David Spears and Madeleine Spears: Oral History Transcription

Name of interviewee(s):

David Spears and Madeleine Spears

Reasons why chosen for an oral history:

David and Madeleine Spears formed Science Pictures Ltd in 1988 and went on to produce groundbreaking macro and micro photography for natural history television programmes.

Name of interviewer:

Steve Nicholls

Reasons why interviewer chosen:

Longstanding colleague and friend

Name of cameraman:

Bob Prince

Date of interview:

30/05/2007

Place of interview:

Curland, Taunton, UK

Length of interview:

43 minutes

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1. The beginnings of Science Pictures

SN: My name is Steve Nichols I'm here today, which is 30 May, 2007, to interview David and Madeleine Spears. We're in the wilds of Somerset in a place called Curland where Dave keeps his technical expertise and equipment and microscopes. We've reached the point where you began a company that you did an awful lot of this development work with, your own company Science Pictures. Can you tell us how that started off?

DS: Yes. When I had been on *Nature in Focus* (1), that was done with Cicada Productions and my own little bit which was DS Limited, and there was just two of us, Richard Kirby and myself, and Madeleine still had a

proper job at the time. We operated from the house and eventually, once that series had finished, we took on other work and Madeleine got very fed up with us working in the house and threw us out. Apart from people clocking in in the front hall, there were snails climbing up the wall and eating the wallpaper in the dining room, so she wasn't that impressed by it all.

MS: And hedgehogs in the bath.

DS: Hedgehogs in the bath as well. So we found some cheap premises in Hitchin and moved out, and took the opportunity of calling ourselves Science Pictures. That had been a name we had conjured up whilst we were still doing *Nature in Focus* (1). We then registered the name and started the company and that's when we started off in earnest making medical programmes, a series of natural history shows and all sorts of stuff, and also specialist inserts.

But it was later then that we were asked to do some educational shows and Madeleine had been in further education as a science lecturer for a long time. She celebrated her 20th year in FE by resigning and joining Science Pictures as a director and producer of the educational output. We went on to produce over 250 programmes.

SN: So we've arrived at the existence of Science Pictures. We're going to talk about the educational programmes that you were able to do using the combination of your two expertises. Madeleine, what kind of subjects were you covering in the early days of these programmes?

MS: Anything and everything. Trying to make use of as much of the special techniques that Dave had developed over the years which was part of the reason for Granada actually asking us to do the programmes. It was a new venture for Granada; it was the first time they went out of house to make programmes. So it was a bit of a gamble for them and they sat on us fairly heavily to make sure that we got everything that they particularly wanted. As I said, they made me a production manager. They wouldn't let me be producer because I'd not done anything officially before. So I spent the first 24 programmes as a production manager with other people doing the producing.

I eventually became the producer. Dave was nominally the producer but he was so busy doing things for the BBC and other Horizon programmes and things like that with the Natural History Unit, that eventually of course he had to relinquish all other than the very specialist stuff of the Granada series.

That went on to a total of something like 48 programmes altogether and ran for years and years, and was really quite different. What they wanted was something different from what had been on schools television before. We tried all sorts of different formats, one of which was actually putting on a format which looked like a computer. We had all sorts of odd things happening on the screen which we hoped would interest the children. But we were very, very certain that we wanted to have real science in there for the programmes rather than the rather superficial stuff that had been on before. We wanted to give them real experiences of time lapses and time studies, and all the sorts of tricks that we were fairly good at.

It was great fun actually. I think we were quite pioneering in some of the stuff that we did and a lot of people followed. Some of the programmes which we've done as 20 minutes ended up being full length programmes that other people had made on other channels.

DS: One of the things that we did pioneer at the time, on the back of Madeleine's contracts for the schools programmes, was the animation system. That was very important because one of the things that's very difficult to explain is inner workings of things at the molecular level and cellular level. Of course, with an animation system you could actually get to grips with it. We actually spent an awful lot of money, didn't we?

