

FILMING FOR TELEVISION

HOW A 16MM FILM CREW WORKED TOGETHER

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Abstract: A media archaeology project reveals how film crews worked together. By reuniting analogue equipment with the professionals who used to use it, the ADAPT project is able to unpack the professional routines and relationships of both people and technology that are at the core of television production. This detailed study of a film crew setting up 16mm equipment reveals the constraints and affordances that defined analogue television material. To study working practices in a historical setting also reveals that there is an absent area in contemporary production studies: the work of 'content acquisition'.

Keywords: film production, television history, production studies, media archaeology, 16mm film, Éclair, BBC, history of technology

1 How Does Television Get Made?

How to people and equipment work together to create television? The process is complex but happens every day across the world. Arguably, it is becoming more straight forward and less costly; nevertheless it still involves ensembles of machinery, different stages of work, and individuals with different skills working together towards a common goal. In this, television production is similar to other industrial processes. However, what marks it out is the fact that no two days are the same. Just as every television programme is different from every other (even different episodes from the same series have unique features), so every shoot and every edit presents crews with fresh challenges.

In this respect, the television industry has had a long experience of working in the ways that the new, creative, individualized economy is working, perpetually creating prototypes and differentiated experiences rather than long runs of identical products. Television also has a long history of working with complex technologies whose functioning is difficult to understand, demanding of its users, fragile and prone to breakdown. In this respect, too, the long history of television production experience has much to offer for our understanding of our technology-heavy present and future.

Yet, despite the fact that television programmes have been created using different technological means since the 1930s, the actual processes involved are poorly documented and hardly researched. This may seem surprising given the ubiquity and sustained popularity of television as a factual and entertainment medium since that time. The reason is simple enough. The actual work of creating television has been (and largely remains) an elite activity practiced by professionals under pressure. They are employees, or at least are spending other people's money, and so access to their everyday practices has been severely limited.

1.1 Production Studies

Production studies have recently blossomed into a new field of study, building on the isolated examples of earlier times¹. They have documented and analysed many areas of the production process from the writers' room² to the exploitation of labour³ and production company cultures⁴. Much more is now known about the organization of production, as the industry has become much more porous since the end of the dominance of the vertically integrated broadcasting organizations. Yet the materiality of, and the moment of, the recording and manipulation of image and sound still remain to be explored, apart from a few pioneering examples like the work of John Caldwell⁵. Those studies of the process that do exist are largely those of 'how to' manuals which confine themselves to operational details. Technical handbooks describe the operation of individual pieces of equipment; training and teaching manuals describe "how to film in 16mm". Whilst useful as indicators of actual practices, both fall short of providing a full account of what happened during a shoot using these technologies, and they certainly do not convey the experience of filming and being filmed.

The study of actual television production processes offers a means of understanding complex technological production processes more generally. It also provides new insights into the nature of television itself. Production takes place within a larger system of assumption, expectations and directives which constitute television as a regulated system of representation. Impacted in the routine decisions of every crew is the architecture of television itself: how its programmes 'should be', how they should look and sound, and beyond that television's overall ethical position and social role.

The working of this regulated system of representation is also affected by the nature of the work undertaken by production crews using the available technological arrays. The system of regulation does not demand the impossible of them, but rather defines that which is routinely achievable. So there is a relatively tight interaction between the specific work of the crews and the overarching system in which they work. This mutuality between the actors and the system underlies their position as an elite within labour in general.

An understanding of production will therefore also illuminate why a specific television programme or piece of text "is what it is", and is not otherwise. The generic form of 'the interview' (which is the subject of this study) follows

1 Manuel Alvarado and Edward Buscombe, *Hazell: The Making of a Television Series*, BFI Publishing, 1978; Todd Gitlin, *Inside Primetime*, Pantheon Books, 1983; Roger Silverstone, *Framing Science: The Making of a BBC Documentary*, BFI Publishing/University of California Press, 1985.

2 Eva Novrup Redvall, *Writing and Producing Television Drama in Denmark: From The Kingdom to The Killing*, Palgrave Macmillan, 2013.

3 Gillian Ursell, 'Labour flexibility in the UK commercial television sector', *Media, Culture & Society* 20.1, 1998, 129-153; Gillian Ursell, 'Television production: issues of exploitation, commodification and subjectivity in UK television labour markets' *Media, culture & society* 22.6, 2000, 805-825; Vicki Mayer, *Below the line: Producers and production studies in the new television economy*, Duke University Press, 2011.

4 Andrew Spicer and Steve Presence, 'Autonomy and dependency in two successful UK film and television companies: An analysis of RED Production Company and Warp Films', *Film Studies*, 14.1, 2016, 5-31; Vicki Mayer, Miranda J. Banks and John T. Caldwell, eds, *Production studies: Cultural studies of media industries*, Routledge, 2009; Miranda Banks, Bridget Conor and Vicki Mayer, eds, *Production Studies, the Sequel!: Cultural Studies of Global Media Industries*, Routledge, 2015.

5 John Thornton Caldwell, *Production culture: Industrial reflexivity and critical practice in film and television*, Duke University Press, 2008, pp. 150-196.

conventions that were current for a long period, roughly between the beginnings of TV and the end of the twentieth century⁶. It would consist of a static shot of a person answering questions asked from an off-camera position: a 'classic talking head' in the jargon. In the case studied here, the questions will be short and the answers kept brief because the film can run only for ten minutes before it has to be changed for a new roll. So, quite possibly, the interviewee's replies would have been prepared in advance.

This form is determined both by the material requirements of the available technology and by the prevailing institutional aesthetic which preferred a steady shot over a 'hand-held' one. Together these requirements have produced thousands of archival interviews which now seem slightly unspontaneous or stilted. This perception can lead a contemporary viewer without this historical knowledge to doubt the sincerity or even truthfulness of the interviewee, when all concerned at the time (both producers and audiences) were convinced otherwise.

1.2 The Archaeology of Television's Past Working Practices

This study uses innovative media archaeology techniques to explore the nature of television's working practices in the recent past. Media archaeology has been a major theme in previous issues of VIEW (particularly volume 4 issue 7⁷), and the particular methods used in this study are further examined in Hall and Ellis⁸. The ADAPT project⁹, funded by the European Research Council, was able to reunite historic television technologies with the people who used to use them. As well as conducting interviews with individuals, the project has also invited them to work together again as they once used to do. This activity has been recorded by the project team using multiple cameras, applying new television production techniques to capture the old. The results are presented on the project website entitled 'How Television Used to be Made' www.adaptvhistory.org.uk and the complete video material can be found in a repository at https://figshare.com/collections/ADAPT_16mm_Filming/4120337. The particular array of technologies used here is that of 16mm film, the usual means of capturing events that were beyond the range of available professional video technologies until the 1990s. Sexton¹⁰ provides a good account of how 16mm film production came to be used in television in the UK.

