BEHP 0092 T BERNARD HAPPE - TRANSCRIPT

BERNARD HAPPE Tape 1 of 2

Interviewer Frank Littlejohn, additional voices Alf Cooper, Alan Lawson, recorded 13 June 1989, ACTT Offices

SIDE 1, TAPE 1

FL: When and where were you born.

BH: I was born in Carlyle in 1912 and I went to school in far west Cornwall, actually at the local secondary school. I didn't get a scholarship, I tried, I went to Birmingham University and took a degree in physics and chemistry and did a years post graduate work in applied geophysics because I didn't particularly want to do anything in the chemical laboratories of industry as I saw them at the time. So I started of my career as a geophysicist on survey. And I had a number of years at that, mostly out of this, not out of this country but mostly away from home. And in 1936 I'd just got married and I felt I wanted a job which was going to allow me to be home a bit more, I'd been at home 2 weeks out of my first 6 weeks of marriage, and I saw two advertisements which interested me at that particular time which I was applying for simultaneously, one was for **Skofany**

FL: You didn't apply for Skofany.

BH: I did.

FL: So did I. I had an interview.

BH: I had an interview. **Wickenhauser.**

FL: A German.

BH: That's right.

FL: I got the job. The chap said to me after a long time, you can have the job. Are you working at the moment. Yes I said, I'm working for GEC, he said are, are you, I said GEC , he said oh really, who ever it was then, Lord someone or other, he's a great friend of mine, I'll ring him up and see if he can spare you. I was supposed to be on an official visit to some other lamp factory really and he rang up this chap and came back after about quarter of an hour and said I'm very sorry they won't let you go. Now I'd already been sacked once from GEC Lamps and the next morning I went in and I thought it's me for the sack again, because instead of visiting, what was it, Swan, I was supposed to be visiting in North London, the Swan Electric Lights works, instead I was being interviewed by Skofany. Yes that was the system for television, mechanical scanning.

BH: Yes mirror drum rotating system.

FL: Yes I got that job.

BH: I may or may not have been accepted but I was interviewed for Skofany and I was also invited to interview at Technicolor with Leslie Oliver.

FL: Going back to Skofany, was it like a spy story, a place in xxx, with a high wall around it, and a chap with a limp, he came limping down the hall, and then when they said they wouldn't let me go I thought this was the end. Then like you I saw the advert for Technicolor, I ran away again from Osmond Lamps to get that interview too, to get the interview at Technicolor, and the Osmond Lamp factory is about half a mile long and and I was working at one end and I had to get out the gate at the other end without being noticed, they had flashing lamps which called you if you were wanted, you had a colour signal, I was red green and yellow, I was running to get out of the place.

BH: I had the inteview with Leslie Oliver and was offered the job then and I decided to take that one.

AL: What kind of money were they offering then.

BH: In my geophysical prospecting I was getting £300 a year. So I said to Leslie.

FL: Were you really, at GEC I was earning £150 a year.

BH: I'd gone through that, I had a year or two. I started working in 33.

FL: I didn't start working till 35.

BH: If we're walking about money I started at nothing per week. My geophysics outfit took me on for a 6 months probationary course, despite the fact that I had a degree and 6 months postgraduate.

FL: The same with GEC. 6 months and then they'd review your salary.

BH: After which at the end of 6 months I was taken onto the staff for £150.

FL: So you had the same starting salary as me really.

BH: But at the time I had my interview with Leslie Oliver I was getting £300 a year on the geophysics survey outfit and I said to Leslie I was hoping for something better and I started at £350.

FL: Did you. My word, I started at £4 a week. Good gracious me. I got £4/15 sh just before I was called up. He said I'll do

something for you because they'll probably pay you while you're away, so I'll put your wages up to £4/15sh, and I didn't get any money while I was away so a fat lot of use that was.

BH: I wasn't free from my geophysics contract till the end of the year so I joined right at the end of 1936, and January 1st 1937 was the first day the transfer machine in London turned over from end to end. It didn't actually make any prints because of the complexity of the thing, so many miles of film, various pieces had been threaded up the wrong way round so nothing actually happened.

FL: What a sight that is to see for the first time.

BH: Yes, and the tank

AC: Who was the supervisor, Davies

FL: No it was Ken Roberts.

BH: Roberts and

FL: He did have an assistant, a shorter chap. I can't remember his name.

BH: No. So that was my introduction. As Frank has said, I was in positive control under Ian Parsons and our operations were concerned with matrix printing and register of printers, grey printing, track printing, track developing and basically the dye transfer process, its three colours. One of my early jobs was to take what was called the process answer charts which were tests which were run at the beginning of each days' operations of the individual colours and do some **densidolotry** on them,

FL: PACs

BH: And see if we were alright to go for some production. Because unlike the negative side which was waiting for business to be photographed, we had on the positive side at least some printing work to do from existing matrices which had been sent over from Hollywood. And it was very important of the technical operation that you should be able to exchange the matrices between the two plants so you got the same results from the same matrix whether it was done in London or in Hollywood and that occupied a great deal of the time on positive control. Get the matrix characteristics correct and the dye transfer characteristics correct on the transfer machine, although there was a separate department, the chemistry department

FL: Doing hand transfers, weren't they,

BH: And **Emilio Bianci** who was doing the actual chemical solutions, their mixing and control.

FL: I bet you can't remember the name of the first chemist.

BH: Bianci.

FL: No, I mean the first English chemist.

BH: **Hardwick.**

FL: No Hardwick was the assistant. No, I can't remember either. Thomas.

BH: No, he was later.

FL: I can't remember his name either but I remember him because he rode a big, huge motorcycle and he came from the Battersea Power Station and he only lasted about 6 months, he didn't like it and then he went back to Battersea Power Station.

He wasn't there very long, a very nice chap, we admired him, in fact he'd got his chemistry degree by evening study, all by himself. But he didn't last long. But they did hand transfers down there as well.

BH: Oh yes.

FL: Because it was a great process for technical know how.

BH: It was a great process for technical kicking at every stage.

FL: Of course we had engineers going round doing their bit of checking

BH: And positive control, for instance, had to print and process photographic tests on every printer and check them up on a microscope for size and shape and position and definition and all the rest of it. So a great deal of labour went in on that side, and of course positive control was also concerned with pursuit of defects. An enormous operation on

FL: And register on the screen.

BH: Register on the screen, yes, you transferred as you did the yellow cyan and magenta images separately and unless you got them down quickly with the matrix and blank in the right condition you'd have nasty coloured fringes, and so register control was an important part of the operation.

FL: We haven't really mentioned much about the grey which we had originally.

BH: Grey was an essential part of the early dye transfer system. You should remember the transfers were made on normal black and white stock in those days, it had to be carefully perforated but it was perfectly normal black and white 1301 stock, it had a

silver sound track, again of perfectly normal characteristics, but it had this black and white image because the dye absorption in the maximum areas wasn't black enough to be satisfactory on the screens, so you put some grey in there to build it up, that was printing process conditions as much as anything else. It was important to be able to claim a defective print so you could both the stock and the grey image and the track image which cost you quite a bit to put back together again.