MS: Yes.

DS: An awful lot of money on Silicon Graphics, Computers and all the rest of it, and operators and God knows what. We also had a full-blown edit suite as well. But that was okay because it was on the back of work so it actually paid for itself over the years, so that was okay.

SN: In parallel with that you were carrying on doing what you might call specialist natural history stuff. I mean one that sticks in my mind, apart from the projects that we've worked on together over the years, was the Beyond the Naked Eye (2) *project. That was an extraordinary achievement I thought in terms of revealing a world that you wouldn't believe existed, and yet not just showing it but actually following behaviour. How do you even start doing something like that?*

DS: Well, Roger Jones came to us from the Natural History Unit with a suggestion because he knew that I'd done some microscopy for the Unit. I had developed a gliding stage and also I had a research microscope that had **Nomarski** optics. Now you probably don't understand what Nomarski optics is but basically it means that you can have organisms and cells on the microscope which normally are colourless, or very, very faintly coloured and you wouldn't really see them very well at all. But with Nomarski it actually gives them shape and contrast, and when you play around a little as I like to do you can assign them colour.

That made it just a field of pond water really spectacular because you can have **amoeba** and **euglena** and **paramecium** and stuff like that whizzing about. It just looked absolutely extraordinary. If you set the microscope right it was like playing like a violin really because you have to twiddle and tweak to get it right. But some of the pictures we were getting were quite remarkable and Roger was really switched on. He did a lot of research and found different organisms which we brought in.

I mean one of the ones that really sticks in my mind is the chase of one predatory **protozoa** which was chasing I think it was a paramecium around the field. I was following it with the gliding stage and, of course, every move you make is back to front. It's in reverse, it's mirror image you see. So you're chasing this thing around and eventually this thing caught the paramecium and ate it right on the screen, and it was absolutely mind blowing really. That sequence obviously went in the show.

But there were lots of other very interesting things that we did and it wasn't all **micro**, some of it was **macro** as well. So we did quite a bit of little guys that live in the pond and in the sea as well. I mean we did some **barnacles** and stuff like that which were really great fun to do. It made a great show actually. I mean it was very interesting. I think the story probably could have been told better but I enjoyed the imaging, I thought it was great fun.

2. Micro and macro photography

SN: One of the things that really brings these micro worlds and macro worlds alive is being able to move the camera as well, to give some three dimensionality to these things. I recall Science Pictures being full of all sorts of gadgets to do that and one in particular which I thought worked spectacularly well was the motion control rig. How did you start off designing and building that?

DS: Well during the shooting of *Beyond the Naked Eye* we'd had to build our own crane because the one we borrowed from the BBC was dangerous. In fact, we did dunk a camera because it just wouldn't lock off properly so we made our own. We were so fascinated by the possibilities and we had a periscope as well and endoscopes and things, which we stuck on the end of the camera and we could move the thing around but it was all done manually.

We thought, well, maybe we can build a small motion control system which we could pre-programme things. So I went down to see Mark Roberts Animation and various other people who built commercial systems, and

they were all huge and very, very difficult to use for small objects. So I set to designing one where I was actually designing out vibration because at very high magnifications one of the difficulties with a single arm system, like the commercial systems, is that as the machine stops the camera doesn't. So it does a little wobble and that's very, very difficult to get rid of.

So the system I did was more like a four poster bed system with a gantry that run on the top of the bed backwards and forwards, and then a vertical column with a camera on a rotating -- inverted stage really I suppose. You'd normally call it a hothead in trade terms. All this was controlled from a computer so we could actually have the camera in any position, in any orientation, within a 2 metre by 1 metre by 1 metre box basically. Although we could actually look outside the box. We could remove legs from the system so we could look outside. In fact we had for a series we did called Bodyscapes(3). We actually had a model in a bath and the camera was actually looking out of the rig and going across her skin, to show Sophie's hair and dimples and pimples and things. It was very effective actually and quite sensuous as well actually.