On 13 May 2015, the ADAPT project invited five television professionals from the BBC's former Ealing film department to reproduce a standard filming set-up, using the technologies that were available to them between the mid-1960s and 1980s. The day provided an example of a team of skilled professionals recalling in practice how they went about their work. The simulation and its filming were organised by Amanda Murphy.¹¹ The activities were recorded on four video cameras, and have been edited as linear accounts. This analysis concentrates on the 24 minutes taken by the film crew to set up their equipment to film an interview in a set representing a stereotypical home interior. It provides an extraordinary insight into how film crews work.

6 John Ellis, *Documentary: Witness and Self-revelation*, Routledge, 2012, pp. 45-63.

7 Andreas Fickers and Ann-Katrin Weber, eds, *VIEW: Archaeologies of Tele-Visions and -Realities*, <https://www.viewjournal.eu/14/volume/4/issue/7/>, 2015.

8 Nick Hall and John Ellis, eds, *Hands On Media History*, Routledge, 2019.

9 ADAPT project, *How Television Used to be Made*, 2018, <http://www.adaptvhistory.org.uk/>

10 Jamie Sexton, 'Televite hits Britain: documentary, drama and the growth of 16mm filmmaking in British television', *Screen* 44, 4, 2003, 429-444.

11 Amanda Murphy, 'A blind date with the past: transforming television documentary practice into a research method' in Nick Hall and John Ellis, eds, *Hands On Media History*, Routledge, 2019, 43-57.



Video 1. A 9 minute summary of the film crew at work.

During the recording, two fixed video cameras provided general views, and two moved within the action to highlight particular actions. The sound throughout is a mixed track of the separate voices of each crew member.



Figure 1. 4 camera display.

This analysis refers throughout to this 'quad' version of the action, which provides as complete a view as was possible. Throughout, hyperlinks lead to short quotations from it.



Video 2. Four camera quad version of the whole 24 minute event, with mixed sound.

This 'simulation' or 'reconstruction' reveals the complexities of obtaining even the simplest piece of television documentary (an interview consisting of a person sitting in a chair answering questions from off camera) in the period from around 1962 to the late 1980s.

The standard BBC filming crew of the time consisted of six people, so **our participants** were: a cameraman – there were no camerawomen at the BBC at that time – (David Whitson), a camera assistant (John Adderley), a sound recordist (Bill Chesneau), an electrician (Alan Muhley), a director (Ray Sutcliffe), and a PA or continuity 'girl' (Alex Branson) who was unable to attend at the last minute **and was interviewed later**. Her role, as she explains, would have been to document the filming and deal with logistics. During this shoot, the crew sometimes turn to the ADAPT PA to fulfil the role of the PA absent from their complement. The crew have an efficient and established division of labour, each responsible for specific items of equipment and specific actions. Infringements of this division have to be **acknowledged and dealt with**.

2 Defining the Task

The task that this team will carry out is the filming of an interview with a male ('the Professor') seated in a chair in his 'home', which is actually a studio set dressed appropriately. To expedite this task, appropriate equipment has been provided and is already arranged at the edge of the set. **As they remark**, they would normally have had to spend some time offloading this from their cars or vans.

The equipment consists of a 16mm film camera and tripods; a number of lights with stands, filters etc; a Nagra quarter inch sound recorder with microphones and stands. Camera and sound are recorded separately and will be brought back together in post-production. The colour film being used requires more light than is available in a domestic interior.

The particular equipment being used was current in the BBC and elsewhere in the mid 1960s. The camera is the highly innovative Éclair, a lightweight 16mm film camera that was virtually silent. Here, none of its innovative potential is being used as it is mounted on a tripod to maintain a steady frame to the shot of the interviewee, an aesthetic requirement in television of that period.

The sound recorder is a ¼ inch acetate tape recording Nagra 3NPR which is linked to the camera by a cable which ensures that the two machines run at the same speed providing perfect synchrony between image and sound. Since its introduction in this form in the late 1950s, the Nagra had quickly become the standard workhorse of television and radio sound recording. During the 1960s, this cable connection was being superseded by a 'crystal sync' mechanism, derived from wristwatch mechanisms, which eliminated the need for a physical link between the two machines. It is clear that the director, among others, has not noticed that this particular array of technology is being used when he asks **"Do you remember the days of sync leads?"**.

In addition, an array of lights is being used, many of which are only now, in 2018, being superseded in common use by LED arrays. These were a considerable advance on the lights available in the 1950s, some of which were provided on the ADAPT set but failed to pass the electrical safety test. This therefore represents a technological array of camera and sound which is at a particular point of technological change: a camera that is full of new potential, but is constrained by both the aesthetic demands of the job in hand and the requirements of synchronized sound recording. This therefore illustrates the everyday realities of technological implementation.

The equipment being used requires considerable maintenance and preparation, and has limitations which define how the work can take place. Each item of machinery makes particular demands on the situation, the people and on the other equipment. The work to prepare for the interview breaks down into a number of functions:

1. Survey and arrange the space to enable the filming
2. Decide filming strategy (camera position, film stock, lighting, sound recording)
3. Set up camera in position
4. Discuss lighting plan and install lights accordingly
5. Load camera magazine with film and place it back on the camera body
6. Select and set up microphone
7. Test all equipment to ensure that it is running
8. Ensure that the camera is generating a sync pulse and that it is being recorded by the sound recorder
9. Ensure that the film will be properly identified in picture by using a clapperboard
10. Bring the interviewee into the space once this preparatory work is finished.

This complex process takes the team just 24 minutes, including delays for solving incidental problems. As they carry out the task, they provide explanations or contextual comments about what they are doing. Except at one moment, these comments are secondary to achieving the professional goal that has been set them.

