12

Duplication and Finishing

Presumably you won't be planning to print all the copies of your publication yourself: running off several hundred copies on a dot matrix printer is an infallible cure for sanity. This chapter explores the different factors that should be taken into consideration when deciding how the camera copy of your document will be multiplied into finished copies. When thinking about how your camera copy should be prepared you should, of course, already have looked ahead to the duplication method; this chapter is intended to be read in conjunction with the previous one.

I have already mentioned the distinction I am making between *reproduction* (the method you use to prepare the camera copy) and *duplication* (how this image is multiplied to form the number of copies you want – often called printing by you and me but to print houses it is known as *machining*); there is also the matter of *finishing*, which are all the processes (such as folding and binding) needed after duplication to form the final product. Another distinction I shall make is between a *print shop* (the sort of small printing firm you find on the high street) and a *print house* (a larger firm that uses heavier-grade machinery such as 'real' printing presses).

Let us look first at what duplication is done onto, then the duplication methods available, and finally the various finishing processes. The factors you should consider in choosing between them will be considered as we go along.

Paper

When I started working in the publication business, I found it hard to get excited over paper; it was just something to carry the image. Although that may have been excusable (just) in the world of scientific journals, where the type of paper chosen years before is used almost in perpetuity, in other publishing spheres the choice of paper for individual purposes has an important effect on the effectiveness of the

publication and is every bit as important a design decision as the choice of type faces and sizes. Fair enough, you may not *want* your job duplicated onto anything more than plain white photocopier paper, but at least think about other possibilities rather than taking the 'plain white' option for granted.

Colour. This is the most obvious characteristic of paper: you can tell its colour at a glance – or can you? Even the white paper used in photocopiers varies in its colour. Some varieties are extra white, an effect achieved by the addition of pigments (like those used in Brilliant White paint). Separately you may not be able to tell them apart, but hold one sort next to the other and the difference is obvious. The same is true even of different batches of the same colour of paper from the same manufacturer: variation in *shade* is a feature of paper (as it is of knitting wool and wallpaper). So if the precise shade of colour is important to your publication, insist that the print house uses paper stock from the same batch for the whole print job.

The range of paper colours is immense, so reflect a little before you start looking at samples. Posters, for example, need to grab attention: if the printed message is bold enough to be read from a distance you can use Day-Glo colours (the sort that dazzle because of fluorescence – they actually seem to emit more visible light than falls on them), but don't expect people to be willing to get close enough to read small print. Such paper is quite expensive; more muted colours are cheaper and can satisfactorily be used for posters, booklets and leaflets.

If you have a sheaf of different leaflets you can make each one distinctive by using a different coloured paper. Don't use a dark colour for something that people don't have to read but you want them to: if the print doesn't show up in good contrast they'll be put off trying.

White is, of course, a valid option; so is off-white or cream for a 'classical' look to a book.

Finish. Depending on what duplication process to be used, the *paper finish* may be important; your choice may also be determined by what sort of publication you are producing. The finish of a paper describes (1) how it feels to the touch – rough or smooth – so if the reader won't be touching your publication (a poster, for instance) the finish will be less important, and (2) how absorbent it is, which determines how much the ink will spread after it hits the paper.

Smooth papers are generally less absorbent and make a better job of fine lines and half-tones; the down side of really glossy paper (*art paper*) is that it reflects light back at the reader and is unpleasant to read for long periods. Art papers are also physically weaker after folding because they contain less of the paper fibres that give paper its strength and more china clay (for smoothness). If you want to include high-

quality half-tones, use something like a *coated cartridge*, especially a matt (non-shiny) one. For ordinary work you can use an *uncoated cartridge*, which has a slightly rougher surface but is still pleasant to the touch. Or, if your job will be duplicated by photocopier, you should use photocopier paper: it doesn't feel as good, but is best for this purpose.

An unusual type of paper is *vellum* (which, thankfully, is no longer made from calfskin): this is quite expensive but gives a real touch of class to wedding invitations, orders of service or menus. Another special kind is *cast-coated* paper, which is extra glossy on one side and rather thick: it is often used for booklet covers.

