THE MACROFLASH - MARK I

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I thought I had best make some vague sort of introduction to this "thing" with a few general comments about cave lighting on a slightly serious sort of vein. What I am mainly interested in is large caverns. The problem originally arose with the caves out on the Nullarbor and this is the type of work I have got in mind; I am not particularly bothering about small cave shots.

Before we go very much further I'll give a few general comments about cave lighting. There is always the old traditional way of course, which was used on the 1963 Nullarbor trip, and which involved getting about 10,000 trogs with 10,000 troglamps and set them wandering off about the cave, leaving your camera open for about 20 minutes. Although this is very effective it does not produce quite the results most photographers are after.

Basically, there are two ways of approaching this problem of lighting a large cavern. One is stringing a lot of small light sources around the cavern and adding them all up, or, you can go about it by having one, or perhaps two, much larger sources, and the effects are very much different. I have never used this multiple-source technique myself, and it is interesting to note that most of the people who have used it seem to be the professional photographers. I don't know whether there is any significance in this or not, or whether they're just brought up that way. I believe myself that the single or perhaps double large source system is, for the average cave photographer who has not got a professional background, a much easier system to handle. The actual placing of these light sources is nowhere near as difficult as when you're trying to balance up the light from six or seven flash bulbs or carbide lamps or what-have-you spread around the cave. So from here on I'll drop the multiple technique, as I say, I have not used it myself. Nevertheless I will say that with a very experienced photographer in this technique, he can I think, produce far more interesting photographs if he employs this lighting skilfully.

The problem of lighting a cave or a large cavern is somewhat different to the normal sort of problems that studio people come across. If you like to think of it this way, you are virtually working inside out. If you look at the books on lighting for photography they show you how to light objects

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within a room or studio or something. For example, I remember one book introduced the subject of lighting by showing its different effects on a very simple object, namely an egg, and showed how the lighting could produce various modelling effects.

Now, I have the feeling that when you're photographing a large cavern you're inside the egg trying to photograph the inside of it, and this is a totally different problem. The problem of getting the proper perspective is totally different when you are working from inside something, and are trying to photograph just the walls, or even the ceiling.

When photographing in a cave and trying to get a three dimensional effect by means of shadows, it is generally conceded that you must get your light source away from the camera. This is fairly obvious: if the light is near the camera there is very little shadow, the three dimensional effect is lost, and the photograph looks very flat. Fortunately in caves like the Nullarbor caverns this is not impossible - you've got a fair bit of room to work - you can get the light away from the camera, which is more than you can do in most New South Wales caves.

However there is a much greater advantage than this, although it hasn't been taken too much notice of in the past, and that is that by placing your light appropriately near the walls of a cavern, perhaps a little behind the camera or in some cases in front depending on the particular cavern, it is possible to achieve a much better than normal distribution of the light down a long thin cavern. This is not as impossible as it sounds when you remember the effect of the relief on the walls.

The walls are not smooth but have indentations in them, so if you place your light quite hard against one wall, much of the light grazes that wall and you can control the amount of reflection off it in the foreground of the photograph. You therefore avoid overexposing the foreground excessively. Putting it another way: imagine the projections in the wall, each throwing a shadow. Now if the light is so placed that the shadow from the first bump is actually long enough to reach the next bump then there is a very small amount of light reflected off that wall. The whole wall is virtually in shadow. By this means you can control the actual spread of the light down the cave.

There is of course the effect of reflected light from the other wall of the cave bouncing from side to side but it does not travel too far because of the square-law effect. The light drops off as the square of the distance, so this means that in large caverns such as on the Nullarbor where the width can be 50 to 80 ft, the effect of this reflective light is much reduced. However in some cases it is sufficient to spread the light right down the cave, and fairly evenly.

The problem that then arises of course, if you are using a single source to throw light 400 ft or more down a cavern is that you need a light source with a pretty high intensity. There have been various ways of overcoming this problem in the past. One of the simplest I have seen, apart from the standard flash powders of course, used a similar form to this except that you just use magnesium powder and potassium chlorate. This is a somewhat explosive mixture, it produces an enormous amount of smoke (considerably more than the "Diprotodon"), and unless you mix it on the spot it is a pretty highly dangerous sort of thing to be carting around in any quantity. But it's worth thinking about if you are doing what cavers seem to be doing these days, that is, rushing off to the Nullarbor for the weekend and not having a Diprotodon handy. Magnesium and pot. chlorate will at least give you some photographs.

The next obvious advance of course is the "Diprotodon", burning a continuous jet of pure magnesium powder, which increases the safety factor somewhat - eventually - after a lot of painful development. I took a diprotodon of ours on the 1963 trip but I was always so busy opening shutters on all the cameras and operating them that I had someone else to operate the diprotodon - I think that was wise judging by the language used at the moment of ignition.