3 24 Minutes in the Life of a Film Crew

The crew enter the space, which they have not seen before. Each knows their place and role, so they immediately define how they will shoot the interview. The director leads with a swift general remarks and hands over to the cameraman. The cameraman briefs the electrician on how he wants the space lit, and then **consults the sound recordist** on his preferred microphone method and placement. After two minutes, everything is decided, and the director becomes virtually superfluous for the next twenty minutes apart from the brief moments where he is consulted by the cameraman about whether he wants **changes in framing of the shot** of the interviewee between the questions and **the position from which he will ask the interview questions**. He busies himself by checking on

possible sources of extraneous sound, and by providing (for the eventual viewers of this simulation) a running set of questions and observations about what is going on.

3.1 After Two Minutes

The crew then set about unpacking their equipment and getting it into working order. Initially, each works separately, and there are occasional moments of silence as they **concentrate on their activities**. The electrician sets up each of his lights in 'his' space and is ready **after three minutes work and immediately begins** to ask the cameraman questions about his requirements. The sound recordist sets up his boom microphone, but after a moment rejects the contemporary microphone provided for the simulation (perhaps because of an incompatibility in screw fixings between microphone and stand) and **substitutes a newer, smaller one** that he has brought himself (an event that is barely captured by our cameras). The camera assistant begins to set up the camera on a tripod, but finds after a couple of minutes that the full height tripod he has brought will not allow a shot level with the head of the interviewee, so he first **"goes to the car" to get another spreader** to allow the legs to splay wider and after a further three minutes experimentation, including placing the **camera on the tripod for the first time, decides on a lower tripod, "baby legs"**. The cameraman waits while this **happens, moving obstacles out of the way** and consulting on details with the director.

Meanwhile **the director calls for the PA from the observing crew ("Daisy")** to assist him in identifying any extraneous noise sources that would cause problems for sound recording. He is trying to reproduce his professional practice as accurately as possible: he might well have spent the time waiting for the crew to set up by **working with the PA on a range of issues** including researcher notes about the interviewee; the rest of the day's schedule; matters affecting the budget like overtime payments, arrangements for future days. All of this is in addition to on-set actions, like this one of making sure that no exterior sounds would disturb the shoot. **As the interview will be short and the cost of film is high**, any interruption would be expensive.

In the absence of an in-role PA, the director adopts another strategy for this simulation. He sits in the place of the interviewee, allowing the lighting of the face to be tested accurately. As he sits there, he picks up on issues that he sees around him and offers jokes or anecdotes which **provide a wider context** for the actions of the crew and gently pushes the crew's preparatory work towards completion, **asking after 19 minutes** whether he should fetch the interviewee. In doing so he is both demonstrating his management of a film crew and playing a conscientious role for the simulation.

3.2 After Six Minutes

After six minutes the activity enters a new phase. The camera is in place and microphone boom has been placed and cable laid back to the Nagra recorder. The electrician begins to place the 'lamps' in close consultation with the cameraman. He moves the 'blonde', the heaviest light, into position behind the camera **in a rather restricted space**. There he encounters a lighting stand which he had carried in as he arrived but had placed elsewhere. The cameraman realises that it was he who moved it, and enters into **a ritual apology**, slapping his hand as might have been done to a naughty boy. The cameraman then sets about refamiliarizing himself with some of the equipment, particularly the fluid head on which the camera is mounted.

At this point, the sound recordist who has been trying to hear sound from the microphone through his headphones (which turned out to be defective) decides to assert his role by **beginning a formal lecture, seeking permission from the cameraman**. Two directors try to make him stop and go back into role: Amanda Murphy, the simulation

director, first waves her hands and then intervenes verbally by telling him that he will be interviewed later; the director Ray Sutcliffe interjects with a question for him about where the boom microphone will be placed. Eventually, after a little more than a minute, he agrees to revert to role. Meanwhile the electrician has been continuing his work, placing a 'redhead' **and turning it on. The cameraman asks him** for more diffusion of the light, using 'papers', and the camera assistant has been changing the tripod, **asking for the cameraman's help** at one stage. After the sound recordist has agreed go back into role, the director initiates a conversation about possible damage to the 'professor's floor' leading the camera assistant to offer **an anecdote about exploding light bulbs** or 'bubbles'. Nine minutes have now elapsed since the crew entered the room.

3.3 After Nine Minutes

The electrician continues to set up the lights and their cables. **He finds a problem:** the 'blonde' has a now outmoded UK 15amp round pin plug on it. It requires a 'jumper' to connect it to the 13amp square pin mains. Everyone joins in to solve this problem. The camera assistant asks for the (studio) house electrician. The crew electrician proposes to change the plug on the lead. The cameraman suggests changing the 'blonde' for another 'redhead' which they have to hand "or to save time, elbow that blonde and use the final redhead". As the electrician begins to do this, they begin a **ritualistic exchange of male jokes** about blondes and redheads. Then a 'jumper' is produced by the simulation team and is handed over by Daisy: **"Daisy go [to the] top of the class"** remarks a relieved electrician. The whole incident takes just one minute to raise and resolve.

Whilst the sound recordist is connecting up his Nagra tape recorder, the camera assistant then declares that he is going to **load the film into the camera magazine**. He consults the cameraman (not the director) about the required length of film, and is told 400 (feet). The director elucidates: "that will give me, what, ten minutes?" a rhetorical question for the benefit of the eventual users of this filmed simulation. The assistant gets the film can from its metal storage box. The electrician turns on the blonde and, once he can see the kind of light it casts, begins to raise it on its tripod. The director, **receiving the light into his face, jokes** "that will improve my suntan", emphasising, again for the eventual viewers of the simulation, the heat that the light is emitting. The electrician remarks, somewhat obscurely, "we can light your soul". The electrician asks the cameraman **where he wants his key light** but has to repeat his question in order to get his attention as he is concentrating on refamiliarizing himself with the camera. The cameraman gets up and moves closer, pointing towards the light he wants and where he wants it.

Meanwhile the camera assistant has sat down on the storage box and found the big black lightproof bag in which he will carry out the procedure of loading the film into the magazine. As he goes to **take the magazine from the camera body**, he asks the cameraman's permission to take it using the formula "just taking the magazine for a second, David, if that's alright", which asserts his intention and assumes consent. The crew are now into the second half of this particular set-up procedure, with an unexpected delay of a couple of minutes to come.