Weight. For a publication that will be handled by the reader, the *weight* of the paper can be important for giving the feel of quality. Weights of paper are given in grams per square metre (gsm or, properly, g m^{-2}), which isn't an easy thing to measure for yourself. Photocopier paper is usually in the range 80–100g m^{-2}, lightweight papers for leaflets can go as low as 60g m^{-2}, paper for an A4 newsletter may run as high as 120g m^{-2} (though this is quite heavy – use it when you want to impress), and the paper for covering a booklet is normally in the range 200–300g m^{-2}. When paper reaches these sort of weights it is often called *board*.

Sometimes a particular job will call for a special kind of paper, such as the very thin (down to 23g m^{-2}) paper used in printing fine bibles: such paper is extremely costly to buy because only specialist paper mills can make it, and it is also very expensive to print on as only top-quality print houses have presses and binding equipment that can cope with it.

Opacity. The *opacity* of a paper determines how much you can see through a sheet showing what is printed on its other side or on the sheet beneath. This is also termed *show-through*, which is easier to remember, although the relationship is inverse (high opacity equals low show-through). For any multi-page publication it is kindest on the reader if the matter on other pages doesn't interfere with the legibility of the page being read. This will be particularly relevant if some pages contain dark pictures or heavy rules: too much show-through is tiring for the reader and will spoil an otherwise well-prepared document. Check for show-through by laying a blank sheet over a page with printing on. As a rule, the heavier a paper the greater will be its opacity. Uncoated cartridge papers generally have good opacities for their weight; art papers have very good opacities, but have other drawbacks for book work. In the long run, your choice of paper will be a trade-off between cost, opacity and weight.

Sizes and Folds. See Chapter 1 for a description of the standard paper sizes, and Chapter 9 for some folding methods. If your publication will be a non-standard size you may have to pay extra for paper that has to be cut to size, and also a charge for cutting it. Multi-page work should be *trimmed* anyway: see the section on finishing.

Duplication Methods

There is a wide range of duplication technology to choose from, and your decision will be influenced by factors such as number of copies, quality, finished size (both page size and number of pages) and finances available. If you need only a few copies of a single A4 sheet the criteria are different from producing a booklet, or even a book, in an edition of several hundred copies. On the one hand the choice of technology is important; on the other the economies of scale, the long print run, may be the deciding factor. This section suggests things to bear in mind when making your choice.

Photocopier. This is perhaps the most obvious and widely used technique. Most of the so-called printing machines used in high-street print shops (you will find print shops in Yellow Pages under 'Printers and Lithographers', along with their larger cousins, the print houses) are nothing more than good-quality photocopiers capable of copying large quantities very quickly. They can produce *backed* copies (that is, copied onto both sides of the paper) and will often also collate and staple as they go along.

If you don't have any way of including pictures such as half-tones in your document you can always paste photographs onto your pages after printing out the camera copy. A way of incorporating colour pictures into your publication without going to the expense of colour duplication is to buy a batch of the sort of small self-adhesive colour prints you see on estate agents' leaflets (they cost less than you might think) and sticking them onto the copies after duplication.

The key points about photocopying are as follows (here and later, • signifies a neutral point, ✔ an advantage and ✘ a drawback):

- • full colour photocopying is immensely expensive, but limited numbers are cheaper than four-colour work at a print house;
- ✔ low cost for short runs (up to about 200 copies) because the original is used without additional work;
- ✔ cost per copy is fairly constant; slight discounts for quantity are usual;
- ✔ if you have pasted photographs onto your original, some photocopiers can apply a screen which will break down a full tone into dots and give better results;
- ✔ can be done while you wait;
- ✘ usually black only (though modern large copiers can handle spot colour, although in a limited range of colours);
- ✘ areas of solid colour may go pale in the middle;

- ✘ quality isn't as good as offset lithography from high-quality originals, and the toner may crack off at folds;
- ✘ often restricted to using A4 paper, though some copiers will take A3 or odd paper sizes (if you want to print double-sided an original that doesn't fill the paper size, watch out for positioning of the image on each page so that they match up front and back);
- ✘ high cost for long print runs.

Stencil Duplicator. A more do-it-yourself approach than photocopying is to return to the good old duplicator with a wax stencil and quite absorbent paper. Some community institutions and schools have (or have access to) electronic stencil cutters that will carve out a stencil by scanning your original printout.