It was in those days a four colour process and each of them required their own particular control.

AC: At one stage we had a defect control department.

BH: Defect was always part of positive control. But chasing defects whether they were spots of dirt or dirt which stopped dye transferring or bits of gelatine which transferred with plus spots, funnels where the film wasn't sitting, where the two films matrixes and blank weren't sitting together

FL: Minus transfer.

BH: Minus transfer where you didn't get transfer over certain areas and

FL: Just the weather for that last night, that would have been a great minus transfer night, last night.

BH: The amount of labour which had to go into insuring a reasonably consistant degree of quality was really quite considerable. And don't forget that in those days every print was run, was viewed immediately after transfer and checked against a reference print.

FL: And don't forget every major distributor had it's own depot where they did it again.

BH: So, there was a lot of checking going on. The transfer machine started off when I was first there, Jan 37 we were running it at about 76 ft per minute, later that year they went up to 95 ft per minute which was a considerable lift in our output rate, but in those days in 1937 or there about we thought we were doing a very good month when we approached 1 million ft of positive print

FL: Absolutely.

BH: A sort of figure which subsequently when Frank was running the place we were doing in a day.

FL: That's right.

BH: But before the war transfer machines.

AC: What were the speeds.

FL: 300 ft per minute.

BH: In the final stages it was 300 meters a minute, the specifications for the Chinese plant were 300 meters, sorry, 100 meters per minute.

FL: And of course by that time the process was a continuous process too, you put the blank on at one end and you put it in the can, the finished print at the other end.

AC: It was put on the printing machine, it came out of the raw stock can straight into the can it was shipped in.

BH: But that was the end of the printing process, we're talking about 1937, you printed a grey and you printed a soundtrack and you developed it and you conditioned the blank because the blank had to be treated with chrome allum solutions to make it suitable to absorb the dye and you conditioned it for a very specific length of time under very specific conditions, because if you conditioned it too long the blank got too hard and wouldn't transfer properly and the dye wouldn't go in, if you didn't condition it long enough, the dye was too soft and you got a fuzzy blurred image because the dye defused, so it was a knife edge operation. Again you tried and order standardization of the thing so that cans off the developer for instance went through a baking process for a specific time on a continuous conveyer before they were actually then taken off and unloaded and the blank fed onto the transfer machine, it went through the transfer machine, it got its three colours on, then it was taken off, and then it was taken again by hand to a projector and run through a projector and viewed by the positive viewers against the reference print, then it was taken off the projector and moved into positive assembly where the lead was taken off, and heads and tails and titles and stock joins and all the rest of it were put back together. The number of stages the film was handled and wound and generally moved backwards and forwards was absolutely amazing and it was not until 20 years? that they started to integrate the processer.

BL: Oh later, because it was after Leslie left that we really got going, in America of course they'd done it a bit earlier. Even in Paris where they had the AT printer, the blank was before it was put into a can, so it was 63 or 64 before it was complete.

We had various stages of linking, well first of all we dropped the grey print as an operation, about 1953 or there about, the improvement of dyes had been sufficient to drop the grey image. So we were concerned only with printing the black and white soundtrack and the interframe lines, and we linked track printers to a developer as a first stage, then you got a linkage between a

track developer and a transfer machine

FL: No, we had to do it the Hollywood way, we started downstairs, we only did that, went back and did that which we weren't supposed to afterwards, we did it really just for double 16 if you remember.

BH: But until eventually, as Alf was saying, you got to in the later stages, rolls of raw stock which at that time were coming in 2,000 ft lengths, were fed on continuously, they went through a continuous flat printer, to print the track they were stripped with a viscus developer to develop the soundtrack, they went direct from the soundtrack developer to a washing operation and were there in the transfer machine and then they acquired their 3 coloured images and then the film went from the transfer machine direct to a projectionist, projector and went through a projector and was viewed and went through the projector to the final take up point in positive assembly where the reels were finally wound up. So there as I remember there was about a mile and a half of blank film between the feed on point

FL: Fantastic wasn't it

AC: Incidentally, the feeder takers all had terrific elevators.

BH: Oh yes because by that point we were running around 250 for 260, getting on for 300 ft per minute and in order to allow time for splices to be made to feed on the new role or to take it off at the other end, you had to allow time, therefore you had to have an elevator with a capacity of several hundred feet.

AC: The take-up elevator was the best thing of all because when you think about all the defects which were recorded by the viewer were all taken out prior to going into the delivery can.

BH: Yes and of course the other thing which went with that was the establishment of loop printing, both on the transfer machine so you took a matrix which could be up to 2,000 feet in length, so it could be one long roll or an assembly of two or more shorter ones, and you joined it head to tail so you could go round and round and round and of course you had to do the same thing with the soundtrack, a soundtrack was running in a loop and was feeding printed blanks into the transfer machine for corresponding loops. But when you wanted to change from one subject to another, either on the matrix or the track, you had to have these enormous elevators which Alf was talking about in order to absorb what you were taking off and have space to put the new ones on. And

FL: They were really wonderful.

Once you were running on a loop, you always sat down on the transfer machine.

AC: We didn't fall asleep.

FL: Talking about a loop, it reminds me of all those wonderful newsreels we did for ages, and this is the time of the year we'd be doing them, we'd start with the Grand National, the Derby, Wimbledon, Hendon

BH: Oh the Pathe News.

FL: Which brings us back to , by that time he was working for AB Pathe and Pathe News and it was his job to get the newsreel prints out to the cinemas on Sundays, and a disagreeable chap he was even then.

AC: I started on Movietone, I did all the first dip tests, sensitometrics.

BH: That established the process in 1937 and basically apart from some occasional, comparatively small increases in speed, it remained substantially the same, then came the outbreak of war. And in my mind the whole Technicolor Limited organisation was in grave danger of being rubbed out, there was after an all a period cinemas where closed, when cinema production was discouraged, when cinema presentation was discouraged, when you weren't allowed any materials or labour, and it could easily mean that since film, the cinema, wasn't given a particular high rating in the national conscious, let alone the added expense of colour, it could very well have been closed down completely. As it was the machine shop which was the centre of maintenance and mechanical precision work was taken over for war work on gyroscope gun sights and things like that. But we had a reprieve in finding some worthwhile war work to do and that arose out of some ideas which Lieutenant Stevens in the navy had.

AC: Before we get there Bernard, you remember **Oakes**, managing director, Elvin was the one reason the industry wasn't shut down, I'll never forget it, I was a new starting as an active trade unionist, and I had Elvin in Oliver's room and Oakes and Harrison were there and we were having our first discussion, and I went out to do a Jimmy Riddle, and I get out of there and there's Oliver and Oakes shaking hands and congratulating each other, and I thought what is he licking the hands of the guv'nors, and he was thanking him for the work he'd done in the House of Commons that morning keeping the film industry going, it was at that period of the war, and it was Oakes who was one of the first to congratulate him. Sorry, I thought that was the right time to bring that in there.