No, it was very, very good at doing very precise moves that you could rehearse. The nice thing, for instance in the film Neanderthals (4), we were able to explore a Neanderthal cave where we had the flint tools and the bones of a real Neanderthal and a skull. We had a shot where the camera just went past the different tools and past the bones, and then ended up through this sort of sinuous path. And ended up on the skull and in focus, framed correctly, and it was all controlled from the computer. We'd actually logged each position into the computer and then gone back to the start, pushed the record button on the camera and then pushed the go button on the computer. It just ran straight through the shot.

MS: But the other thing about that system is that we were looking to -- Going back to Bodyscapes, we were looking to using the motion control rig, to link up then with the electron microscope, so that you could actually go from wide to macro right down to micro, and actually follow through on some of these very detailed explorations of different parts of the body.

The one that got everybody was looking in someone's trainer so that we actually went right the way down into the trainer with the macro. Then going right down to micro and finding the bits of skin.

DS: And bacterial scale. It looked as though it was only one shot which was pretty amazing really.

MS: Because we were able to match the moves and the pace of the move with the motion control right the way through, down into the electron microscope.

DS: Because we use the same software on here that we use on the motion control rig.

SN: You mention the scanning electron microscope, that's what we're sitting in front of at the moment. Can you explain roughly how it works and what kind of images you can produce on it?

DS: Well, yes. What we have is a column which is just like an ordinary microscope column really in that you've got a light source, in this case an **electron** source at the top here, and it fires a beam of electrons down through an **aperture** and then onto the specimen which is inside here. I can open this door and the specimens sit inside here. You can't see, the door's in the way actually. But basically I've got a bit of Velcro in there at the moment. Then we close this off and turn the pumps on, and this has to be a complete a vacuum in here because electrons don't pass through air, not more than a millimetre or so.

The beam is scanned by some coils at the bottom here just above the specimen. It scans the beam in a very tight pattern onto the specimen and then we take the reflected electrons from there on a detector that's on the back of the machine there, and that then goes into a computer and produces the picture. Because that scanning that's going on there is actually reproduced on the computer. So when you hit a little bright spot on the specimen here you get a bright spot on the screen but, of course, it's a much bigger bright spot. We can change the magnification by changing the scanned area.

This machine will go up to about quarter of a million times magnification, this one's 10 years old now. More sophisticated machines to go up to a million times or more so you're looking at molecular whereas this one can't do that. For bacteria that's fine but I think viruses we're pushing our luck I think really. No, bacteria are fine actually.

SN: And that produces a still image which is not great of course for television. So you've had to persevere and think of ways of actually turning those into moving images.

DS: Well, that's right. Whilst I was working with London Scientific we were making lots of medical programmes, and one of the things that we wanted to do was to try and make something a little bit more exciting while moving across an object, just a simple move. Rather than do it on a **rostrum camera** which you could do on a print, we decided to do it actually on the microscope itself because then you would get a perspective change when you did the move which you can't get from a print.

There was a friend of mine called Peter Rolls who ran the electron microscope unit at the Raine Institute which was part of the Middlesex Hospital. So I toddled down there with my specimen and talked him into doing this, and I think he probably wished I hadn't at the end of it all. But basically what we were doing there, because we didn't have computers on the microscopes in those days, everything was hand driven. So the positioning of the stage on this one is all done manually by a joystick here which controls motors in there. But in those days you had knobs and you twisted the knobs and the thing moved. The picture moved when you twiddled the knob.

So what we had to do was to mark the movement we wanted on the screen with **Chinagraph**. We actually measured it out and worked out the trajectory of the move and marked it with Chinagraph. Then there was another screen which we photographed with a **Bolex camera** a frame at a time. So we moved, took a picture, moved, took a picture. The difficult thing was the other screen was a different orientation to the one we were looking at. So the Bolex had to be sat on its side on a stand sitting on top of the microscope you see.