The key points of this technique are:

- ✔ low cost, especially if the organisation will cut your stencil free as a service to the community;
- ✔ you can do the duplication yourself if you have access to a duplicator;
- ✔ with colour inks you can produce colour copies, though accurate positioning of spot colours might be difficult;
- ✔ acceptable for posters, handouts or parish magazines (note that type smaller than 10pt is hard to read);
- ✘ not good enough quality for professional or semi-professional work.

Offset Lithography. This is the quality end of the market, though even here the range of equipment in use means that prices vary from firm to firm: don't ask a book print house, with huge machines that will print 64 pages at a time, to duplicate your club's membership cards. What you are more likely to need is known as a *jobbing printer*, a small print house that has a small machine (up to A3 or A2) and specialises in short or medium runs.

Without wishing to get too technical, I need to mention some of the processes involved in preparing material for *offset litho*, as it is known (the abbreviation 'litho' rhymes with 'lie low', by the way), to explain the time and cost factors. First, the full story.

1. Photography. The usual first step is to photograph the camera copy, usually a page at a time, onto a large piece of film so that the image is the exact size needed for duplication. It is at this stage that any reductions or enlargements are made if the camera copy is a different size from the final size (for instance, if you printed it enlarged to improve the quality). The film is then developed and any blemishes such as dust marks are painted out.

2. Plating. The film is placed in close contact with a sensitised metal sheet (the *plate*) and exposed to (usually) ultraviolet light for a controlled time. The latent image on the plate is developed with chemicals that etch the shiny metal surface slightly. The chemistry of the plate will determine whether the film was a negative or a positive: some print houses prefer one sort, some the other. The image on the plate can be read: it is the right way round, not back to front.

3. Machining. The plate, which is flexible, is wrapped around a cylinder on the *machine* (the actual printing press) and a mixture of ink and water is fed onto it by a series of smaller rollers: the water tends to cling to the bare metal of the plate where there is no image and the ink to the etched surface of the image itself. As the plate rotates the ink is transferred to an intermediate roller (the *blanket*) and thence to the paper. (In case you are wondering why the blanket is necessary, remember that the image on the plate is the right way round, so if it were transferred direct to the paper it would end up back to front.) The word *offset* refers to the double transfer of ink to paper via the blanket: the plate is offset from the paper by one stage.

This is the complete and most expensive route, which can be summarised as follows:

camera copy ⟶ film (negative or positive) ⟶ printing plate (metal) ⟶ machine.

Notice the number of intermediate stages before your original image hits the paper; no matter how good the photographic and other equipment used, there will always be a slight degradation of quality at each step. So, if quality is important you can supply film to the printer as your original (most likely by way of an imagesetting bureau from a PostScript file) and break into the process at a later stage, avoiding one round of photography. It won't make the job significantly cheaper, though, because you still have to pay for the film.

Another thing to remember is that if any last-minute changes are needed to your document it is far cheaper to make them to the camera copy (before filming) by cutting and pasting paper than it is to have someone cut and stick pieces of film together. But again, if quality is vital you may have no option but to have half-tones photographed separately, usually onto special film (the originals should be full tones, without dots: see Chapter 1) because you can get a much greater range of greys and a finer dot pattern this way; the resulting half-tones have to be *stripped in* to the film by hand.

Despite the high cost of transferring the image from your original to the plate, once this setting-up cost has been covered the cost of each copy is quite low because offset litho is designed for large quantities. This means that for small numbers it is an expensive option but there comes a point when it is cheaper than, say, photo-copying.

If high quality isn't a major consideration, but your print run is long enough (more than a couple of hundred copies, say) to warrant offset litho, you can still cut corners and get a good result because many print houses give the option of using a different, less expensive material for the printing plate. This *direct image* process also eliminates the need for a film intermediate, cutting the cost still further. However, the final quality isn't quite as good and the plate material is less durable, limiting the print run to only about 1,000 copies for paper plates and about 10,000 copies for plastic. The abbreviated process possible with direct image plates can be summarised thus:

camera copy ⟶ printing plate (direct image) ⟶ machine.

So, if you propose to use this method for a short run, you need only a paper or bromide (from a bureau) original. If in doubt, check with the print house before you prepare the camera copy.

The key points of offset litho are therefore:

- ✔ long print runs are feasible;
- ✔ very high quality is possible;
- ✔ on large machines several pages can be printed at once;
- ✔ a wide range of different colours are available;
- ✔ with metal plates, *reprints* (repeat orders of the same job) are less expensive because the plates can be stored for re-use;
- ✘ high initial cost for short print runs;
- ✘ can't be done instantly because several processes are involved.