There is another method for lighting caves which I came across in an American journal and it had all sorts of fabulous claims; one of these was that it reduced the smoke problem of burning magnesium by some considerable percentage & it was claimed to be somewhat cheaper. This is the use of "Thermite" powder, which is a mixture of aluminium and iron oxide. It is commonly used for welding railway lines. I think the fact that 99% of the energy is put out in the form of heat, not light, is sometimes disturbing. However I decided to investigate this and as I was going out to the Nullarbor after the Perth Conference we loaded up the Land Rover with many pounds of aluminium and Thermite powder from hardware stores all across the country. I had done some previous tests at Naracoorte to determine the colour temperature of the powder and discovered it was somewhere down near 2000^{o} Kelvin. This is a little bit disturbing, because by the time you put enough blue filtering in front of the lens to bring it back to somewhere near normal you need quite a few pounds of Thermite powder to achieve the same result as you do with a diprotodon. However it was reasonably successful and some of the best photographs I've got of the Nullarbor were done with this Thermite powder. It was cheap, and the smoke was reduced, I think, to a fairly definite extent.

That brings us now to the next possible method, and that is the Macroflash. This amazing device causes no smoke whatsoever, has a variable intensity - you can chose whatever guide number you wish quite simply, and the principle of the thing has been used for a long, long time by many people. That is, simply burn your magnesium in a sealed, controlled atmosphere and achieve ignition by electronic means. You then have complete reliability. This of course sounds all very expensive but my particular Macroflash only cost me about $5.00 to construct.

A Macroflash actually consists of a deep aluminium bowl with six PF100 flashbulbs mounted with their bases around the rim and pointing towards the centre of the bowl. The battery-capacitor power supply is mounted on the back of the bowl. It's quite simple really, all you need is a small fortune to spend on bulbs. The battery consists of two nine volt batteries in series and the capacitor is 1000 uF. That is about all there is to it.

As an example of the guide number, this particular model with six bulbs in it and using Kodachrome X gives a guide number of 390, that is, 100 ft at F4. This is usually all that is required in the Nullarbor caves because although most of the cave shots are a lot longer than this you don't want to over-expose the foreground, and the dropping off of light in the distance helps to give the perspective effect. When you look down a cave you normally expect it to get darker in the distance.

DISCUSSION

Evalt Crabb, HCG: I take it the bulbs are connected in parallel and that enables you to get away with using an 18 volt battery. Normal practice with multiple flashbulbs is to connect them in series. I would also question your guide number: I am quite used to using these bulbs, that is PF100/97's with 50 ASA film and generally rate these with a guide number of 270 for a single bulb and use this figure in many industrial applications. You may be using a lower guide number because of the lower reflectance of cave walls.

Ted Anderson: I got my figures from two sources: one was the leaflet which comes with these things, and I checked these figures with two other sources of literature, one a general pamphlet on all of Philips bulbs and these seem to agree fairly well. I must admit I forget now whether the guide number was in feet or in metres but anyway the results obtained bear out that I was getting the guide number I was using.

Evalt Crabb: The last thing that I want to raise is a fairly nebulous idea I have built up while you were showing the slides and that is the different effects of the diprotodon and this thing. I noticed the Macroflash seems to overexpose the foreground rather more than the diprotodon. I think perhaps the answer to this is in the characteristics of film emulsions and in particular, reciprocity departure. The diprotodon gives quite a long exposure time and I wonder if you break through a certain "inertia zone" (as far as exposure level goes) evenly right through the length of the cave, with the diprotodon. You don't have this departure with the flash bulbs as the exposure time is close to that for which the film is balanced. You will get the more even lighting with the diprotodon and perhaps a diprotodon with a lower level of lighting will give a rather more even lighting throughout the cave than the earlier ones which gave out quite a blast of light.

Ted Anderson: There is another factor which comes into this I think, and that is that the particular diprotodon I was using was somewhat different to the present small models: the flame of that thing was about 3 to 4 feet long, about 3 feet high and a foot thick (the unit was built like a sub-machine gun), and in fact you could no longer consider it a point source. This may help to distribute the light better.

Alan Hill, CEGSA: What was the exposure of those early models? They were only about a second or two exposure time weren't they? The thing emptied itself almost instantaneously.

Ted Anderson: Mine didn't! Mine burnt anything from one second to half-an-hour ..... after it was dropped on the ground.

Alan Hill, CEGSA: For exposure times greater than 15 seconds, the reciprocity failure colour shift is towards blue for Daylight Kodachrome II. The diprotodon has a colour temperature below daylight which creates a shift to pink, so the two colour shifts tend to compensate each other.

Evalt Crabb: I do think a line that may be worth following is to now use different films with the diprotodon. You can't measure this reciprocity departure with these funny light levels and under such peculiar conditions. Perhaps by sticking mainly to the Kodachrome series of films, we may in fact be using the worst films for this application. I would suggest this could be a line worth experimenting with.

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