Sitting on the storage box, the camera assistant begins the skilled procedure of loading the film into the magazine. As the film is light-sensitive, this has to be done in a special bag which excludes all light. The assistant therefore has to do this by touch only, a craft skill which required considerable practice. **He begins by taking the sealing tape off the film can**, placing it in the bag, opening the magazine, placing that in the bag, zipping and sealing the bag and putting his hands into the bag's special sleeves. He then tells the simulation filmer who is following his actions, "if you want to go to something else, I'll tell you when I'm coming out of the bag". Presumably he says this as his next actions would simply look like fumbling around, or because it has already been arranged that he will give a separate blindfold demonstration of this activity later on for the simulation cameras.

While this is going on **the process of lighting continues**. The electrician turns on the key light and the cameraman asks for some 'paper' diffusion on it "if you don't mind". The electrician offers the alternative of further closing the

'doors' on the light to reduce its intensity but the director refuses this. The electrician then asks whether he wants to light to be raised. There is a problem with the simulation microphone that he is wearing at this point and he is **briefly called to the side to fix it**.

Meanwhile the sound recordist is reconsidering the placing of the microphone as he is watching the evolution of the lighting plan. He asks the cameraman whether the **boom should be placed on the other side of the interviewee's chair**, and the cameraman consents "I think it might, if that's all right with you". The sound recordist is visibly pleased that this suggestion is accepted. As he positions the microphone, he enters into a light-hearted conversation with the director, who is still sitting in the interviewee's chair, about what he is doing. He progressively moves the microphone closer to the director, to ensure a better sound pickup. The director questions this and the sound recordist says in mock resignation "**I'll push my luck until I'm moaned at**", emphasising (in role this time) the perceived subservience of sound to image in the filming process.

The film loading and setting of lights continues. The cameraman sits listening to the talk between the sound recordist and the director. The assistant, with the simulation camera back on him, remarks that it is "**a little ugly**" to be loading the magazine on set and embarks on a humorous anecdote about how "a little old lady" mistook the activity of an assistant loading a magazine whilst sitting in his car for something more dubious: probably another off-told anecdote.

3.4 After Fifteen Minutes

The lighting is reaching its conclusion. The **electrician consults with the cameraman** who is still seated by the camera, monitoring the results of the electrician's work. Offered the option of the final redhead "bashing in", the cameraman opts instead for a redhead "down where John is" (i.e. the camera assistant) with its doors closed to put "a bit of Mongolian" on the curtains. This is a dense use of a jargon that has since probably vanished from usage.

The sound recordist has temporarily left the scene, probably to find substitute headphones, when he returns, he is initially hardly visible in our footage as he **begins to check the Nagra**. He is beginning to have problems with it, problems that he keeps to himself for another three minutes as he methodically checks where the source might be. He is not receiving a sync pulse from the camera which will ensure that the speed of the film through the camera and the speed of the tape through the Nagra will be exactly the same, ensuring that sound and picture remain perfectly in synchronicity. **He asks the cameraman to run the camera** to test whether a pulse will be received by the Nagra, and the director interjects, misunderstanding the question, that this is better done with the interviewee in place: he assumes that the sound recordist has functioning equipment by this stage and just wants to check the sound level and balance. However, there is a serious problem. The recordist moves over to the camera to **check the sync pulse generator** and then takes off his headphones **with a shrug of his shoulders**.

Everyone else is moving to a conclusion of their preparations. The assistant has removed the loaded magazine from the bag and **begins to show how to thread it through the gate**, where it will be exposed) and onto the take-up side that will contain the exposed film. He also explains about tape and labelling, which enable the onward identification of the exposed film and protect it from tampering whilst it is being used.

3.5 After Eighteen Minutes

After 18 minutes of preparation, and prompted by the simulation director, the electrician checks his final light with the director, and declares "**that's all the lamps**". He is indicating that his preparations are over. As the assistant returns

the loaded magazine back to the camera, they engage in an exchange about **an anonymous unit manager** who insisted that all lights sent on a job should be used, followed by a story about camera tape and the **BBC's influence on the film manufacturer Kodak**. The cameraman, however, has realised that the sound recordist has a problem and begins to help out by checking cables. The director is trying to move things along, and thinking that everything will be ready once the magazine is back on the camera, asks whether he should bring the 'professor' in and "light him for real". The sound recordist declares that "we'll have to sort out my little problem first". The camera assistant appears not to have noticed this and continues the process of putting the loading bag away, an important procedure as it has to remain clean and dust free inside.

A minute later, the Nagra still appears not to be working, despite running the camera again to generate a sync pulse. Then **the camera assistant intervenes**, since it was he who supplied the Nagra for the simulation from his extensive collection of historic equipment. He asks the recordist whether he has got sync, and explains that the Maltese Cross (which indicates sync) will not show unless the controls are "in the record position". The sound recordist says that he has tried this. This cues a general debate attempting to problem solve including the electrician's joking suggestion that the batteries might be missing. The camera assistant does not intervene at the controls of the Nagra, however, but continues with his procedure of replacing the magazine on the camera. The director reminisces about the problems of sound recording **before the introduction of the sync pulse generator**, when camera and tape recorder had to be linked by a physical sound cable. "that's where we are now" says the cameraman who is aware that a faulty sync cable may be causing the sound recordist's problem. Before replacing the magazine, the camera assistant **cleans the camera gate** (where the film passes behind the lens) by blowing air on it, producing some banter with the director who demonstrates how he did this wrongly for some time. The director intervenes by raising the subject of the amount of film in the magazine (and hence how long the can shoot), and emphasising the cost of a roll of film at £100 plus processing. The assistant begins to **replace the magazine on the camera body** which takes a couple of tries before it is running satisfactorily.

The cameraman and the sound recordist together immediately turn to the sound problem. The assistant takes the magazine off the camera so that it can run without exposing any expensive film. The camera assistant turns the switch on the Nagra from start to test which is not quite as he had explained a couple of minutes earlier. There is a sync pulse and the sound recordist remarks "embarrassing help from the camera department", adding "it is his equipment" by way of explanation. The cameraman then checks with everyone that they are ready, before telling the director that he can bring in the 'victim' as the director now refers to the interviewee. He shows in the 'professor' and once again asks for the presence of the simulation PA to stand in for the missing PA who would then start preparing a shotlist which recorded everything that was actually filmed, both to ensure that nothing needed was forgotten, but also, crucially, so that the filmed rushes could be interpreted on their onward journey through the production system.

24 minutes have elapsed since the crew first arrived on the set.

