

# SETTING UP A WORKSHOP

**James Dalgety**



James Dalgety has spent two years as project director setting up the Exploratory. Having pursued such diverse occupations as observing the weather in the Antarctic and farming turkeys, he spent 15 years running his own company – Pentangle. He designed, manufactured and distributed all manner of mechanical puzzles and executive toys. Amongst other sins he was responsible for introducing Rubik's cube to the western world.

Consider what your workmanship is going to be used for. It is hard to overestimate the effect of 100,000 toffee-covered fingers prodding your expensive *bifurcated difleagle variator*. So whatever your exhibition, if it is hands-on it will need a workshop for maintenance. Before you start, ask yourself the following questions:

- Are you going to build your own exhibits?
- Once your exhibition is open are you going to go on building more exhibits, or just maintain those already made?
- Are you going to use your workshop for research?
- Having spent thousands of pounds on a workshop, are you going to exploit the public's habit of gazing at building sites and have it somewhere visible?

A maintenance workshop does not need to be very big and needs relatively few large pieces of equipment. An exhibit-building workshop which has been reduced to maintenance-only appears underused and not good as a public spectacle. A large well-equipped exhibit building and research workshop is fascinating.

The Exploratorium in San Francisco appears to have the ideal arrangement: the workshop is situated at the edge of the main exhibition area and separated from it by a low fence. There are always members of the public leaning over the fence watching what is going on and how the machines are

used. It has many advantages other than as an educational exhibit in itself – it is close to the exhibits and thus convenient for maintenance, the technicians can see the public over the fence and can see what is being done to their exhibits, the mystery is taken out of exhibit production and the requirements of the customers are never forgotten. So, if your exhibition building allows it, I would always follow this example – however, it may not always be possible.

### **The building**

The building needs to be warm and dry. You cannot do good or delicate work if you are cold, and in damp conditions everything will deteriorate very rapidly. If not actually part of your exhibition, it should be very close to it. You will almost certainly be working with an exceptionally wide range of materials so you should be able to separate woodworking, painting and clean areas. This can be done to a certain extent by arranging heating and ventilation airflows in the right directions.

Some of your machines and exhibits will be heavy so a ground floor is preferable. A loading bay would be a bonus. If possible make a floor plan showing the layout, allowing for the machines you hope to get in the future; it helps when working out the distribution of services. As you mark in the position of a small machine remember also the shape and maximum size of workpiece that will be used on it. The working area of a machine cutting an 8ftx4ft sheet lengthwise is at least 8ft and a pair of hips wide by 16ft and two bottoms long. As you will not have a commercial workshop your machines will not all be working at the same time so your working areas can overlap.

### **Storage and junk**

You will need a large storage area especially if you are going to do research. Your stock of basic materials will not be very large and should be in the workshop. But if you are clever you will beg, borrow or scrounge a huge collection of other people's obsolete equipment. They will be delighted to get rid of it to a good home but you will find it takes up an awful lot of room – which is probably why you are being given it. As a resource it is invaluable, and as long as it is within a reasonable distance, it does not have to actually be in your workshop. What is important is that it is stored somewhere with lots of room so that you can walk up and down the gangways and quickly see what you have got. There are three varieties of junk: 'Useful as it is', 'Useful in bits' and

‘Someone thought it would be useful – but goodness knows what for’. In any event, always remember that junk is only useful if you know what you’ve got and where it is when you want it.

## **Workmanship**

As mentioned earlier, it is hard to believe how destructive large numbers of even the nicest people are. If your family were to turn the TV on and off five times a night for a hundred years, the result would be comparable to a year in a hands-on science centre. But, you paid for your TV and will have to pay the repair bill so you are careful; think of the damage a vandal could do to the TV – or do you think there will be no vandals amongst 100,000 people?

This dire warning is only given to impress the need for quality in exhibits. If you make them look like Centurian tanks they will almost certainly be treated that way. We find that visitors are usually relatively careful with a delicate looking thing *if it works*. Non-working exhibits encourage vandalism.

## **Safety and insurance**

Remember, all machines can be dangerous if mishandled. They should all be fitted with the statutory guards, and everyone who is using the machines must be instructed to use the guards, even if they are going to choose to ignore the instruction. If yours is a ‘research’ workshop you may be allowed to bypass some regulations which apply to other types of workshop.

Check with your insurance company – some companies have very restrictive clauses in respect of woodworking machines. No-one under the age of 18 should be allowed to use any machine.