So it was an incredibly difficult thing to do but it worked and it looked quite spectacular actually. I mean there was a little bit of shake in there and, of course, we didn't have the post-production computers nowadays which would have taken that wobble out. But it was quite a promising thing and it stuck in my mind as being something that would be quite exciting to do for other things, such as natural history.

Later on when we got projects, I think it was really a BBC project that we had quite a lot of electron **microscopy** to do and that really convinced us that it was worth investing in a machine. Because I'd bought my own electron microscope for £2,000 or something and it was a piece of junk basically. The stage was absolutely horrible and it was a manual stage and we really couldn't get it to work nicely at all. So I sold it off to a colleague who wanted the bits really. In fact, there were two went actually. One went to Johnny Watts and the other went to the guy who works at Aardman and he wanted to use the vacuum system. So I got my money back on these pieces of crap.

We were then convinced by what we'd seen that it was worth investing. Leo at the time, which was a successor company to Cambridge Instruments who invented scanning electron microscopes. It's now owned by Zeiss. But we went to them and said, well, can you modify one of the machines we had and they said, well, it'll cost you as much to do that as to buy a new machine. So they gave us a very good deal on this and it was still a breathtaking amount of money I might just add. We started developing then the programmes to do the moves because we'd already been playing with moving images, moving cameras.

So we used the same software which is a Hollywood developed motion control software. But the trouble with this system is that we have to translate it from what a normal motion control system would understand to something that the microscope will understand. So there's an awful lot of work involved which is Madeleine's

little forte, of translating the curves we get from the motion control output into what the machine can understand, and then feeding it back into the machine. It's a nightmare, I can't do it. It's just mind blowingly difficult to do but Madeleine can do it.

MS: But Paul Cook who worked with us for a long while actually did the initial work of setting it all up.

DS: He worked with the Leo people.

MS: And actually produced some stunning material, some of which went into programmes which you might know a little bit about yourself. He perfected actually the moves that could be made and I was merely someone who followed on from Paul, although I did enjoy it. I think one of the more spectacular things that I think stick in the mind. Someone down in London, in one of the London teaching hospitals, had actually exposed a cochlea, a human cochlea, and we were looking at the detail of the cochlea. We were able to move round it and see it in more and more detail until we actually get to the point where we can see the individual cells which carry the hairs, and are the hearing apparatus. That was absolutely stunning.

Being able to do that was something nobody else has been able to do. Coming from a teaching background it was absolutely fantastic to be able to give a visual image which is so difficult to give people the other way. So that was extremely exciting.

I think using electron microscopes, every time you put anything underneath the microscope, you could spend days and days looking at it because there's more and more detail.

DS: It's the ooh, aah, factor. That's the guiding principle of my life really, is that I've always been able to look at stuff that other people haven't been able to look at. That is a really big buzz for me, is actually to show people things that they can't see for themselves. Not just the images but the ideas as well. I mean I think it's absolutely fascinating that so many people go through their lives and they don't explore the world around them. TV is a really great way of actually showing them that and I think we're missing a lot of opportunities actually. It's one of those things.

One of the other things that we did with this machine was to put on an extra computer which has a special little board in there which actually takes control of the scanning system. What that does instead of taking a picture with only a thousand line resolution which is what the stock instrument would do, this is now 4,000 lines by 3,200. So it means that you can make very high resolution stills and we've used it for, not at that resolution, but we've used it as a resolution for IMAX.

When we did a series called The Human Body (5) with the BBC Science Department they then went on to make a version which was shown on IMAX. So we had then to do a moving sequence with IMAX which was very difficult because each frame at that kind of resolution takes 13 minutes to scan. So you can imagine. You've got hundreds of frames to do. I mean it is a very long task and, of course, the filaments in this thing are like light bulb filaments, they don't last for ever. So if that goes in the middle of your shoot you wreck the shoot because you can never get it to look exactly as it looked before. Because however good you are at realigning thing, which is a little bit fiddly, it's wrecked the sequence so start over.