4 The Work Process

This group are reproducing a complex group task that was habitually carried out under pressure of time. Each location is specific and different; the work has to be adapted to demands of that location. It takes just two minutes for the crew, led by director and cameraman, to reach a collective understanding of the nature of this particular job. Then each person sets about their specific responsibilities which relate to one item or class of equipment, after which their role is named. Each piece of equipment requires a sequence of tasks to be carried out. These tasks fit within an overall series which is clearly understood by all. The others sometimes have to wait whilst a particular action is carried to completion.

4.1 Hierarchy and skills

The division of labour between the six people of the crew is at once clear and intricate. The director is in nominal charge of the operation, but he would usually be unable to operate any of the equipment to a professional standard. So there is a hierarchy of skills and a hierarchy of functions which requires a level of mutual respect and negotiation.

It also led to a running joke at the expense of the ADAPT team. During the shoot, the crew members insisted that the director Ray Sutcliffe was the oldest amongst them, adding a whole decade to his age. The researchers discovered this joke only when the online blog about the shoot attracted a comment from Sutcliffe's nephew pointing out our mistake about his age. The joke reveals two aspects about crews of this era. First, that a secret in-joke provided a mutual bonding, and second that the director's age was still a matter of some sensitivity. These men worked together when the BBC's second channel, BBC2 was opened, requiring the recruitment of a new cadre of directors, including Sutcliffe. So as a young man with a university degree, he was put in charge of a crew who were both older and more experienced than he. In his case, it was not a career impediment, but for some others, it was.

The division of skills means that the two camera people have different skills to the sound recordist and the electrician. The cameraman would once have been a camera assistant, as this was the only recognised training route¹² so their skillset would be similar. The electrician works to the direction of the cameraman but there is a **distinct division of responsibilities**. This is rooted in questions of safety as much as anything else: the electrician is responsible for equipment that could severely injure by electrocution or burning. The sound recordist has another skillset, but a slightly subservient status in the crew, as recordist Bill Chesneau makes clear. Sound acquisition was generally regarded as presenting fewer problems than picture acquisition. However, Chesneau also demonstrates that the good sound recordist was also a keen observer of the dynamics of the film crew, having to understand the interplay between camera and lighting so as to secure the best microphone position. In general, though, crew members had a specific set of skills of their own which they developed in order to advance their careers. They had a general understanding of the work of the other members, to the level where they could **perform basic tasks in an emergency**. There were very few who would "go out of their way" to find out more about their fellow crew members' equipment. However, those were often the people who were able to make innovations in practice.

All the crew members work efficiently with a full understanding of the division of responsibilities. It is the assistant's task to set up the camera on its tripod and to load the magazine, not the cameraman's. It is the electrician's to set up the lights and not the cameraman's or the assistant's. There are aspects of those tasks which require specialised skills. The lights are heavy and generate a lot of heat, requiring careful handling. The cameraman almost certainly could load a magazine (having once been an assistant as part of his training) but would not be able to do so as swiftly as an assistant who was doing it regularly.

The director may seem to have no particular role at this stage, but is in fact assuring the smooth and speedy running of the crew and manages them to avoid conflict. He will have to ensure that the interview itself is carried out within the brief allotted time of a 10 minute roll of film. Usually, during a shoot of as simple as this, he would have used the time to work with the PA on arrangements for the rest of the shooting schedule. The situation with a crew of this type is one of trust, as he emphasises. He knows that everyone will perform their specific task without having to check up on them. His function is to ensure that the tasks all contribute to realising the overall conception of the programme.

¹² Ian Macdonald, 'Mindset and Skillset; the persistence of division in media education', *Journal of Media Practice*, 7, 2, 2006, 135-142; Ian Macdonald, 'Related Vocational Qualifications in Media Practice Education: an analysis of the rationale and the historical and political contexts', *Journal of Media Practice*, 1, 1 2000, 12-22.

When a problem does emerge within the work process, the reaction of all is to offer proposals on how to solve it. The discovery that a 15 to 13 amp jumper for the blonde is missing causes the cameraman to propose “for the sake of speed” that the lighting plan is changed to accommodate this. Adaptation is a standard aspect of this work. If a light won't work, then a way around has to be found. Furniture is moved to adapt the space. Decisions are taken quickly: it takes four minutes for the assistant to decide that the tripod he is using is inappropriate because the Miller head on which the camera is to be mounted provides a substantial amount of elevation in its own right.

4.2 Communication skills

The crew work within a clear division of labour where hierarchy and deference are tempered by the need for every function to operate together. The need for speed also generates a considerable amount of jargon which returns to them naturally as they work together in the simulation. Each item of equipment has a familiar name or abbreviation: paper, mag, redhead, mic etc. They address each other with an exaggerated politeness which reduce the necessary element of giving orders and sometimes needing to dispute them (“please”, “if you don't mind”) and use jokes and anecdotes to reduce the tension further. The cameraman marks his transgression of the division of labour by slapping his hand. This approach evolved within a close work culture within the BBC in which people did not work together continuously. They were rostered to jobs and the only sustained close working relationships were those on remote location shoots. So a standard form of behaviour evolved which has largely passed on to the freelance sector nowadays. It has changed over time: the all-male banter, the reference to a ‘Mongolian’ are not things that would be found today.

The particular style of address is still an important part of crew culture and one that is just as difficult to acquire as technical skills with a piece of equipment. Bechky¹³ observes similar practices in the “temporary total institutions” that are contemporary US film industry crews: “role expectations are communicated through practices of enthusiastic thanking, polite admonishing, and role-oriented joking”¹⁴. Bechky further emphasises that “coordination on film sets was sustained by the creation of an enduring generalized role structure and accomplished through negotiated role enactment. Coordination was embedded in the generalized role structure understood by members as they arrived on a temporary project”¹⁵.

The sound recordist's behaviour clearly shows a strategy for achieving the demands of his specific role within the wider context of collective work. Although he perceives his work as in some way subsidiary to that of obtaining pictures, it is still necessary that clear sound is recorded and he has to negotiate his way through to doing so. He does this by adopting a role: at times cheerful, at times rueful, he nevertheless is quietly assertive. He also understands the work of the other roles and chooses his moment to intervene very carefully (e.g. in moving the microphone and in asking for his ‘little problem’ to be taken care of). The sound recordist realises when the lighting plan has largely been executed, and only then proposes moving his microphone to enable it to be closer to the interviewee. At that point, he can easily find a placement that both suits his needs and avoids casting a shadow in the shot. He bides his time, waiting for the right moment to propose a change that is mutually helpful to both the cameraman's and his own work.