Finishing

There are many ways in which a printed product can be made ready for use, ranging from no further work (posters and handouts) to preparing a fully sewn hardback (*case-bound*) book. The activities after printing are known as *finishing*.

Folding

Some jobs stay flat for use; others are folded (like an A4 sheet folded to make a four-page A5 leaflet); others are folded and then bound; still others are just bound. Machining several pages on each side of a single sheet of paper, if the press is big enough, has two main advantages: the cost of each page is less, and with some binding methods the folded sheet helps to hold the bound copy together. Arranging the individual pages on a film to allow more than one page to be printed per sheet (this is called *imposition*) is complicated and best left to the experts because (1) the order of the pages has to take into account the folding scheme, and (2) the outer

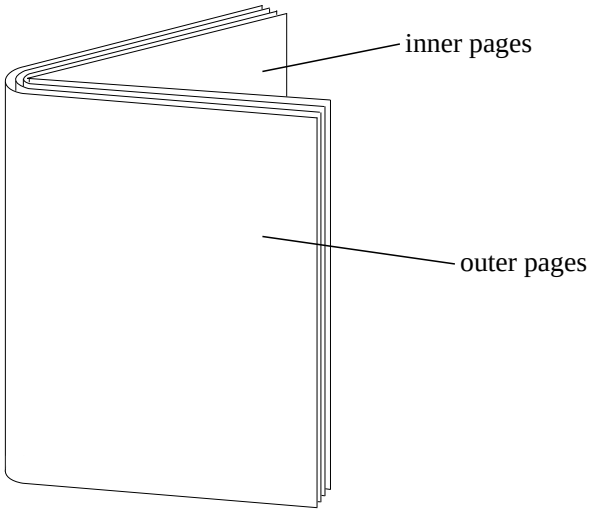

Figure 12.1 *A folded sheet (containing 16 pages), showing the greater spine allowance needed for outer pages than inner ones*

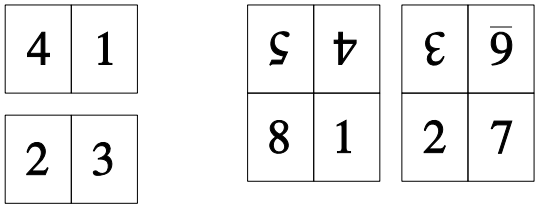

Figure 12.2 *Imposition schemes for four-page (left) and eight-page (right) sections*

pages of a folded sheet need a larger inner margin to allow for the fact that the paper has further to go to wrap round (see Figure 12.1).

Because of the way in which imposition works (Figure 12.2 shows two small schemes), sheets are easiest to print containing pages in multiples of two; on large machines a sheet can take 32 or even 64 pages. This has implications for your document: a 17-page booklet to be machined on 8-page or 16-page sheets will cost considerably less if it is edited down to 16 pages. A 14-page booklet can easily have a blank leaf left at the back if you don't mind this. On the other hand, if pages will be copied or machined two to a sheet (front and back), folding won't be a consideration.

There is nothing to stop you from having, say, four A5 pages per sheet of A4 paper and then *collating* them for folding into an A5 booklet. Remember to plan the