MS: Though when you sit in the cinema and actually see a whole human egg rolling slowly down, going through the fallopian tubes, it's just stunning.

DS: And it's got a six foot sperm sticking out of it, it's just absolutely mind blowing.

3. Further pioneering techniques

SN: Yes, you're fascination sometimes worries me. There was this one technique which I remember seeing set up a few times in my visits to Science Pictures which I think was also fascinating, which was Schlieren photography. Can you explain what Schlieren photography is and what you were using it for?

DS: Well, what it is, it's an interference technique again. What happens is that if you get a change in air density, light passing through those changes in air density actually gets diverted. Just like you see above a fire or a flame some kind of wibbly image by looking through the hot air. Schlieren actually was developed for wind tunnel work on supersonic aircraft and missiles. There you get a shock wave coming off the front of the aircraft, of the nose, and then something in front going on. It's very critical that they get these shock waves happening in the right place as they transition through the speed of sound. There's a sudden change in the position of where the shock waves come from and there can be a lot of instability in the aircraft.

So this mirror that I have here came from the Royal Aircraft Establishment wind tunnels at Thurleigh in Bedfordshire. They closed the whole site because they're just not necessary anymore. They know how a missile works and they know how an aeroplane works I suppose, and also a lot of that work's now down abroad anyway, or is computer simulation. Also a huge amount of work on aerodynamics is done at low speed. So Schlieren is not relevant really to subsonic in terms of aircraft. They use wind tunnels and stuff like that.

But what I found was that with using Schlieren and heat you can actually show air currents. A friend of ours, who works at the University of Hertfordshire, for a film that we did many, many years ago at London Scientific called Water Walkers (6), had developed a Schlieren system that worked vertically. He was looking at the dimples caused by pond skaters in the water film, and he could work out the exact weight and orientation of them. You could tell whether a female was pregnant or not depending on the size of the dimples of her feet because if she was pregnant to put more weight on the back feet so the dimples were bigger. So you could actually get a measurement of all this.

It all came out in beautiful colour because instead of the aircraft guide just having a razor blade as an edge to separate the diverted from the undiverted rays, my friend was using a grid of red and green stripes of celluloid. The interpretation was done by an opaque metal grid. So what we could do was have bright red flames coming off a candle. So you had a candle which normally you would just see the flame but on this, of course, all the hot air coming from it, you could make it bright red or bright green or whatever colour you wanted really.

Of course, it was so sensitive if you set it up right you could actually get the heat off your hand making these great plumes. Of course, we used it for all sorts of programmes where we were looking at scent and smell and air currents and things like that. We have to admit to a little cheat occasionally. But we wanted to show the scent coming from a rose you see so that someone sniffed it. Of course, you can't see the scent coming off a rose so we made an electric rose. What I did was to curl some **nichrome** wire round a glass rod to make a tiny little coil and then put that into the rose, into the bud, and then fed the wires out the back and then down the back of the rose so you didn't see it. Of course, when that got hot it produced these lovely fumes coming out and someone put their nose in and sniffed it and said how lovely.

MS: Okay, were there any other tricks of the trades that you used to produce some startling images?

DS: Well, one of the programmes in *The Human Body* that we did was on pregnancy and we did the entire story. In different programmes we'd done the whole story from end to end, from fertilisation to birth including all the little bits in between. One of the things we were quite interested in was showing the changes that occurred to the body during pregnancy. We'd seen some pictures, stills, of a stripy lady. So someone had projected green stripes onto the body and it actually shows the contours of the tummy and the breast and everything.