13 Beth A Bechky, ‘Gaffers, gofers, and grips: Role-based coordination in temporary organizations’ *Organization Science*, 17, 1, 2006, 3-21.

14 Ibid., 3.

15 Ibid., 17-18.

4.3 Acceptable and Unacceptable Role Playing in The Simulation

The sound recordist's behaviour in setting his mics and getting his equipment to work lies well within the parameters that the rest of the crew expect and even require. Like everyone else in the simulation, he is repeating a role that he played throughout his professional life. However, when he steps out of this role and tries to deliver a lecture, he is subjected to a series of individual and collective 'sanctions' which demonstrate how a genuinely disruptive colleague might have been treated. The sound recordist himself asks permission for his transgression from the cameraman (rather than the director Ray Sutcliffe, or indeed the simulation director Amanda Murphy). Initially, those around him largely ignore his transgression. Initially, they just get on with their jobs, and the camera assistant begins to ask the cameraman about changing the tripod. The volume of their exchange gets louder, and then the director intervenes to stop the sound recordists flow by asking him a direct question "Bill, how are you going to mike this?" He starts to provide his answer, but then diverges again by trying to incorporate the answer into a more general statement "this is the sort of thing I would do...". It takes a further intervention from the simulation director Amanda Murphy to get him back into role, by pointing out that he would be able to reflect on the process in a later interview. He returns to role by saying of the crew, "oh, they know what I'm doing", reinforcing the existence of a collective understanding of the work process.

4.4 Onstage and Backstage Behaviours

Goffman's distinction between onstage and backstage behaviours is crucial in understanding how crews like this used to work¹⁶. For this simulation, these technicians were invited to demonstrate what was best about their working practices. They are working carefully, quickly and efficiently in a good humoured way to achieve a result. This is an 'onstage' behaviour, implemented when under pressure to perform the job to their best professional standard. It involves a demarcation of work responsibilities and established behaviours.

In interviews, they revealed the 'backstage' aspect of their work, where many of these demarcations and behaviours could be exploited for personal gain or sheer amusement. They discussed the pranks and jokes; the **conflicts over schedules and other arrangements**; the ways in which colleagues judged less able were dealt with; the tricks that could be played on unpopular characters. In particular, they outlined some of the ways in which the **expenses and 'penalty payment' system could be 'played'**, or work could be stretched in order to trigger overtime payments or payments for 'missed meals'. Alex Branson discusses her role as a PA as though it were **a game of cat and mouse**, between her responsibilities to the institution and budget, and the crew's propensity to try to get as much money and enjoyment as possible out of their work. They all worked in an industrial system governed by regulations. (For a subsequent simulation, OB cameraman Ken Osborne brought his copy of the *Conditions of Service: Monthly Staff* from 1972 which runs to over 20 pages, given to him when he was first employed at the BBC). Negotiations between unions and employers had set regulations to prevent the exploitation of workers, and broadcast workers were in a strong position as they could (and did) easily disrupt live broadcasts by going on strike. So the **rights of film crews on location** were finely calibrated and could be exploited to trigger extra expenses or compensation for inconvenience. As time went on, these backstage behaviours gained in notoriety, whilst the onstage behaviour tended to be taken for granted. The level of industrial disputes escalated in the 1970s, ending in the 10 week strike of ITV workers from 10 August to 24 October 1979 during which the channel was off the air.

¹⁶ Erving Goffman, *The Presentation of Self in Everyday Life*, Anchor Books, 1959.

5 What Frames the Work Process?

Goffman's concept of 'framing'¹⁷ is useful to understanding the various factors that bear down on this single instance of recreated working practice. Framing is a neutral term which enables the understanding that the participants had a high level of understanding of how their work fitted into a set of larger processes. They knew what was required and what they could 'get away with', as is demonstrated by their descriptions of exploiting the prescribed working day. It also allows for the understanding of multiple technological and institutional framings, and how they interact. These framings are internalised by the crew in that they have acquired a working knowledge of how their particular work fits within the larger whole of television production. Theirs is a situational knowledge. They do not necessarily know how the whole institution of television works (areas such as commissioning or its broadcast engineering), but they do know how their work fits within the larger process of film production, and they act on that knowledge. They are also working with two people whose role it is to ensure that their work will fit within these wider framings: the director and the PA.

5.1 Knowing You Are Part of a Process

This crew is shooting on 16mm film and recording sound on ¼ tape, a process commonly adopted for reasons that were both institutional and technological. This production route involves a complex onward production process, and the crew's work is structured by the requirements of this process as much as by considerations of the space in which they are working or the nature of the particular programme they are making.

The exposed negative was sent back to a centralised laboratory facilities where it was developed overnight.



Video 3. The film laboratory process as it is today.

17 Erving Goffman, *Frame analysis: An essay on the organization of experience*, Harvard University Press 1974.

The next day, the rushes (a quickly-made positive print) were viewed either by crew members, if they were back at base, or by the unit manager to check for any problems. If there were, a decision had to be taken to reshoot the material, to work with the faulty footage, or simply to continue the project without it. Usually, practical considerations meant that a reshoot was impossible. When on location, the problem was magnified as it could be days before the footage was transported back to London by train or air freight. Alex Branson and David Whitson explain how important **the unit manager's comments on location rushes** could be, and how hard it was to correct mistakes.

A key part of the PA's role **was to prepare shot-lists** which would simplify the onward process by providing what we would now call metadata about the nature of the film negatives. This was in addition to the various roll numbers that identified the material itself, and included the numbers of the takes, the descriptions of the contents of the shots and sometimes notes on what was said. Together with the information from the clapperboard, this would enable editors to find the required 'good' takes. The clapperboard itself showed basic information: an identifying title for the production, director and/or cameraman name and the roll and take numbers. It was the camera assistant's role to write in this information on the clapperboard. Crucially, when the clapperboard is filmed by the camera, the sound made by the hinged part hitting the main board provides a convenient frame-accurate point at which to synchronise the sound and the picture during the editing. In difficult or urgent situations, the clapperboard was sometimes replaced by a simple on-camera hand-clap provided by the assistant.

The editing process begins with **this synchronisation of sound and image**. The sound recordings are transferred to magnetic 16mm film so that it will move precisely with the picture during editing and can be accurately measured with it. The crew are careful to provide enough information to allow synchronisation to take place easily, as it is a painstaking and skilled operation to attempt to do it without. Similarly, the crew understand the editing process itself, both the expectations of how the footage will look at the end of the process (an aesthetic consideration) and **how it will be handled during the edit**.