If you intend to have volunteers using your workshop check with your insurance company that they are covered against accidents. Young volunteers with too much enthusiasm and too little experience are the most accident prone – what starts out as constructive fun can easily end up as a tragedy with someone permanently crippled and your organisation sued for sums that will put it out of operation.

## **Equipment and tools**

To produce good-quality work you need good hand tools – I do not mean that it is necessary to buy rosewood handled screwdrivers, but avoid cheap tools as they rarely encourage good work and frequently break and have to be replaced. Consider buying each of your technicians their own basic set

of tools and making them responsible for replacing them, certainly a set of drills each is advisable.

Decide if you are going to work in metric or imperial. We decided on metric but 90% of the 'junk' we were given is imperial so now we swap back and forth.

You will need a very wide variety of hand tools but it is all too easy to rush out and buy the latest 'gizmo' only to find that it gets used only once a year and you could have borrowed one from the man next door anyway.

## **Machines**

Machines, being a lot more expensive than hand tools, are even more fun to rush out and buy, but the temptations must be resisted. You should consider how frequently they are going to be used. Are they really necessary or has the garage next door got a perfectly good one they will either use for you or let you use? Many good machines can be bought secondhand – but beware of excessively worn machines (it is useful to know why they were sold). Some very large machines can be had cheaply but make sure you have room for them and that they can do the fine work you will require. Before setting up your workshop consider the following:

**Drills** You will need a good pillar drill with a wide range of speeds. If you get a cheap Taiwanese one you will find it not only noisy and 'rough' but impossibly fast for some jobs.

**Saws** A bandsaw is very handy and relatively safe to use. Apart from the slow jigsaw, it is the best machine for cutting out large circles. A table saw is particularly useful for cutting up large sheets and a radial arm saw is invaluable for curious and accurate angles. If you can afford it, I would recommend a 24in bandsaw, a De Walt radial arm and a good 12in rise and fall tilting arbour sawbench.

**Sanders** Sawdust one can live with, with care, but sander dust is far too fine – it seems to have a life of its own – it travels far and gets everywhere. You will need a dust extractor and this will always be attached to the sander, so you may need two extractors. Regarding sanders, I far prefer a large 24in disc sander to a belt sander as I feel it allows greater control.

**Lathes and planes** Woodworking lathes and planers are both optional. You will usually be using stock sizes of timber and the small quantities you want reduced to a special size you

can do on one of the saws. A metalworking lathe will be essential and the ubiquitous Myford would seem to be ideal for most work. As with all more complex machines, beware of accepting cheap old models which are either too large or will be difficult to get into and keep in good working order.

**Guillotines and folders** We were given a sheet metal guillotine and a folder. I don't think we would have bought them but they have both proved useful and these machines seem to be relatively inexpensive secondhand. If you are going to get a folding machine ensure that it is the 'fingered' variety that can be used for box corners.

**Grinders and mills** You will need to have a bench grinder, possibly with polishing attachments. You might consider a milling machine, but bear in mind that this needs expert handling and can be dangerous; however, a turret mill would be preferable to our vertical one, but they are much more expensive.

**Painting** If you are going to do spray painting you will have to have an air compressor and will need to consider a spray booth. The complexity may make you decide in favour of a brush. The compressor has great value for cleaning and dusting things (and for spinning gyros up to speeds they were never built to take) so I should buy one.

**Electrical tools** Among the more useful electric hand tools are: rechargeable Hitachi drills/screwdrivers, Elu router, belt sander and orbital sander. I originally thought the rechargeable drills were wildly extravagant until I discovered the joys of 'wireless' drilling.

**Workbenches** Benches should be strong, simple and not so smart that you are frightened to use them. Most benches should have a woodworking or metalworking vice fitted. It is useful to have at least one vice with pipe-gripping jaws. You will want to weld or silver solder, so one bench should be fitted with an asbestolux top and ideally should be situated in its own fireproof bay with provision for gas bottles etc, and possibly an acid cleaning bath which can be used for various cleaning jobs.

**Electronics** If you are going to assemble your own electronics you will need the usual soldering irons, multimeters, oscilloscopes, power supplies etc. It is best to set aside a special

room for electronics.

**Catalogues** A most useful asset for any workshop is a good collection of trade catalogues of tools and materials. You should try to build this up sooner rather than later.

Finally, I have been advised by our technicians that no workshop is complete without a water supply, kettle and teapot.