We thought, well, maybe we can actually show this dynamically. So what we did was to set up in the studio two projectors with slide that were generated from - we'd shot a computer screen basically. Projected these slides and the stripes actually coincided, so one stripe was running into the one coming from the other projector. Then we marked a turntable which was locked off on the floor and then this poor volunteer came in. We photographed her and filmed her and we actually did a rotate as well. But more importantly we just took a single shot of her in position and we marked her feet on the ground and locked the camera off, so nothing moved. She came back every few days right through her pregnancy and you could see the shape change. I mean it was quite spectacular.

The thing is because these stripes run down the body like this, when there's any shape change they move radically. So through the shot you could actually see these stripes moving apart as she grows. It was really quite a spectacular shot actually.

MS: We used a female cameraman because we felt that might be a bit more decorous and they worked very well together. It's quite exciting to see the month by month change in the shape. So when we actually showed the whole sequence you could actually see these quite dramatic changes, with the shape of not only the tummy but also the back and the way the back curved, and how the curve changes as the load in front changed to accommodate it. So it was quite an interesting as well as an exciting piece of work which looked very boring when you actually were doing it because you were having to be so very, very precise in how the woman was actually positioned.

It's a bit like some of the hair growing that you've done and nail growing shots which are always a technical nightmare in locking down things.

DS: Yes, you don't get wibble. Wibble in time lapse is a nightmare because things move, things change and you get some very strange effects sometimes.

SN: It sounds like there's virtually nothing that you see around you that you can't turn into a fantastic and revelatory image if you know how.

DS: Well, yes, I think so, I'll go along with that.

4. A new company and the future

SN: But sadly Science Pictures no longer exists. What happened at the end?

MS: Well it's always difficult to decide exactly what happened, exactly at what point. I think basically what was happening were two things. In terms of the work that was being done with schools, the big companies were becoming interested in doing the schools programmes. They were able to offer what was then BBC and Channel 4, who were the main producers of schools programmes, better deals in terms of unit costs. Small companies couldn't do that and we either had to step up a big step and basically bring in money from elsewhere, or we just had to let go on that sort of production.

The other thing was that big companies take forever to finally make up their mind as to whether or not they're going to take a project. We had something like £1 million to £1.5 million worth of projects which were at the point of almost signature. One of those disappeared completely because the BBC were going to do a series on Leonardo, and the series that we'd proposed to Channel 4 the letter said we're terribly sorry, we're going to let the BBC do this series. We're not going to do it ourselves, although later they did do a Leonardo series.

Then some of the others - *National Geographic* took forever to sign contracts and so on. In fact, the day we liquidated Science Pictures we actually had the contract for signing come through from *National Geographic* which was a bit disappointing.

So we just liquidated the company because we couldn't really keep on. At the time we had 13 full-time members of staff. We would take on other members of staff as and when we required for individual projects and it's just that time gap. I mean it's sickening. We should have been able to continue because after that people were asking us to do work. I went out and earned a bit of money doing other things but I set up Mad Science Productions and carried on with some of the schools work. Then I had a gap coming up and filled in with some work for RNIB. Dave continued with the specialist work which he can tell you about.

DS: Yes, I mean although it was a very searing experience firing your staff and closing the company down, I actually managed with the help of friends to rescue the specialist equipment. Not the editing and animation, all that we got rid of. But the microscopes including this one and a lot of the other equipment we actually managed to save. We actually had to vacate the building so it was all moved out pretty quickly up to some buildings on a farm at Clouds Hill.

Obviously we couldn't use the name Science Pictures anymore because that was technically the property of the liquidators. So we called ourselves Clouds Hill Imaging because we were Clouds Hill Farm. What I did then was just do specialised photographic work for other producers basically. No production and no employees and that was fine actually. That's now been going for 7½ years.

2½ years ago we decided to move down to the West Country because Madeleine took a job in Bristol basically with RNIB there. We moved down here and my son and I built this studio and it's been great. We've been doing work for the broadcasters. But also because this machine can actually produce very high resolution pictures and my library pictures all are with a friend of ours called Adrian Warren, he and his wife suggested that we did a book based on some of the images that were in the library. They worked out a way of doing the colouring of the black and white photographs that come off this scanning electro microscope, and did a fantastic job on it.