Both the PA and the director are responsible for ensuring that the crew's specific activities fit within the larger whole of the production process. The director has a conception of the overall programme and knows the background research on its subject. The PA controls the immediate processes of enabling the schedule, making arrangements for transportation, food and accommodation; documenting shot material; and communicating, when on location, with base about any problems with the rushes that had been sent to base.

The crew themselves have absorbed a work discipline that makes sure that what they produce will suit the onward production process. They are economical with exposing of the negative, not wasting a foot of it if they can help it. This was vividly illustrated during the afternoon shoot of exterior shots. The crew decided to film the interviewee walking towards camera and then to pan up towards the outside of the impressive Royal Holloway Founders building. At the time, the ADAPT team thought that they made two takes as they insisted that the action was repeated twice. In fact, only the second take was filmed; the other was simply a camera rehearsal to make sure that the shot would work and to calculate the focus shifts that the cameraman would have to make. This is a level of economy that has now been lost from the production process. If that exact same set-up had involved digital rather than celluloid film acquisition, both iterations of the action would have been recorded. But for film, it meant extra cost and extra time in the editing. So a film crew would have internalised an economy of film usage as part of their basic working practices.

5.2 Technological Framings

The technologies being used frame the work process. Their requirements and capacities set limits on what can be done within the physical context provided. But those technologies are also themselves framed by the institution of broadcast television. Television requires that they perform reliably and repeatedly to deliver a result or product that can be carried forward through the production process and eventually shown on screen. The crew carry within them,

collectively and individually, a sense of what this means. They 'instinctively' choose to shoot with a static tripod mounted camera and not with a handheld camera which would follow the interviewer and interviewee as they move around. They also know that it would be possible to film for longer than the ten minutes prescribed by the amount of film that can be contained in a magazine. The Éclair magazine was designed to facilitate a quick change-over, which an able assistant could carry out. This was sometimes done when following particularly crucial events.

Both the technologies and the crew could do more. They don't because of the institutional frame in which they work. It was risky to push the process to its limits; using large amounts of film was costly, and so on. So the institution formulated a safe and reliable set of practices which could then be varied or departed from, but this happened only for special projects with advance permission and a more generous budget and schedule.

However, the entire filming process, normal or exceptional, is governed by one non-negotiable technological given. The institutional calculations about what 'dependable' practice might mean had been elaborated with this in mind. When using film, it is impossible to see what the camera has recorded until the film negative has been processed in a laboratory and 'rush' positive prints have been made. Through the viewfinder, the cameraman can see how the shot is framed, but everything else remains a mystery or a gamble, requiring all kinds of minor rituals to guard against failure.

As a result, much of the activity around the camera consists of extra rituals of checking: cleaning the gate before remounting the magazine and **checking immediately after filming** whether any hair or dust has got into it during filming. In addition, film requires lighting because it is not fast enough to register an image in available indoor light, or will generate an image with an unnatural colour balance. Lighting is also needed because available light, even if powerful enough, can cast shadows that render the image unattractive or even unreadable. **The lighting has to be specifically arranged for the sensitivity and type of film being used**, and the electrician carefully double checks that 'incandescent' film (i.e. film for incandescent lighting) is being used. The lighting is checked visually and by using a light meter that the cameraman has on a lanyard around his neck.

This technological imperative governs many of the choices made in filming for television during this period. Film was always a bit of a gamble. Sound tapes, at least, could be replayed instantly if a check is needed, and that often happened when a background noise was heard during the shooting. Directional microphones did not necessarily pick up extraneous sound, so a tape replay could confirm whether a particular passage should be recorded again, if that were possible. However, the exposed film cannot be inspected. So why was it used? The answer lies in the way that the institution of television negotiated the affordances of the technologies to ensure a reliable method of obtaining useable results.

5.3 How Television Used Film

Film was used almost exclusively on location until the 1980s, despite its cost and limited running time, because the industry standard analogue video equipment available until then was too unwieldy for many purposes. 'Outside broadcast' video could be used for a major and relatively predictable event like sport, public ceremonies, and specially organised entertainments. For such purposes, 'outside broadcast' was ideal as it could be live (or near-live) and it provided the long durations that film, with its limited length of magazine, could not. But broadcast standard video was not suitable to take into a home for a short interview until relatively portable one-inch video recorders appeared in the early 1980s. However, film continued to have considerable advantages in the onward production process, so it was not immediately supplanted. Skilled camera people could use film to produce 'better' images (with a greater colour and light range). Above all, film could be edited more precisely, flexibly and cheaply than videotape until the advent of digital editing.

Such are the decisions that lie behind the choice of this particular technological array. A Nagra and Éclair (or an Arriflex) were common; the Éclair was regarded by many cameramen, including David Whitson and Brian Tufano, as ‘the best’ **because of its ergonomics and flexibility**. The use of a sync lead remained for some time after the introduction of crystal sync because it was ‘more dependable’. The lighting package of blondes and brunettes was also standard issue for the period. Work with this array is also framed by the anticipation of equipment failure and the routines that stave it off, or are carried out when it happens. We see a version of this when the Nagra does not generate a sync pulse: the sound recordist goes into a routine of checking connections. Many of the anecdotes told during this set-up relate to ‘when things go wrong’, an ever-present fear. The technologies being used are interdependent, but it sometimes seems like a forced partnership.

The interview itself will be swift, shorter than the set-up time, with pre-determined questions designed to get answers that will fit into an overall programme plan. The director is aware that the interview must be over in ten minutes because a 200 foot roll is being used, and that carries a specific onward cost. So part of the (off camera) preparation of the interviewee would have been instruction in how to answer the questions: to keep answers brief and to the point; to incorporate the question in the answer. This gave the interviews of the time a slightly formal or rehearsed feeling.

Film provided flexibility, both in the shooting and in editing of recorded material, that could not be provided until the 1990s at the same level by video technologies. It was also perceived as providing a better ‘look’ and the possibility of more reliable preservation. But all this came at a cost: a financial cost that was considerable. So television’s normal use of film required the working practices that have been demonstrated here: careful sets of calculation, the avoidance of risk, and a pronounced tendency to avoid ‘wasteful’ shooting whenever possible.