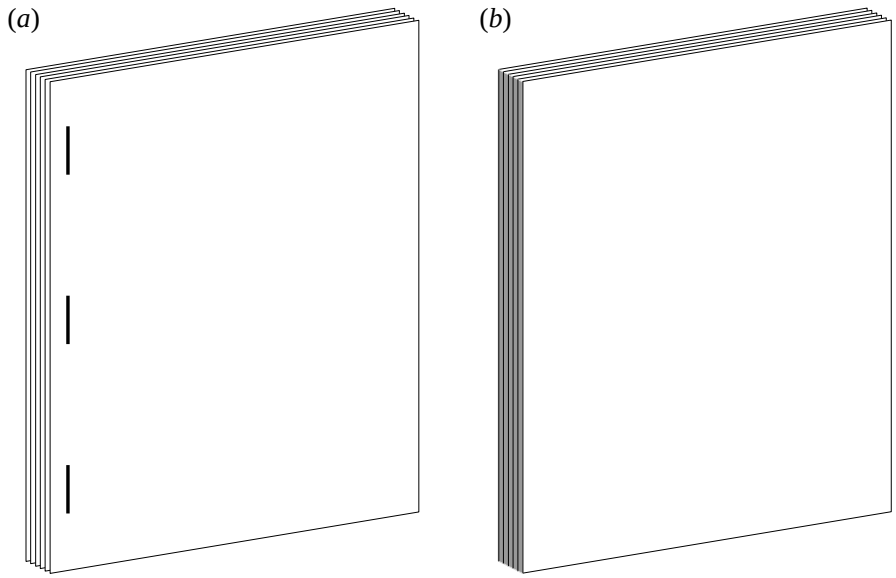

Figure 12.3 *(a) Side-stabbed binding and (b) perfect binding*

arrangement carefully if you want to do it yourself: take some slips of paper, fold them in half, then assemble them loosely as a booklet of the right number of pages (to the next highest multiple of four). Now number the pages from start to finish, and when you separate the slips again you will have created the imposition plan.

Binding

There are a number of ways of binding a document, to meet all pockets and purposes. They can be separated into two types: bindings for single sheets and for folded sheets.

Single sheets. To start with the simplest, *side-stabbed* binding is another name for stapled sheets (see Figure 12.3(*a*)): it is quick, easy and cheap. You can put thicker paper covers front and back before stapling (the spine and staples can be covered with an adhesive binding tape), or a folded cover that wraps around the whole document can be put on after the staples have been inserted. For more than a few pages you will need something heavier-duty than an office stapler. The drawbacks of the technique are that the resulting book can’t be opened flat and the margins at the spine must be very large to allow room for the binding.

Perfect binding, shown in Figure 12.3(*b*), is common, inexpensive and popular: the

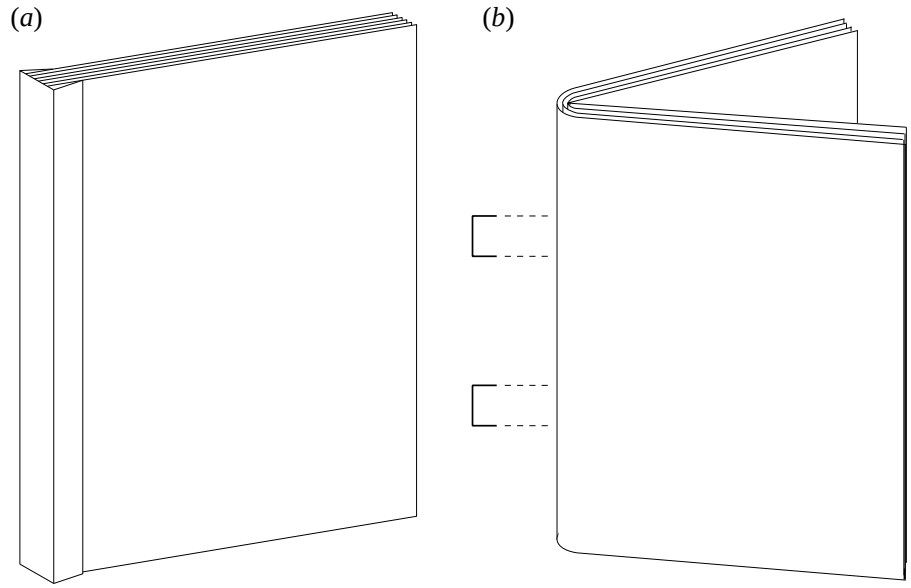

Figure 12.4 *(a) Plastic strip binding for single sheets; (b) saddle-stitching folded sheets*

sheets are clamped together and a special binding glue is applied to the spine. Once dry or set, this glue forms a strong bond to the edge of each page and, with the modern glues now in use, is pretty durable. Again, covers front and back can be used but a wraparound cover is preferable. You can do it yourself if you have suitable equipment or materials; use this method for documents over about 30 pages long.

Plastic strip binders (Figure 12.4(*a*)) are useful for quick assembly of thin documents that may need pages changing from time to time: a plastic strip is slid down the spine and grips the edges of the sheets. This is very cheap and convenient to put together; unfortunately it won't open flat and the strip may pop off sometimes when the document is opened, especially if you use too thick a board cover front and back. As with side-stabbing, the spine margins need to be large.