BH: Well there was a proposal from Lieutenant Stevens in the Royal Navy to improve anti aircraft gunnery, particularly with hand aimed weapons, the ones which were aimed by eye rather than predictor. And he had the concept that you should take the Albert Hall and build an enormous hemispherical dome the size of

the Albert Hall and put on films of aircraft and in the centre of the hall you would have people being trained in the use of anti aircraft weapons and their sights and the appropriate song and dance of sound and battle and the rest of it. That was put up to the navy people of the gunnery school at HMS Excellent and they said we don't know about this but is this the kind of thing Taylor Hobson can undertake and having put it up to Taylor Hobson the TH said this is the kind of thing Technicolor might be interested in. So we had some long discussions about what might happen and George Gunn was very enthusiastic about it, we all were, about the possibility of doing something on a much smaller scale but would allow the use of film as a target method, as a method of trying out target, of practicing on moving targets. And as a demonstration stage, we built a minute dome, it was only a quarter dome actually, it was built in the men's locker room, with about 25 ft across and built of electrical conduit as frame and plastered over by Arthur Waller, do you remember, the projectionist, and he was also a skilled plasterer, and in the middle of this dome we put a projector and since a 35mm projector was too damned heavy and immobile and full of innertia to be able to swing it around, we fixed the projector and projected the picture by means of a mirror which could be rapidly moved to project the image of the target up of the surface of the dome and close by that we put up a stalk with a suitable gunsight on it. And we made a number of demonstrations to various people from HMS Excellent, Commander Hamilton was the local man at the time, people like Admiral Dryer was concerned with the training of, what do you call them, DEMS, Defence Equipped Merchant Ships, took to the idea and eventually we got a project to build domes for anti aircraft gunnery, primarily for the navy, and associated with that was a major project for instructional films, as to how you should recognise you aircraft and by recognising the type, its action, approximate direction of flight you could estimate where you should be aiming with the various types of gunsight. And that became a very major project and that took over all our engineering resources, it saved the life of the camera department because we very quickly demonstrated that it was no good going out with a camera, let along a Technicolor camera to try and shoot genuine aircraft, even if you could get the appropriate German types, and later Italian and Japanese types, at several 1000 yards, they just didn't show up, so we developed the business of producing all our aircraft targets synthetically by animated models and I had a team of about 15 girls, because we didn't have computers in those days, working out the attitude and the condition of the camera, frame by frame, for each of these runs to produce an aircraft which was making the right sort of manoeuvers and making a dive bomb attack or a low level attack or an attack on you or an attack on the stern and so on. That in fact became a life blood industry, I'm sure it saved our life during the darkest days because we made several hundred domes. Because they were initially for the navy and they were sent all over the world, some of them arrived, like the ones which went to Singaphore, arrived to late to be any good, others went to the States and South Africa. There was one on the Thames at HMS

President, on the river, and that was particularly useful for merchant seaman coming up the Thames. There was mobile training units sent out on buses which could be directed to different ports to meet convoys coming in and to update their crews, and as I say several hundred domes were built and several hundred target runs were made. It was also taken up subsequently by the RAF regiment for the defence of their air depots and the army eventually came in and they wanted Bofors and **Stifky sticks** for their training, and that gave us quite a lengthy life of activity during the 1941,42, 43 period.

AC: It gave me a job too, because I was running the prints on the spare side of

BH: Because we didn't bother about transferring in colour in full, you were concerned with 3 things only, the aircraft target which was effectively a silhouette for most of the time, although in very close positions you might see something of the Iron Cross or whatever it might be, and a blue background which was just to give the impression of a uniform sky and a yellow spot which indicated the point of aim which the gunner should be aiming at to allow the time of flight to get out there with his particular weapon. And the trainee couldn't see the yellow spot because he had a yellow filter in his sight, but the instructor and everybody else in the class could see where he was aiming because there was a small still projector mounted on the gunnery sight which projected an image, a bright line image of the gun sight on the surface of the dome, so everybody could see where he was aiming and where he should be aiming but he couldn't see where he should be aiming. And that produced a lot of interest and was a full time job for a number of years, during which time thank heavens the general recognition that film was something to be encouraged and if necessary expanded was going forward and the film industry was still alive, cinemas were working and people were beginning to make films.

FL: Didn't Churchill invite Korda back from America.

BH: The Lion Has Wings.

FL: Yes he came back from America and made a series of films of which that was the first one. The critics said what is this Hungarian jew doing over here making films to improve our moral.

AC: That resulted in George Gunn getting the MBE

BH: I think so.

AC: Bernard, you and Stew worked on the cams and all that thing between you.

BH: Stew was particularly concerned with that one, he was doing the plant running, I was more concerned with the mathematics.

AC: You were doing it. I thought it was tough that George got the MBE and people who had to do the thing didn't get a mention.

BH: That's the way it is. Anyhow, Technicolor got some recognition out of the thing and it kept us going while the proper business of making films was allowed to recover and expand. And my the end of the war thanks to films like Henry V and

FL: The Great Mr Handel, do you remember The Great Mr Handel

BH: Yes quite early. Things like Henry V had prestige and by the time the end of the war came there was a demand for colour, a demand for colour prints, the Americans were full of production as they always had been, they'd been frustrated from getting it into Britain for quite some time and they had frozen resources which they could use in various ways and sometimes were used for film, so by the time 1945, 6, 7 came we were feeling the strain of lack of resources,

FL: Resources, capacity

BH: Lack of cameras, 4 of them only, one transfer machine which I think had got up to 185 ft a minute by that stage but that was running flat out, 6 days a weeks and sometimes on Sunday and we needed more production.

FL: We'd built our first optical printer by that time, 236, do you remember.

BH: As an optical special effects, yes. Though as you said we'd been in the optics printing business for a long time.

AC: Nobody seemed happy in those days.

BH: There was a hell of a lot to do. You could then see on one side a camera manufacturing programme which was going to treble thereabout our resources for initial photography, and then on the other side a programme for building space and then machines to go into it which would add enormously to the release print capacity. That started to take shape, cameras in 1948 onwards and the first new transfer machine, 12-8, we started off with 5 second hand from Hollywood.

FL: 5, 8, 9 and 10.

BH: And the first of the new transfer machines just about the same time. And then it went, that was a boom period, and until in 1952/53 came the shadow of Eastmancolor and that made the complete fundamental difference to Technicolor as an initiating production organisation, the camera department was no longer the whip hand of the producers, anybody with a camera could buy Eastmancolor negative. But again, as Frank was saying earlier, we were badly caught short and this was a severe lack of

foresight on the American side. They could see colour negative coming but they didn't take any positive steps about saying alright when colour negative comes what are you going to do. So the question was whether to give up the idea of the transfer process completely and just become the equivalent of any other laboratory with colour negative and colour positive or whether we should try and keep the dye transfer process going, because the dye transfer process complicated as it was had some enormous advantages in the days enormous numbers of copies were used, once you'd made a set of matrices you could turn out literally hundreds of copies.

FL: Because the competition had nothing going for it because the interpositive/intermediate was so terrible.