Dae Sasitorn who is Adrian's wife has become a real expert in doing the colouring. We're now on the verge of publishing this book, it'll be in the shops in two weeks' time and it's spectacular. It's not just our photography but the way in which the colouring's been done and the layout of the book, I'm extremely pleased with it actually. I think it'll be a lot of fun for people to explore the bugs that live in us, on us, in our garden and in our ponds.

SN: And what's your current project? Are you still working on future books?

DS: Well, I'm quite interested in doing other books. So I'm looking at different areas of interest to the public because obviously it has to be something that the public has to be interested. So I'm playing around with all sorts of little bits and pieces, widgets and things which could make up another book. But that's in very early stage at the moment.

But also if people need macro work or time lapse or photography doing then obviously we've go the kit here to do it. But it's been mighty quiet of late.

MS: But we've got all the bugs and grubs outside which is also helpful. Living in the town as we did down in Hertfordshire we didn't have quite so many bugs and grubs around us. But now we've got everything, you name it and we've got it out in the garden or even in the house. One of the things that we're trying to get used is actually the invasion of so many animals into the house which is quite incredible.

SN: Scope for a whole new career.

MS: Absolutely.

SN: Great, well thank you very much. That was a fascinating insight into what you've been up to over the last, how many years?

DS: I hate to think really. 1970 I went to the OU so you judge it from there really.

People, films and organisations mentioned

Adrian Warren
Dae Sasitorn
Johnny Watts
Paul Cook
Peter Roles
Richard Kirby
Roger Jones

Aardman
BBC
Cambridge Instruments
Channel 4
Cicada Productions
Clouds Hill Imaging
Granada
IMAX
Mad Science Productions
Mark Roberts Animation
Middlesex Hospital
National Geographic
Natural History Unit
Open University
Raine Institute
RNIB
Science Pictures
University of Hertfordshire
Zeiss

References

1. *Nature in Focus* (Cicada Films, 1985 – 1987)
2. BEYOND THE NAKED EYE (The Natural World) (BBC Bristol, tx 1997)
3. *Bodyscapes* (Science Pictures, 1999)
4. Neanderthals (UNKNOWN TITLE)
5. *The Human Body* (Science Pictures, tx 1998)
6. WATER WALKERS (Wildlife on One) (BBC Bristol, tx 1981)
7. *Horizon* (BBC, 1964 -)

Glossary

Amoeba: Microscopic single celled organism of the order Amoebida, fluid in shape and with a simple internal organisation

Aperture: A hole or opening through which light travels

Barnacles: A type of arthropod belonging to infraclass Cirripedia in the subphylum Crustacea

Bolex Camera: Swiss manufacturers of 16mm and super 16mm format cameras

Chinagraph: A wax pencil

Electron: A subatomic particle that carries a negative charge

Euglena: A genus of single celled complex micro organisms that is composed of chlorophyll and has a rudimentary eye

Macro photography: A dedicated lens system designed to magnify a subject by a minimum 1:1 object to image ratio

Micro photography: The photography of microscopic objects

Microscopy: Technical methods for using microscopes to view microscopic samples or images

Nichrome: Brand name of a wire that is a non magnetic alloy of nickel and chromium

Nomarski optics: A type of Microsccopy that detects optical gradients in transparent specimens, important in the study of cell biology and the examination of surface textures

Paramecium: Any microscopic single celled organism of the genus Paramecium defined by their fixed shape and complex internal organisation

Protozoa: Large group of single celled organisms that are distinguished through a membrane bound nucleus but vary widely in size, structure and form and include Paramecium and Amoeba

Rostrum camera: Specifically designed camera used in film and television to animate a still picture or object

Schlieren Photography: Photo-optical techniques used to study the distribution of density gradients through differing refractive index within a transparent medium

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