Ring binders are often referred to as loose-leaf files: they have a hard cover (thick board covered with plastic or paper) and are often used for manuals and other publications that may need frequent updating with new pages. Holes are punched in the spine edge, corresponding to the split rings in the binder that snap shut. The binders themselves are readily obtainable and you can have your own design printed on them by *silk screening* (a technique not dealt with in this book as it is somewhat specialised). If you expect the document to be referred to frequently, slow down wear on the holes by choosing fairly heavy paper for the pages and don't just use a

two-ring binder: you will need three rings for A5 and four for A4 pages. As long as you have suitable equipment for punching the holes in the right places this can be a do-it-yourself binding method. Remember to leave enough of a spine margin on the pages to allow for the holes.

Wire or comb binders are often used for software manuals: a row of holes or slots is punched along the spine edge, into which a wire fastening or plastic comb is threaded. This lets the pages open flat and makes them less likely to tear out than from a ring binder; the disadvantage is that pages can't be added after binding. Another problem is that the wires tend to tangle together if you put several such documents together on a shelf; adding a cover to wrap round the wires is the solution, but not an easy one if you are doing the binding yourself (as you can if you have the equipment).

Folded Sheets. The simplest binding for folded sheets is also by stapling, this time through the fold: it is termed *saddle stitching* (and not, as it happens, back-stabbing). Figure 12.4(*b*) shows the principle; up to 16 pages can be done with a long-armed stapler; more than that requires a special saddle-stitching machine. Even this has its limitations: beyond 64 pages, even with light paper, the spine acquires an unsightly bulge and the document will tend not to stay closed.

You can have several sets of 16-page *sections* (the proper name for folded sheets) bound together in a wraparound cover, but each section wouldn't normally be saddle-stitched: more expensive techniques are the norm for this: *slotted binding* and *fully sewn binding* are used in the production of high-quality books and are very strong. Fully sewn means what it sounds like: each section is sewn together and to its neighbours with thread: being labour- or machinery-intensive it is pretty exclusive. Slotted binding is entirely mechanical and is a little cheaper than sewn (but still quite pricey): the spine of each section is perforated with slots during the machine-folding process. Once the sections have been assembled in order, hot glue is forced into the spine and penetrates the slots: when it has cooled, the glue holds together both the sections and the pages in each section. Covers are put on afterwards to form a paperback or hardback (*case-bound*) book.

Perfect binding of folded sheets is very common. It can be done at high speed, which makes it popular for paperbacks (and some hardbacks) and not too expensive. This book is perfect bound: notice that you can't see the sections in the spine because the folded paper has had to be cut away, giving paper edges for the glue to bind to.

Trimming

Any multi-page document looks better for being trimmed so that the edges are smooth. It doesn't cost a lot and is a good finishing touch. Figure 12.1 shows that in

a bound section the inner pages tend to stick out further at the edge than the outer pages, which looks untidy. More to the point, the edges of a folded section have to be trimmed away to separate the pages. In former years it was common for books to be sold untrimmed, and the outer edges had to be parted by the buyer with a steel ruler or similar object; I think this is still true in other countries. Don't try doing your own trimming unless you have the necessary skills and equipment (a good guillotine with a sharp knife – it sounds every bit as dangerous as it is).

Finally, a point that ties together thoughts on design, DTP, duplication and paper: so that your document can be the right size after trimming it must be printed on a sheet larger than would be necessary if no trimming were to be done. Hence the term *trim size* to describe the finished size, and also the SRA series of papers (SRA0 to SRA3), which are something like 7–8% larger in each dimension than their corresponding A-series sheets to allow for trimming.

The thought on design arises from the fact that trimming as part of the finishing process allows photographs or tint panels to run right up to the edge of the page. This can be a very powerful design feature on a page but can only be used if the page will be trimmed, as there must always be a white region around the edge of the printed area during duplication so that the machine has somewhere to grip the paper. Such elements that extend beyond the trim size are said to *bleed* off the page: allow 3–4mm beyond the crop marks on any bled edge (except at the spine edge in a folded sheet because this won't be trimmed unless you are going to opt for perfect binding).

Implementing bled panels or photographs is as yet very difficult on the Archimedes, but given the power of the computer and the recognition of its potential by software developers, I don't think we shall have long to wait before all the facilities needed for truly professional DTP and document preparation become available – it feels as though they are just around the corner. Maybe the Archimedes will yet receive the recognition it deserves as a DTP machine in its own right.