BH: And for the interchange between America and England and vice versa this gave a way of maintaining the equivalent quality and great stress has always been placed on the interchangeability between the Hollywood and London plants, it used what was then inexpensive raw material in the sense of black and white positive stock, it could make large numbers of copies of great consistency and there was a lot to be said for it when release print requirements were sufficient. So the coming of colour negative was first of all met with the very unsatisfactory, intermediate stage of making black and white separation negatives, extractions as we called them, from which we could then use the normal dye transfer process, but the requirement really was that there should be a set of matrix stocks which themselves were colour sensitive, red, green and blue so that you could in fact print your matrices direct from the colour negative.

FL: So once these new matrix stock had arrived we were back on top again until unfortunately for Technicolor the CRI was invented which gave the competition a new weapon because they in turn no longer had to use the original negative for all their copies and they had a very good duplicating material. This was again something which Technicolor Hollywood should have foreseen, it was coming along, and they should have laid their plans accordingly. But it was neglected and so we lost a lot of business as a result of that arriving.

SIDE 2, TAPE 2

BH: The expansion of colour negative didn't lead to the disappearance of the dye transfer process, quite the contrary, we had some very good peaks and increasing production of dye transfer release prints

FL: We took back all the people we made redundant and more.

BH: The late 1950s and early 1960s, but the dye transfer process was still not as it ought to have been for the new requirements, and the new requirements of the big wide screen on the anamorphic presentation, particularly the big screen was beginning to show up a lot of the limitations of the dye transfer method as far as the quality of the outline image was concernd. Diffusing dye into a piece of gelatine didn't really give you a sharp enough outline, it was lacking in definition in comparison with the competition and this began to be a serious technical criticism as people started to put their anamorphic pictures on bigger and bigger screens. So again work had to be done, and again too late I fear, later than it should have been, but there were two lines which were developed. And one had been incipient in Hollywood's research areas for at least 10 years previously, because I remember when I visited Hollywood in 1947 and I asked the naive question about pre mordated blank there was a deathly hush around the table, the sort of think you weren't supposed to know about. But it was possible to put chemical components into the blank so it would tie the dye down so it didn't go diffusing away through the gelatine areas. And this was mordating, you know the textile business, and premordating was putting something into the emulsion at the time of manufacture which would do it. Unfortunately, some of the early mordants had excellent mordating characteristics but they completely fogged the black and white silver emulsion, so they had a limited life and you had to apply them afterwards, you had to apply them as post mordating. We had a period of that if you remember.

FL: Yes indeed.

BH: At any rate, with sufficient pressure Kodak eventually came along with a satisfactory premordated blank which meant that the dye transfer image was a lot sharper and didn't go wandering away in the gelatine layer.

And shortly after that, again a matter which had been available their in the research department for 10, 12 years, improved dyes. In the early days right from the first stages in Hollywood in the 1930s and applying to London from the 1930s onwards, the dyes we used, although they were transferred as yellow, cyan and magenta were in fact complex mixtures of dyes which were normally available as textiles and they had to be compounded with various proportions of different dyes, the cyan dyes had as much as 5 separate components in it which had to be kept correctly in balance, hence all the work which had to go on in the chemi lab

and for years the research people had been saying you could design a dye, a yellow or cyan or magenta dye specifically for the purpose of dye transfer, it would save, it wouldn't be variably depleted when you ran it, it would be consistent but it wasn't until well into the 60s that this was really allowed to go ahead and what we call the new dye systems were at last introduced, first of all in Hollywood and then in London, and that was the way we finished up, with mordated blank, no grey, silver soundtrack, and special dyes made specifically by dye manufacturers such as **Byer and American Silomide** for Technicolor's specification.

The big advance around those later days was the availability of S Star stock. Cellulose acetate, cellulose nitrate in the early days, we were all brought up in the anti fire regulations with little rooms all over the place, we got through the nitrate period and became entirely safety based in 1951 and later in the 1950s the availability of the polyester bases became a possibility. For matrix stock these had enormous advantages, they would stand up to the wear and tear on the transfer machine multiple usage, they didn't expand and contract and shrink to anything like the same degree, they were much more stable, and they were the first application, matrix stock on S Star base, was the first application of these polyester bases on a regular commercial basis and this made an enormous difference to the consistency and ease of running of the transfer machine, matrices lasted longer and they didn't wear out and they didn't shrink and they didn't expand in quite the same way and everything was much easier. And I suppose you could say it was on that basis from the middle of the 1960s that Technicolor as a process reached its peak in terms of output levels.

AC: Do you remember your highest output levels for any one month for any one year.

BH: I've got the year ones here Alf. The one thing you might just want to touch on which was never given enough prominence was non silver blank, of course.

FL: But it never got anywhere.

BH: Around the 1970s when we had 4 transfer machines all going at 300 ft per minute

AC: 24 hours a day.

BH: 24 hours a day and sometimes weekend, we were doing 310 million feet in the year.

FL: Not bad, eh.

BH: And in fact we were around the 280-300 for a period of about 4 years then, 68, 69, 70, 71, that would be

FL: Yes, that was my time

AC: 1350 people we had

BH: About that including the people at Hendersons.

AC: And they were all in the union.

FL: I'm not sure whether we got the draughtsmen in.

AC: Yes we did, there was never a draughtsmen union.

FL: They were the last weren't they.

There was just one last thing we might mention because I think we ought to give credit to where it really belongs and that is to **Henry Imers** and that was wet printing which was encouraged by Leslie Oliver and developed by Henry Imers. Because originally Eastmancolor negative was a very soft material and very easily damaged and we spent a lot of time, all laboratories did, lacquering and taking the laquers off, and relaquering negatives in the way of trying to cover up scratches and minimise them and so on and then I suppose it was Lesie and Henry together who thought of this other idea, wasn't it, and Henry did a lot of work

BH: I think it was Henry's idea but

AC: Did Henry Imers work at Tec, I don't know the name.

FL: He was one of the original men who came over and trained our camera technicians, he went back to Hollywood and like most of them he didn't get much of a job when he got back and eventually he finished up as a contact man for defects and in the end he became so unpopular in Hollywood, in the end he became their damage specialist in Hollywood and we were having a good deal of trouble with dirty/damaged negatives in London and he was sent over to help us with out problems.

BH: He was sent over to help us with out problems and he had the idea, and I'm sure he was the originator of them rather than the other way round, that if instead of coating the negative with a laquer which you had to do as a separate operation and then take off and put back again, you coated the negative with a film of liquid just at the moment before it was printed, before the actual frame was printed, then you could give yourself the equivalent of laquer on both side of the film which was evaporated off immediately after the printing gate which you could keep doing again and again and again, it was a brilliant idea and it was Leslie's encouragement which allowed him to take one of our matrix printers and build little additive pieces onto it and see if it worked, because the concept as it eventually worked out was that just before the negative went into the negative head of the matrix printers, don't forget these were

optical printers so the negative head is quite separate from the positive, just before the negative went into the printing gate it dipped into a little tray of liquid, it was evened off by means of an air squeegy and if everything went well you had just the right amount of liquid on both side of film as it went up through the gate, sufficiently lasting to stay there while the particular frame was being exposed and then as it came out of the gate you went through a little air nozzle and dried it off and the film was taken up completely dry.

FL: At this point may I say goodbye.

