

# **LET THERE BE LIGHT**

## **– OBSERVATIONS ON THE ART OF CAVE LIGHTING**

– Dan Cove



A dichroic light fitting. Photo: David Rowling.

Few subjects can seem so apparently simple, and yet be as remarkably complex as that of lighting a show cave. At first glimpse for the casual observer we seem to have a very straightforward situation; caves are dark and electric light will enable visitors to see so we install lighting. In essence, this is absolutely correct but the devil really does reside in the details.

Electric lighting can be one of the single most environmentally destructive aspects of creating and maintaining a show cave. It certainly can represent one of the most important tools available to management in shaping the visitor experience. If badly designed, lighting can compromise some of the core elements that make caves attractive and enticing to visitors in the first place. Lighting inevitably influences how a cave guide can interpret and present the cave to the public. Underlying all of these considerations is an ever expanding range of technologies available to the cave manager which makes the task of planning a new lighting project virtually impossible for any single individual without consultation and collaboration.

The last decade has been an exciting one for show cave managers, and advances in lighting have been a large part of this excitement. At Jenolan, there have been essentially four leaps forward in this time. The first has been the rapid evolution of lighting technology, most obviously the transformative effect of LEDs. The second has been the advances in use of automation software and in control mechanisms. The third has been the use of renewable energy derived systems to cave lighting to create cave wide wholly uninterruptable power supplies. The last has been the development of a coherent underlying philosophy concerning the lighting process.

All of the above points have been discussed, to varying extents, in previous Journals, I propose only to provide a brief summation here of some of the key outcomes resulting from these advances. On the subject of technological advances, a clear outcome of the Jenolan experience has been to transform cave lighting into a collaborative endeavour. In the mid 1990s it was still possible, and indeed was standard practice, to dispatch a single electrician and an assistant into a cave

with orders to replace an old lighting system with a new one.

Today this is simply not an option if you wish to create a lighting system that is consistent with 'best practice' approaches. It is only through the collaboration between electrician, management, guiding staff and the source providers of your technology (both lighting and lighting control) that you can hope to plan and deliver a complete integrated solution. This is not a reflection on any declining standards of cave electricians, as indeed quite the opposite is true. It is a recognition that no individuals now possess the complete skill set required to integrate all these disparate elements.

The advances in power supply, coupled with the dramatic reductions in total power consumption that modern lighting makes possible, means that there should be no question of compromising with visitor safety. It is now entirely possible to power an entire cave via a power supply capable of sustained operation independent of external power interruption.



New LED lighting in the Binoomea Cut at Jenolan. Photo: David Rowling.

The importance of this advance has commercial implications also, as loss of business through power outage was traditionally a risk to ticket sales. At Jenolan, situated at the termination of a long grid supply line, this was especially the case. Thus we have an economic benefit, an obvious improvement in provision of a safe environment for visitor, and the elimination of one previous aspect of the cave lighting planning process as there is no longer a need to split track and feature lighting systems or to install a separate redundant 'backup' lighting system.

Notwithstanding the enormous advances in technology, it is possibly the development of a lighting philosophy that has been the most transformative factor. A part of this philosophy has been to assess technology critically, seeing it as a tool rather than an end in itself, and to use it selectively. This critical assessment has recently led to even closer collaboration, most notably with Weidmuller, in that we have driven the process of technological development by not being willing to

compromise between available technologies if it cannot provide the effect required.

All relighting projects at Jenolan now begin with consideration of what we have come to regard as our set of 'first principles':

- 1) Asking what we want our visitors to see, and why we want them to see it.
- 2) Asking how we want our visitors to feel (in the sense of an emotional response) and exploring how this emotional response may be evoked by lighting design and lighting effects.
- 3) Not over-lighting the cave, recognising that to do so is to detract from one of the key elements that makes a cave exciting and enticing to visitors, yet not allowing the phrase 'over-lighting' to provide an excuse for unsafe or inadequate lighting.
- 4) Differentiating lighting between caves, appropriate to the nature of the cave and to the 'theme' of the tour of that particular cave, and recognising the importance of lighting to interpretation.
- 5) Reducing energy consumption and energy output.
- 6) Concealing the lighting infrastructure to the greatest possible extent without requiring physical alteration of the cave while ensuring all infrastructure is easily serviceable and entirely removable.



A carbon filament lamp. Photo: David Rowling.

These 'first principles' and the collaborative efforts described are currently being applied in the relighting of the 'River Cave'. The project began with consideration of the theme of the tour and the nature of the cave with the determination being that the River is a tour strong in the elements of cultural heritage and cave exploration. Therefore the decision was made to create a softer and more layered lightscape than that used in the Orient Cave where LED technology was pushed to its limits in an attempt to make the lighting a dynamic factor in the cave experience. The Orient was designed to provide the visitor with chambers of 'moving' light, making the lighting itself an active factor in the visitor experience – something that they would be consciously aware of. The River will present a different experience again, with lighting more 'passive', revealing the cave for the visitor as they are guided through on tour. Naturally, the most modern technologies are being applied to this effort, with the latest generation of Weidmüller LEDs and a control/communications system that will now sync the entire Southern Show cave system and be linked via optical fibre directly to the Guides Office.

In discussing cave lighting in the 21st century, it is often easy to slip into the trap of being critical

of past efforts. This is a mistake, as unfair as comparing a film made in the 1950s with a CGI rich film of 2010. Serious study of the engineering and cultural history of Jenolan Caves reveals that those who have lit our caves, since the earliest days of the 1880s to the present day, have shared a common passion for their work and a genuine desire to provide the best possible experience for visitors. It is still common today in cave relighting to discover that the original light placement of a century ago cannot be bettered. Technology will continue to improve, and the formulation and codification of the underlying principles is of great importance, but our own efforts will one day be placed in their historical context and it is important not to succumb to hubris. Rather it is important to keep pushing the boundaries, to appreciate the changing expectations of our visitors and always to be aware of the fragile environment of the cave.

Lighting a cave is an enormous challenge and if mismanaged can be an embarrassing disaster environmentally and commercially, one that can be extremely expensive to repair. However, it is also one of the most satisfying challenges that cave managers and staff face, and one of the most rewarding tasks upon which to be engaged. The degree to which relighting can 'transform' a cave can be truly startling, and I believe that it can be not just marketing hype to advertise a 'new tour', or the 'reopening' of a particular cave. The first decade of the 21st century has been arguably the most significant in this field since the installation of the first lighting systems over a century ago. We can only wonder what the technology of tomorrow will bring to the art of cave lighting but, given the high level of progressive thought evidenced throughout Australasia on the subject, it will be exciting and fascinating to see where it may take us.

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