "hard copy" group. Those members who might be interested in sharing their images with others but who are not on the web or would prefer to see high quality paper output. Is that you? If so, again please contact me. If there is sufficient interest and I should think even half a dozen or so would be sufficient then I'll try and get it off the ground.

Folio Secretary

One of the great improvements made to Photoshop with the release of version 5 was, for many, the History feature. Primarily it brought about the multiple undo feature. No longer did we have to rely on 'Revert to Saved' to go back more than one keystroke. Wonderful! However, associated with the History Channel is the History Brush, which allows the possibility of painting from history; either past or future history. It took me a little while to become comfortable about painting from history but in reality it's quite simple. I would like to outline a use for it here.

My normal practice for adjusting or modifying a part of an image would be to use one of the selection tools. A useful but sometimes painstaking way of doing things and, I believe, the History Brush will often do the job more simply and better. The picture of Heather and Mark was done using this method. Heather, as you can see, is quite a colourful subject while Mark, apart from the red hair presented a plainer image and I wanted to emphasise that by making his face monochrome. Here's how I did it.

The image was scanned, cropped and tidied up as usual. Heather's face was too bright and contrasty requiring some darkening so I had adjusted the whole image, in this case using levels, until the face was the tone I wanted. The rest of the image was then too dark but that didn't matter. Ensuring the History palette was open I took a snapshot by clicking the centre

icon at the bottom of the History palette. I then moved back one step in history, selected the history brush and ensuring I was painting from the snapshot (click the space next to snapshot 1) I painted over Heather's face bringing out the corrected tone. This was a lot quicker and more flexible than selecting the face and doing the adjustment. Near the edges I was able to feather the tone into the original image by varying the opacity of the history brush effect.

Next I wanted to make Mark's face monochrome. This time I desaturated the whole image, darkened the overall tone a little and, once again ensuring the History palette was open, I took a snapshot (Snapshot 2). Again I stepped back one history place, selected the history brush and ensuring I was painting from the correct snapshot (click the space next to snapshot 2) painted over the face. Again this was easier than using any of the selection tools as I could feather the effect into the hairline by varying the opacity of the brush. It also meant that I could paint around Mark's eyes quite easily leaving them the original colour.

I've used this method for varying the tonality and colour balance of hits of images quite successfully for a while now and wonder how I ever managed without it previously. Try it and see.

Ray Grace LRPS

COMPUTING

You don't have to be a Nostradamus or even an Old Moore to predict that the current digital revolution will transform our lives to an almost unimaginable extent., the interest in digital imaging has grown exponentially. New digital cameras come on to the market almost every week.

When I started into digital imaging four years ago, there were no printers available except for the incredibly expensive dye transfer machines costing thousands of pounds. Now you can buy an excellent printer for under £200. The speed of progress is incredible. No sooner do you buy the latest software than a new version pops up, so making someone the richest man in the world bar none.

The problem is not in the mechanics but in the resultant imagery. One of the most dangerous tools ever put in the hands of man or beast is the 'Filters' menu in Photoshop. Once the image is on the screen the keen digital imagist can have a choice of transforming scanned images into a series of highly predictable changes. Its like giving the supermarket shopper the choice of 50 varieties of breakfast cereals, or allowing the tyro cook to put ten different spices into the after dinner pudding.

Looking at any image transformed in this way I say to myself, "ah yes, someone has used the find edges filter" quickly followed by, "so what". In the days of the albumen print, the photographer worked terribly hard just to produce the actual print. Terribly exhausted by all the effort, there was no energy left to muck the print up and many of the great prints produced by this process have not been bettered.

When the computer manufacturers made the dyes for their printers they were not bothered about the longevity of the print. The dyes were made to make proof prints that were meant to be discarded as soon as the printing process began. Perhaps they sus-

pected that most of the prints produced by the digital fraternity were not worth preserving anyway.

Digital Imaging has come a long way since then and the digital imagist now has immortality in sight. As a dedicated subversive, I really like the idea of an artwork that disappears, but those who sell their work for hard cash are just worried about being chased down the nearest alleyway by irate collectors. Galleries and museums are also a bit leery about accepting fade art.

Now the Great Search is on for archival dyes. A company called Lysonic has come on the market with archival dyes that have been suitably tested. They have also come up with a set of b/w dyes that they claim will make prints last for a hundred years. As a result of all that power now available to transform photographic images put through the computer, I decided to make my own game plan about how to make use of the computer without resorting to the usual round of visual fireworks. As far as filters are concerned, I rarely use anything there except sharpening, blurring and adding noise (dust and scratches), the latter used mainly with the History palette.

When I photograph I edit. I believe in pre visualisation, not in the way Ansel Adams used it, but by deciding how I am reacting to what I am looking at and how to convey that to my putative audience.

I always think of images as a series rather than an individual print simply because a single image rarely enables me to show what I need to show. My imagery is made on two levels, the outward appearance of the images plus something else, visual rather than verbal, incorporated either in the mood or perspective, or indeed anything else that I can do to the image to give it an underlying layer of meaning. It is a very ambitious task and it may not work, but I think it is worth a punt.

Meaning in imagery is a most interesting subject in which psychology plays a key role. Great imagery can stimulate the imagination and

tends to invite a narrative process in the mind of the viewer. This task is made easier through the use of the computer.