BH: You had to keep the film very thin and very uniform, it was probably only a few molecules thick, but it not only filled up the scratches and abrasions on both sides, but also it reduced the effective grain seen by the matrix printer because Eastmancolor negative in those days, and possibly still, has a sort of orange peel surface, and that in fact was optically reproduced in the matrix printing and appeared as a sort of, a kind of grain, a light weight grain, and the wet printing had the advantage of evening that out as well.

AL: That wet printing, was it a Technicolor patent, do you know

BH: It was certainly a Technicolor speciality, I don't think anybody else, I imagine it was covered by patent in those days.

AL: Because I thought some other labs did take up wet printing.

BH: Oh yes, wet printing is now a very common operation, but they have all gone to the business of a cell, where they are feeding a film between two plates of glass which is in fact filled with the appropriate liquid which is a lot more complicated and which had to be built into the printer. Henry's brilliance of approach was that you can apply this system to all the existing matrix printers without any rebuilding apart from add on, there were add on little bit below and add on little bit above, and there was plenty room there for the space. And of course if you are building a printer from scratch as they do these days, you build in your wet gate, with a circulating system and the liquid cell that the film goes through, that's a much more elegant but a much more complex way of doing it.

AC: What liquid were they using.

BH: I've forgotten. The essential requirement was that it should have the right refractive index, about an average between the refractive index of the gelatine and the base and it should evaporate reasonably quickly. We found lots of things we could put on as a dip, but when you got it up to the top it took a minute or two to evaporate away and you only had second. I'm glad Frank reminded me about that because that was a real advance. And I would like to think Henry Imers is remembered for that because he isn't always given credit for the various things

he did over the years. As Frank was saying a number of our American colleagues went back to Hollywood after their period in London, at the beginning of the war, and didn't get much of a hand out.

AC: Some of them were out of jobs.

BH: Some of them were either offered something which was so

AL: Do you know why that might have been.

BH: Out of sight, out of mind. You've been away, you've been with these Limeys for two years, we've moved on, so and so's been sacked, so and so has taken their place, and people like Bianci who was a very good chemist, I forgot what he was offered when he went back to Hollywood, I think he was offered a chemical mixers job, he said no thanks, he went to Disney and became one of their research chemists, leading chemist. The same thing happened to a number of others I don't know so much in detail about.

That perhaps is useful to add there because it was around that time, the later 1950s, 1956 onwards that enormously complex demands were being made on the matrix printing process as a result of all these different negative formats, Vistavision, and Technorama, and the squeezes and unsqueezes, and all of these were making use of colour negatives, all on optical printers of varying degrees of complexity, and some of them were extremely complex, with an optical path as long as that because all the pieces you had to put inbetween. And the fact that Imers wet printing method could be applied to any of these printers was of enormous advantage and made a terrific contribution. Of course, we've mentioned the failure of Vistavision to get anywhere because it didn't look significantly different in the cinema and the conversion of that idea of the double frame, the 8 perforation frame, to Technorama, Alf has raised the variety of Techniscope, a two perforation one which

AC: Are they still using it.

BH: It comes up every now and then, it hasn't really any regular usage.

AC: It never really took off, did it.

BH: It took off enormously in Europe.

AC: Over here we didn't seem to see much of it.

BH: We didn't see much of no, but it was very widely use as Frank was saying in Italy, it was used extensively in France, it was occasionally used here. The Americans didn't like it, as simple as that. It was well used in Europe. I remember going over to Paris for the Unitec conference and giving a contribution

there on Techniscope and it had quite a popular period.

AL: When you say the Americans didn't like it, do you mean Technicolor America.

BH: I always mean Technicolor America

AL: Why was this.

BH: It was invented here.

AL: I see.

AC: Like Concorde.

BH: I don't want to make too much of this, but in our younger days

AC: We were there on sufferance.

BH: No we were an important contribution to the finance but we weren't supposed to have technical thoughts, these were all supposed to come from the centre. And indeed there used to be a cynical phrase I don't want to make too much of, an American reaction to a British invention was 3 fold, it had 3 stages, the first reaction was that it won't work, the second reaction was it can be made to work but it isn't worth doing, the third reaction was we've got a wonderful idea why don't you do this. And I have to assiciate this particularly with our wartime 16mm activities.

I don't know how much you remember of that Alf but during the war partly as a result of this naval training stuff but also for all the other services both for instructional films and training and entertainment, because all the services entertainment had to be on 16mm, there as an enormous demand for 16mm prints. Well we couldn't make 16mm dye transfer prints on a 35mm transfer machine, we only had the one transfer machine, Hollywood had the advantage that it had several transfer machines, they had at least 4 at the time and they could put one aside and say this was a double length 16 and you could do 32mm film on it, you could do 2 rows of 16. But we only had the one transfer machine which was built for 35mm and you couldn't do 16mm on that. No you couldn't because the relation between 16mm perforations and 35mm perforations is absolutely incredible, there's no relation between them at all. And don't forget that the whole essence of the dye transfer process is that it depends on printing a matrix which registers on certain perforation holes on the matrix and that the matrix and blank are registered together on perforation holes to make them come out together. So we were under heavy, heavy pressure from all the services, what could we do for 16mm prints, and we started off in a most unsatisfactory and expensive way of having copies done on Kodachrome and sent elsewhere and we would print them on Kodachrome and we would send them elsewhere for processing, it cost a packet of course which was very

unsatisfactory, so we had to think about how to use our one transfer machine both for 35 and 16 because you couldn't do away with either, with 35, it wasn't the case of being able to shut it down for a week and make it 16, the amount of 16 required was only perhaps a few hundred thousand feet a week so you couldn't, it wasn't more than a few hours running, and so we had to think of some way of doing it. And out of various brain storming operations and I think **Silvey**, the man in the drawing office, made the biggest contribution, he started looking at the figures for the 35mm perforation pitch and the 16mm perforation pitch and he said well, I've forgotten the numbers now, anyway if you take a certain length of 35mm film, you have so many perforations a long it. Now that in fact is almost exactly the equivalent of 47 16mm perforations, so somehow or other if you can divide a 35mm into this proportion you can print 16mm matrix images down the middle of 35, and provided you maintain the right relation between the performations on all the records absolutely throughout, you can use the 35mm perforations on the transfer machine to transfer the image. And that is what we did, we , he, I think he was the initiator of the design, he designed a rtary perforator, which would take 110 perforations of 35mm round a sprocket, a precision sprocket and advance it in 47 steps with a registering device and each time you registered it you perforated a 16mm hole, and that was the basis of our 16mm on 35mm dye transfer. You perforated the matrix, you printed the matrix using the 16mm holes, you transferred onto your ordinary blank using the 35mm holes, you reperforated the blank using the 16mm holes again making sure they came in the right place, marks all over the place. Then you slit off the sides and you had a 16mm print and we made million of feet that way.

AC: Perforating and slitting.

BH: It had the enormous advantage that you could run mixed 35mm and 16mm on the transfer machine because the blank was all 35mm anyhow, you made up your 16mm matrices, they were 16 on 35, so you made them up to the right sort of length and you could intercut 16 production and 35mm production just as you wanted to do. It was a tremendous advance.