5.4 Institutional Framings

The professionals taking part in this simulation spent most or all of their careers working for the BBC, which, unlike ITV, had its own ‘in house’ trade union. Their behaviours reflect the overall culture of that organisation. They also belong to a particular generation, born immediately before or during the second world war. They therefore shared a substantial level of lived experience, having passed through a relatively traumatic phase of history. They seem also to share similar class origins: unlike Ray Sutcliffe, they did not go to university (only 4% of the UK population did at the time), but sought forms of technical education. Crucial in all their backgrounds would have been their experience of compulsory military national service (where some might also have received their basic technical training). This a specific group of workers, an elite with a high level of skills, working for a very visible public organisation. These specifics should be remembered when generalising from this representation and analysis of working practices.

6 Conclusions

This simulation exercise demonstrates the everyday difficulties of ‘content acquisition’ over a thirty year period when broadcast television was the principal mass medium in the Western world. Television required a standardised product for the bulk of its output, a product whose parameters had been developed around what the available technological arrays of skilled personnel could reliably produce. Nevertheless, each shoot brought new situations and challenges; each deployment of the equipment a fresh possibility of mechanical or electronic failure. The crew demonstrate for us the learned industrial work disciplines and routines which had developed to minimise those difficulties and to speed up the process as much as possible. These disciplines and routines did not make the job automatic as each filming space and encounter brought its own challenges. Rather, the routines enabled each technician to play their particular role, as part of a team, in adapting to the individual and even unique circumstances that faced them every day.

6.1 The Decision to Film

In the twenty first century, the decision to film has become an easy one, as easy as pulling out a phone, opening the app and pressing record. In contemporary society, ordinary people can film at will.

This was not the case in the twentieth century. The decision to film was a weighty one. The complexity of everyday media practice during the twentieth century is often underrated in academic work on the media. To film required preparation. To film was to initiate a whole sequence of subsequent activities (labs, rush viewing, synching up and editing) before results could be seen and heard. To film required premeditation and planning. Filming was a constrained activity, involving teamwork, an industrial structure and a considerable investment of money. Filming equipment was relatively scarce, and certainly was beyond the reach of the vast majority of the population. Filming was therefore the activity of an elite.

6.2 The Filming Elite

The filming elite were not, as we have seen here, people (usually men) who exercised any great power. They were an elite in that they had access to scarce resources and had painstakingly acquired a high level of skill. They worked within an industrial structure whose norms and requirements they had internalized. They had some **scope for innovation** within their work. But they had no real control over the means of production as they worked within large organisations that had the considerable capital needed to invest in equipment and production.

They belonged to the particular institutional cultures of these organisations. This simulation and the surrounding interviews has captured both the onstage and the offstage moments of the working culture of the BBC.

6.3 Working Together

The basic technologies of television production have changed substantially since the era which is simulated here. Nowadays, film is a specialist and rare medium for shooting, rather than the first choice as it was in this period. However, it could be argued that many of the working practices depicted here continue into the present practices of audiovisual creation

This simulation shows people working with machines which are often temperamental or unpredictable. It shows the intimate practices of organised labour process designed to be as efficient as possible given the technology and the need to adapt to specific spaces. It shows how to negotiate working relations and how to collaborate to an agreed common end. Many of these parameters still apply to the process of collective production of audiovisual works, and the work patterns seen here, together with the practices of 'crew etiquette', are still seen today.

6.4 Historical Perspective

This analysis examines the practice of 16mm filming for a TV documentary using the equipment typical of the period from the early 1960s to the late 1980s. This is a particular practice that is slipping away into history, and would otherwise have remained unrecorded. The practice of filming with 16mm within the institutional context of broadcasting

lies behind the huge amounts of archival footage which has become our audiovisual data of the post-war era. This simulation elucidates how that footage came into existence, why it is as it is and not otherwise. To watch the procedures explained here is to see the answer to the question “why didn’t they film more, or differently, or as we do now?”

6.5 The Research Method

The method used here is an adaptation of Geertz’s ‘thick description’ method: “doing ethnography is like trying to read (in the sense of ‘construct a reading of’) a manuscript – foreign, faded, full of ellipses, incoherencies, suspicious emendations, and tendentious commentaries, but written not in conventionalized graphs of sound but in transient examples of shaped behaviour”¹⁸. Ethnographic description, Geertz says, ‘is interpretative; what it is interpretive of is the flow of social discourse; and the interpreting involved consists of trying to rescue the ‘said’ of such discourse from its perishing occasions and fix it in perusable terms”¹⁹.

The affordances of multi-camera video recording transforms the possibilities of fixing those “perishing occasions”. The creation of a near-exhaustive audio-visual recording of the event enables a re-analysis that has substantially altered the impression gained by the researcher as the events unfolded. The recording itself owes much to the methods developed within the television industry for the genres of multi-camera reality television, from *Big Brother* (2000) onwards. In this instance, we used two static cameras to capture a general view and two cameras operated by trained students to capture the details of the activity.

There are obvious links to the practices of oral history in the way that we have conceived the simulation to capture the collaboration of skilled individuals engaged in simulating or demonstrating the typical behaviour of their working past. The use of real historical equipment, still more or less functional, is derived from the hands-on history approach pioneered by researchers in many different fields²⁰; examples include Sharpe²¹, Miller, Arnold, Morrison²². In this particular case, these skilled individuals are recalling their past as they work, sometimes pausing to puzzle over particular aspects of a machine (“**I’m sure this used to be on the other side**”), sometimes slipping into attitudes that, in interview, they no longer express spontaneously.

It is a method that is able to discover far more than interviews alone can do. It allows the researcher to catch a glimpse of the past through a new optic. Applied to contemporary work practice, this method could also reveal much, but would raise many ethical and practical concerns. These are, fortunately, not relevant to its practice in historical research.

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18 Clifford Geertz, *The Interpretation of Cultures*, Basic Books, 1973, 10.

19 Ibid., 20

20 see Andreas Fickers and Annie van den Oever, “Experimental media archaeology: A plea for new directions.” *Techne/Technology*, University of Amsterdam Press, 2013; Nick Hall and John Ellis, 2019, op.cit.

21 Elizabeth Sharpe, ‘The visitor as historian: the Hands On History Room experience’ *The Journal of Museum Education*, 12, 2, 1987, 8-11.

22 Linda Miller, Trudi Arnold and Gil Morrison ‘Hands-on History’, *Teaching World History: A Resource Book*, ed. Heidi Roupp, Routledge, 1996, 175-8.

Biography

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