The game plan is to change the imagery, if at all, in a way that really does not show. The images work on an audience below the conscious level and through a purely visual stimulus.

In many ways all photographs working with an enlarger, altering tonal values and cropping are working in the same way but with limited facilities. These photographers all work without the Photoshop 'Filter' menu and are therefore saved from a terrible fate.

The digital imager, on the other hand, can displace the very difficult problem of making images of substance and meaning by resorting to digital fireworks.

The future looks good. Relatively cheap high quality scanners are coming onto the market. Indeed, the 35mm worker has ample choice in that area. Powerful computers are available at lower prices and printers are there too.

The advantage of having a digital darkroom is that I have now freed up a lot of space in the home. Family members appreciate that. Photographers who do not have space for darkrooms can now make prints with ease. There are other advantages. I can now see what I am doing. The prints will not change tones when they dry. I can make further prints to order that actually look like the original.

Best of all, is my ability to work on my images and read the newspaper at the same time. I can save my images, close down, go for a walk, and think about how I can improve the poor results I keep getting. As the great Chinese philosopher once said (in Mandarin, of course), "a critical self awareness is the first step towards achieving reality".

Edward Bowman FRPS

DIGITAL IMAGING GROUP SPECTACULAR 2000

15th October Benn Hall Rugby Put it in your diary NOW

Despite the trepidation that we all felt prior to the Benn Hall event last year such was its success that we have booked the venue again this year for another spectacular Digital Imaging Day.

As DIG members, you are given the first chance to make your reservation and select the events you would like to see during the day. The event will be opened (soon) to other RPS members and the general public too, so to ensure your wishes are fulfilled book early. (As a charity the RPS cannot restrict entry to members only) Send the tear-off slip at the bottom of the application form, with a cheque to cover your entry fee and an SAE, indicating which lectures you would like to see (in order of preference) and send it to John Long. Confirmation of your ticket and lecture bookings will be sent by return.

Remember Places will be limited. To avoid disappointment book early.

During the event last year we trawled the audience and trade stands to try and gauge the success (or failure) of the day and were more than pleasantly surprised at the positive response. Indeed, letters of congratulation and good comments were received long afterwards. There were criticisms, inevitably, but they were mostly constructive; we have taken the points and, where appropriate, incorporated them into this year's event. The main points are:



Checking In. This will be more streamlined. Lectures will be pre-booked to reduce the confusion at the entrance.

Opening Time. Entrance to members will be at 10am not before. The trade stands need time to set up and be ready for you.

Lectures. All lectures will take place in the Rokeby Room. All lecturers will be key DI people not dealers (no sales pitch) and lectures will last 45 minutes.

Competition. There will be a competition again this year so please bring your prints along and hand them in to John Long at the door as you enter.

Prize Draw. There will be a prize draw again run on similar lines to last year. Your entry ticket is your draw ticket. We hope the prizes will be as equally attractive as last year some £5500 worth!

Entry Fee. We have decided to charge this year to ensure we do not make a loss on the event and, possibly, build our funds to provide even more events in the future. Your committee is determined to continue the development of the group and run it solely for the benefit of its members.

Trade Stands. We are endeavouring to attract a similar number of trade stands to this year's event with many of the key manufacturers and traders in attendance.

Clinics. A big criticism last year was the noisy environment on the stage and the difficulty in hearing. This year we intend to have them among the trade stands throughout the day so that you can ask the people running them about any problems you may have.

Catering. The caterers were caught unaware by the demand throughout the day last year. They will be better prepared this time. A complimentary coffee on arrival will still be offered.

The Venue. We felt, as most people did, that the Benn Hall was an excellent venue. Geographically central and, because it was not too large, we were able to create a good atmosphere. Additionally, the traders all commented that they enjoyed talking to an informed audience and having sensible discussions over subjects of mutual interest.

What was evidently clear from last year was that everyone had a great day out. We were delighted to see members from all over the country and hope they will return this year. We anticipate a high demand for the limited number of tickets available so, remember, book early.

The DIG has a membership of over 700 there are only 300 tickets available.

Book now! David Coombs ARPS (picture Bill Henley)

The Digital Imaging Group consists of members of the Royal Photographic Society who have elected to pay an extra subscription to receive the group's journal DIGIT and to work together via meetings and circulated portfolios to promote digital imaging. Submissions for inclusion in DIGIT are very welcome. Please note that the editor will assume that all persons submitting material have ensured that they own the full copyright of all the images and text submitted, and that any legal infringements will be the responsibility of the submitter. Copyright of all the material published is reserved in all countries on behalf of the RPS and the authors. Any views expressed are not necessarily those of the Royal Photographic Society nor of the Digital Imaging Group. Web address: <http://www.digit.org.uk>

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**Exhibition
and
National Meeting**

There will be
a national meeting on
Saturday 1st July 2000
commencing at 2pm
at the Octagon Bath.

The meeting has been arranged
to coincide with the exhibition
of group members' work from
22nd June to 6th July in the
members gallery.

Experienced speakers
will share their
enthusiasm & skill.

An entrance charge of
£3 at the door

Spectacular 2000

Sunday 15th October

The Benn Hall
Rugby

10am to 5pm

Entrance by ticket only
available from John Long

Choose your speakers
also trade stands
& clinics
competition and prizes

Please return the application
form as soon as possible as
places are limited.

Group members £5 each