AC: But you couldn't be one perforation out on millions of feet of film.

BH: What did this come out of, it came out of the fact that I commented on the American reaction to some of our proposals was often lukewarm. We put this up to Hollywood as a procedure we were proposing to do, we said our livelihood, status with the armed forces, depends of us being able to produce 16mm prints. We said to Hollywood we're going to do this because we believe it's the only way of meeting an absolutely overwhelming demand and it was dismissed out of hand. It contained an inherent irrationality was the phrase. Wally Pole was the man Frank was trying to think of, he was the technical manager and ultimately technical director over there, meticulous in his approaches, only

too anxious to turn things down, so they turned it down. We went ahead, we had to, they adopted it subsequently, but by that time we had several years behind us, and we kept that single rank, 16 on 35 going for years and years and years, even when during the 1960s the demand for 16mm began to become so much that even we in London put in a double rank 16mm machine, we had sufficient business to be able to say, we will allocate for a whole week at at time one of our four transfer machines and put in double rank 16mm doing 2 rows of 16mm on 35 and throwing away a 3mm strip. Now of course that's fine, it's much more efficient, it's a greater output, a better use of stock and all the rest of it but when you only have one transfer machine and 35mm is the only material available you've got to find some way of getting an answer to it and that was one of the useful answers.

AL: And this was all built in the workshop.

AC: We had a very good drawing office.

BH: Very good drawing office. First class design work. The rotary perforator was damn slow so we had to make a lot of them but they were beautiful bits of precision engineering, where Technicolors toolroom skills really came in, these sprockets which had to be absolutely uniform round the outside, every perforation step, I look back on that as quite an achievement, and in fact I seem to remember that the single rank 16 was still ticking over in the last days of the dyatron process when there wasn't enough business to justify double rank transfer operations but we could still put on an odd job on the single rank one because it could be interspersed with the rest of the material.

AC: Do you still go back there.

BH: I do go there but wearing another hat, I was there the day before yesterday actually, because I've been completing a test film for ITVA association and Technicolor have been making a release print for it, but of course there are not many people there that I know, and the interior is so changed you can't find your way around at all, although I did get into one of the printing rooms and I recognised a large number of the matrix printers of various designs that we had in those days.

AC: Are they still reclaiming.

BH: You don't reclaim colour positive.

AC: Oh no, I'm forgetting that.

BH: As far as my particular contribution is concerned I would say that I was directly concerned with all these developments and the introduction of the new dyes in the 60s and the improvement of optical systems and so on, and that in the later 60s and the early 70s there was a lot of unhappiness, I think, in the general status of things there, I wasn't very happy about things, I was

given the job of trying to maintain, it wasn't research, it was development project, I retained a few people like **Harold Towl** and Ronnie Cork on special projects which I could justify but it was a somewhat tenuous situation until my final fling with the Chinese operation was concerned.

I started the thing. We now come up to the early 70s and I'm going to finish there. Around 1972 there was a visit from Chinese technicians from their cinema industry at all levels, from production through to laboratory. And we had a delegation sent down to Technicolor and I had the job of showing them round and explaining the process to them when we eventually realised that they were talking seriously about a dyatron process for operations in Peking. Now they wouldn't in those days, and it was the early 70s, they wouldn't recognise America, they weren't prepared to do any business with America whatsoever, but they were prepared to do business with the United Kingdom, so they had a look at the Technicolor process, I had about 3 days explaining it to them, and subsequently they expressed an interest in acquiring the know how and an operating plant to be, we didn't realise at the time that they were absolutely dead keen on acquiring it and we were rather under the impresion that we were one of the technical processes which were in competition with other organisations to establish colour negative and colour positive processing on the same basis out there.

They'd had, of course, a very bad experience with the Russians during the 60s and had put in a lot of equipment from Czechoslovakia primarily, under the guidance of Russian technicians, for colour processing. And some time, I forget when the date was but it must have been the late 1960s, came the split between the Soviet and Chinese operations and the Russians were all pulled out complete, even their data books were taken and the Chinese were left with a very unhappy taste about the thing. But they must have come to a decision in the early 1970s that they had a cinema industry which was going to require prints by the 100s if not 1,000s for their general release and they only had limited resources to devote to making their own materials, and the decision must have been taken at a fairly high level that all their technical resources would be devoted towards bringing about a home made, Chinese product, negative. And because it was comparatively easy to make black and white stock and they were already making black and white stock in substantial quantities, as far as release printing was concerned they would devote their technical development resources to making colour negative, that they would use their existing black and white resources to making release print stock and they would buy themselves a dye transfer process which would allow them to make colour prints in large quantities for general release on that stock. So Technicolor was in fact a natural and I wish I'd realised that they would have been so dead keen because I wouldn't necessarily have made so many confessions. But at any rate they came over in 72 and looked at the place. And in 73 when they were beginning to express some serious intentions they said would I go over to China and explain

to their technicians there what it was about.

So in 1973 I went over to China, to Peking, on my own as far as Technicolor was concerned although I had the guidance of some old China hands who'd been doing business, in the textile business and so on, old hands, who were good enough to show me the ropes and keep me from putting my foot into social problems and so on and I was there for three weeks and it was a very grilling operation, a very grilling experience. I don't know if you've ever heard the gag about the Chinese examination question which used to be told in my university days as a joke, do you know what the Chinese do for their examination of the mandarins, well they get all the madarins, all the potential mandarins together, they gather them in the square of the imperial palace and give each of them a separate tent and unlimited writing materials and unlimited paper and they give them one question, the same question to all of them, and the one question is write all you know, and it makes rating very simple because the last man who comes out has obviously written most.

SIDE 3, TAPE 2

BH: Well at any rate, I was there in China and I was given a Chinese examination, each morning there would be a team of 4 to 5 assorted technicians and we'd sit round a table revived with the standard tea, which was the regular practice continually served, and they would grill me on one aspect or another not only the Technicolor process but as far as I could see practically everything else in the film industry. And in the afternoon it would be repeated with a different team. And that went on for the best part of the 3 weeks. We had some social trips, taken out to the Great Wall and the Ming Tombs and the Summer Palace and so on each of which became an occasion for particular people to get hold of your elbow and ask what about so and so and what about so and so and what about so and so. And at the end of the 3 week period I said I must be getting back, yes they said, it's been very satisfactory. Obviously they had put all this effort not just into the task of instructing, getting information into their own people but getting an idea from me of what I knew, how able was I to consider the problems. So I came back to London and then shortly after, that must have been May, the dust storms were beginning in Peking, and later that year, August, I went back again with the top brass from America as it was at that time, McKenna and another man whose name I've forgotten, who took their wives with them on the trip, with the idea of producing a contract, signing a contract. And in fact a contract was signed at that time

AC: They accepted the Americans.

BH: No, the Americans were merely there because they were at that time they were members of the board, in fact McKenna was chairman of the board of Technicolor Inc, he was also chairman of the board of Technicolor Ltd, so he was there was Technicolor Ltd, and the contract was signed by Technicolor Ltd to supply the, design the plant, supervise its building and its services and to supply, train and get going a dye transfer plant consisting of one transfer machine and a space for a second and all the dubbings which went with it. This was a release print plant only, it wasn't concerned with negative developing, or negative rush printing or any of those stages. They were already being dealt with at the various regional laboratorties associated with regional studios. But the concept was that the regional studios would undertake their productions on colour positive, take them all the way through up to the answer print stage and then send the finally cut negative and soundtrack into the Peking plant for release printing. That got underway eventually. It was a big project.

AC: Quite expensive.

BH: As I remember it, it was something like £3 and a half

million as a contract. Technicolor Hollywood, Technicolor Inc did very will out of it because they got a lump royalties payment, I don't know what it was, half a million dollars or something like that for the, because they owned the rights of the process, after all it was their process, and we got in London a fair amount of business, I thing we got a further three years of life in the dye transfer process, and really that was my concern as much as anything else. Really I could see the writing was on the wall as far as Technicolor Hollywood was concerned. They were going to shut down the dye transfer process and they did in fact shut it down in about 1975. I feel that the Chinese project gave us an extra life, and extra period of 3 or 4 years for a number of people and it was worth doing. In any case it was eventually built and installed and got going and at the end of 1978 it was commissioned as a going concern and everybody came out. Ron Cork had been out there on almost a permanent basis for two years or so, I'd merely gone out for odd periods. And other people like Tony Bennett and all the others had gone out for various periods and it could be anything between 3 and 6 months for them. And we left it as a going concern. With a sigh of relief as a matter of fact.

AC: Did Kodak supply the matrix stock.

BH: Kodak supplied the original matrix stock, but the Chinese did a deal with 3Ms, and bought their know how from Italy and made their own eventually. Just as they bought the mordeting formulation, which we did not actually know, mordeting the blank was something which the stock manufacturers kept very much to themselves, we merely had the say compounds of this sort are the sort of thing which will have the right effect but what they actually put in the emulsions was never told to us so the Chinese bought the mordeting information, also from 3Ms in Italy and were making their blank very quickly indeed, they were making their blank at the end of 1978. They were a bit longer on the matrix stock. But they were more or less self contained by 1979, of course, they'd always had a very good dye textiles industry so they had no problem at all in making the specialised dyes.

AC: How many machines do they have now, 2.

BH: I'm not quite sure. In the original plan there was only space for two, we installed and left one running and there was a space for a second to run in parallel and the last I heard which was 3 or 4 years ago was that they were working on that as a double rank 16mm one. But I've met people from, not very recently, the Chinese film industry who are aware that it's still going as a going concern. And one of the things which pleased me most, when there was a period, when would it be, 1980 - 1981, when there was a raprochement between the Chinese and the Americans, and the Chinese invited a full team representing all sides of the SMPTA to visit China, and to give lectures and to see what they were doing, it gave me a great deal of pleasure that one of the things the SMPTA Committee reported when they

went back to the States that they'd seen the most advanced processing laboratory in Peking which they'd ever seen which contained a number of aspects which they felt were even an advance of American practice. And I think I will finish on that note.

AL: I would like to go back a bit if I may, I've come from the camera side of the business and I can remember various old mates of mine talking about the Technicolor experts who come on the floor.

BH: Oh the Technicolor colour consultants.

AL: Yes.

BH: Now that's a thing almost everybody, if every I'm talking about Technicolor, if I have an occasion to give a technical lecture or something like that the business of what is a Techicolor consultant or who was Natalie Kalmas, because colour consultant, Natalie Kalmas and sometimes another name appeared on practically every Technicolor film from the 1930s to the 1950s. Now the theory behind all that was really a very good one, you see in the two colour days at the end of the 20s colour was beginning to get a little popular but 2 colour Technicolor, 2 colour any process is a tricky one and some colours come out, some colours won't, some colours will reproduce more or less like life and some can't make an attempt. And the concept you might say that a colour consultant made available by Technicolor would have a wide knowledge of what had been successful on past productions and what had been unsuccessful and could give advice, you know that deep purple won't come out, it will come out brown and don't expect to get a cobalt blue because the process won't do it, and things like that, and could give some guidance to the art directors and set designers. And the same thing applied even more so, with equal strength to the 3 strip process, you musn't use brilliant whites because they burn out, so you have to use what were called Technicolor whites which were white dyed in coffee, you musn't have absolutely dead black suits for the men's evening wear because it goes absolutely solid black lump, you must go to midnight blue or something like that, all sorts of other things like this in the reproduction of colours and tones which it would have been a good thing for advice to be available from the specialised process, and afterall nobody as far as 3 colour processing was concerned had had any experience, there was only one picture Becky Sharp and then there was another and then there was another and there were 5 pictures in 4 years, something like that, so the concept of a colour consultant who provided additional information to the art directors and set designers and costume people was in fact a good one. It was the practice which was so notorious to use a careful term.

AL: I wasn't thinking of Natalie Kalmus at all.

BH: That was the concept of colour consultant. But the Natalie Kalmus saga has a lot of background to it, I don't know if you want me to go on about that.

AL: It's an interesting thing.

BH: It is an interesting thing because it isn't very much on the record although I did a bit in the Projected Picture Trust magazine. Natalie married Herbert Kalmus in his student days. She had been a model, she was a model and she certainly collaborated with him in a lot of his early experiments, although practically nobody knew about it, can I look at my notes, yes she was an art student in his college days and they married in 1902 actually. Although very few people knew about it they were divorced in 1921.

AL: Really.

BH: But they continued their working partnership under the same roof, when I say very few people, even their close acquaintances in the industry didn't realise they

AC: They were still living together then were they.

BH: They were at that time. There was a divorce, following that divorce there was a settlement in 1926 and part of the settlement gave Natalie the rights of colour consultant, or Technicolor colour consultancy, which was to become a mandatory clause in every contract for a major feature film that Technicolor signed, so it goes back to the 2 colour Technicolor days. So you had to, if you were signing up with Technicolor to hire a camera.

AC: You had to pay his alimony.

BH: You had to take on Natalie Kalmus as a colour consultant. With the expansion, once 3 colour got going, Technicolor was on the expansion in Hollywood from the mid 1930s onward and Natalie built up her team of colour consultants, they were mostly personable young men of artistic leanings, although what they actually did I was never clear. In London we had occasional visit from her and she would allocate one of her colour consultants to a particular production until Alf was saying, it was soon after the war that Joan Bridge was appointed on a permanent basis as a permanent colour consultant over here. All this would have been quite reasonable if it had gone back to the outline I originally noted but in fact the relation between even the camera department let alone the laboratory was tenuous in the extreme. George Gunn would see her and he would see perhaps some of her colour consultants on the set floor but she's never be seen at answer print shows or anything like that and as far as contact with the laboratory was concerned, by the time I got there which was 1937, was negligeable.

AC: They did come over together, Natalie and Herbert, they did

come over together on one occasion.

BH: They were frequently over together. Nobody knew, not nobody, but very few people knew they were divorced. They were living together in the same place and maintaining a menage and people like George Gunn and Mike Allen and so on who went over to visit the Kalmus in the States were certainly unaware of that thing. But as I said where it got unstuck was Natalie was so overwhelmingly attracted by the artistic and creative side on the studio and anything which was just a consultancy and advice didn't fit the bill at all. Let me quote from her own book, which she wrote in 1935, which was agreed before my own time, she wrote a book called Color Consciousness, and she was describing the functions, these are her own words, the functions of the colour consultants, "we first receive the script for a new film and we carefully analyse each sequence and scene to ascertain what dominant mood or emotion is to be expressed. When this is decided we plan the appropriate colour or set of colours which will suggest this mood. We prepare a colour chart with samples of fabrics and materials, each scene, sequence, set and character being considered." Now this is just the job of the art director, the scene designer, the costume designer, but particularly the art director, that's just the function they want to carry on. So it was natural enough comments like I see the particular mood of the scene being so and so and so it should be in such and such patterns could be completely different from what the art director has said. So it was easy to see that there were some hellish problems of conflict but the clause in the contract was there and if necessary it was branded about, no colour consultant, no camera, until I quote from somebody I'm not going to put a name to who is reported as saying I will pay your demands, I am not using the accent correctly, but I will not have that woman in my studio. So by 10 years later, the late 1940s, Natalie and her colour consultants were at a pretty low rating in Hollywood, and as Alf said they were regarded as a bit of additional taxation on the budget.

AC: In the early days if there were certain colours which the dye process came out a bit mucky

BH: This in fact was carried on through the camera department, contact men, the people who would see the rushes, the cameraman and the director, and say this hasn't come out, will you reprint it, make it a bit

AC: In the early days advice was probably useful.

AL: I remember a wonderful story from Desmond Dickinson when he was doing Men of Two Worlds, he had a camp fire scene and he got a signal there is nothing on the blue register, he wired back what do you expect there to be, they got another one back, there must be something on the blue register.

BH: At any rate, as far as colour consultancy was concerned they were in low status as I would regard it by the late 1940s or 1950 or there about, and it was about this time that Kalmus actually publicised they were divorced and within a year or two of that colour negative was on the scene and the whole inflated structure had completely collapsed.

AL: It's very interesting to have this because this great myth has built up.

BH: Oh yes, you can't do otherwise, people who are students of film who read meticulously through the credits at the beginning will always see appropriately displayed colour by Technicolor which was an important part of the contract, Technicolour colour consultant Natalie Kalmus and sometimes assistant consultant somebody else.

AL: It's rather like the Douglas Shearer credit.

Looking back over all your years would you have wanted a change at all or were you satisfied with it.

BH: It was an immensely satisfying period for a very long time. You felt that you were in a developing industry, that you were making some positive contribution to it, in what was for many years an encouraging context, and I was very happy indeed, despite long hours and troubles and things like that for the whole of my first period until the 1960s when other influences began to come in. As Frank Littlejohn reminds us, Leslie Oliver who I regard as really the man who set the initial shape to Technicolor Ltd was ignominiously thrown out in 1962, I think I was closely in line to go with him because I'd always been closely associated with him for the previous 25 years, but they decided they needed some technical Technicolor continuation, Frank Littlejohn came up and I was happy to work with him, after all he did all the heavy work on running the organisation and I could concentrate on technical development and technical interests. The later 1970s were unsatisfactory because there were management changes, we didn't know where we were going and it wasn't easy to see how things would develop. There was dissention even on the American side about how things should be shaped and the degree of autonomy which should be allowed elsehwhere and Frank went, Frank was as he said by Fassnack and Fassnack put me back in both technical operations and a degree of customer contact I had a degree of responsibility without power which I didn't find very attractive, so I was very glad when the Chinese project came along, because that was a self contained project which I could organise more or less with people that I wanted, that I could give a shape to, that in fact that encapsulated all that I'd known about the Technicolor process, one of the things that the Chinese required was immense amount of documentation, they required not only the detailed drawings in triplicate of every component screw that was used in the organisation, but part of their training programme where they

sent over 10 or 12 Chinese technicians for various lengths of time, some of them as much as 16 months, required the detailed writing up of the Technicolor process at all it's stages, and that was something which had never been done before and I threw myself into that. There are in fact 15 or 18 volumes of technical data on the process as it was passed over to the Chinese which they meticulously translated page by page each night and brought me back the next morning.

AC: How much difference in size was there between the Chinese and English volumes.

BH: Not all that,

AL: Because one of the things which has come out of all the interviews we've done with the people from Technicolor is the technical excellence of the machine shop. That is something I find commented by every body.

BH: Oh yes. You see the Technicolor process was a photomechanical process with the greatest emphasis on the mechanics. The photographic side of it was very limited. The photographic side of it was very limited, the chemical side of it was very limited, I mean in comparison with the emulsion manufacturers and the colour stock manufacturers, for the chemists and photographic side we had very little, we used what was available. What we did have to bring into being was the mechanics and you started off you know with the peak piece of mechanical engineering, the 3 strip camera, a beautiful bit of work, but that and the the requirements of meeting up to that at all subsequent stages really set the tone.

AC: You couldn't achieve it, the tolerances were virtually nil, plus or minus nil really because of the register of the product

BH: And matrix printers were built with gate mechanisms like precision cameras. The whole concept of the transfer machine, that you should be able to hold two pieces of film, a matrix and blank, strictly in register together, for a period of two minutes, because in the early days it took two minutes for the dye to migrate from one to the other, so a transfer machine had to hold a piece of blank and a matrix with yellow dye together, in register for two minutes, then it had to peel them apart and pass on the blank with the yellow image on it to another matrix which was carrying the cyan image and hold those two in contact for another two minutes and carry them on to a third side where the same piece of blank would pick up the magenta image and at every stage those three images had to go on top of each other and go on top of the grain you'd already printed.

AC: Also you had to take into account that the blank was stretching and shrinking on every occasion inbetween transfer and imbibing one dye there was liquid and dryness and you'd still got

to get that thing back to the right dimension and you know what that thing was like if you over dried, it curled up.

BH: Yu controlled the intermediate wetting and drying very closely so the blank was in the right condition.

AC: The first stages of non-flam, if you weren't careful the bloody thing curled up like tubes. Our negatives they were sensitised and they had to be rehumiditised, we have to be sensitive of the humidity

BH: And you had to handle all your three records of negative exactly the same way, they had to go through the same perforator at exactly the same time one after the tother and as far as their sensitising was concerned you had to be absolutely meticulous that you were handling the three rolls of film, three rolls of different stock together

AC: And they were kept from the beginning right to the end of their life together. I was thinking about when he was talking about the fingerprint of Eastman, you know Leslie would never have there was any problem with Kodak stock, I could never convince him

AL: I remember Freddie Young talking about that

AC: And I was in hell of a lot of trouble and I took a strip off one day and I was so pleased, you know where the sensitiser was in Leslie's office, I couldn't get in that office quick enough, I actually got a piece of shirt material on the emulsion, and I jammed it up to Leslie and said Kodak can never do anything wrong.

AL: I can remember Freddie Young talking about the fingerprints on the Lawrence of Arabia days.

Thank you very much.

END