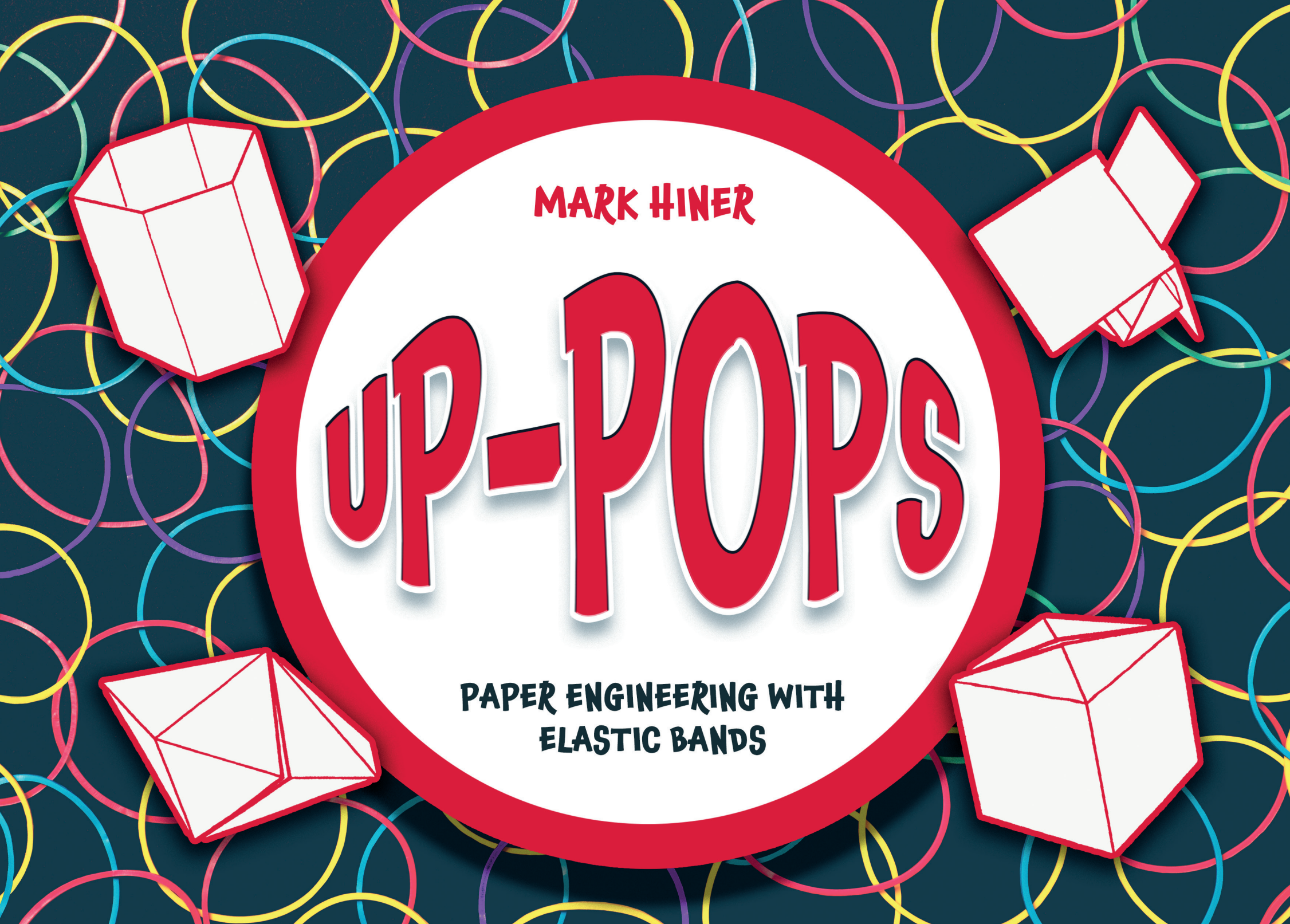
MARK HINER
UP-POPs
PAPER ENGINEERING WITH
ELASTIC BANDS

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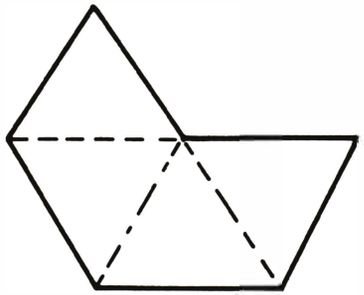
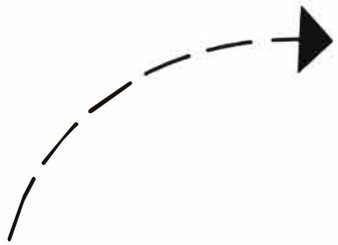
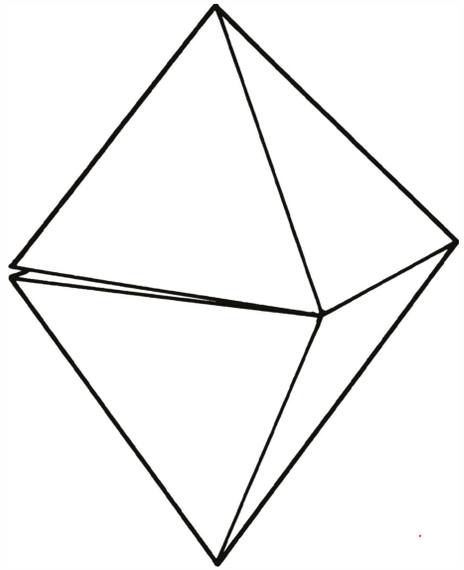
It's flat



It jumps



It's an up-pop!



The purpose of this book is to explore the imaginative possibilities of elastic power within the art of designing pop-ups. It can be regarded as a kind of dictionary or encyclopaedia of interesting mechanisms.

Since the art is essentially a practical and three-dimensional one, the best way to understand it is to make actual working models. In doing so, the important practical features of these mechanisms can be appreciated.

Within the book, there are ten different mechanisms to make and each is then stored flat within a restraining band on its appropriate page. Together with practical hints and useful suggestions for further designs, the completed book then constitutes a basic grammar of the subject.

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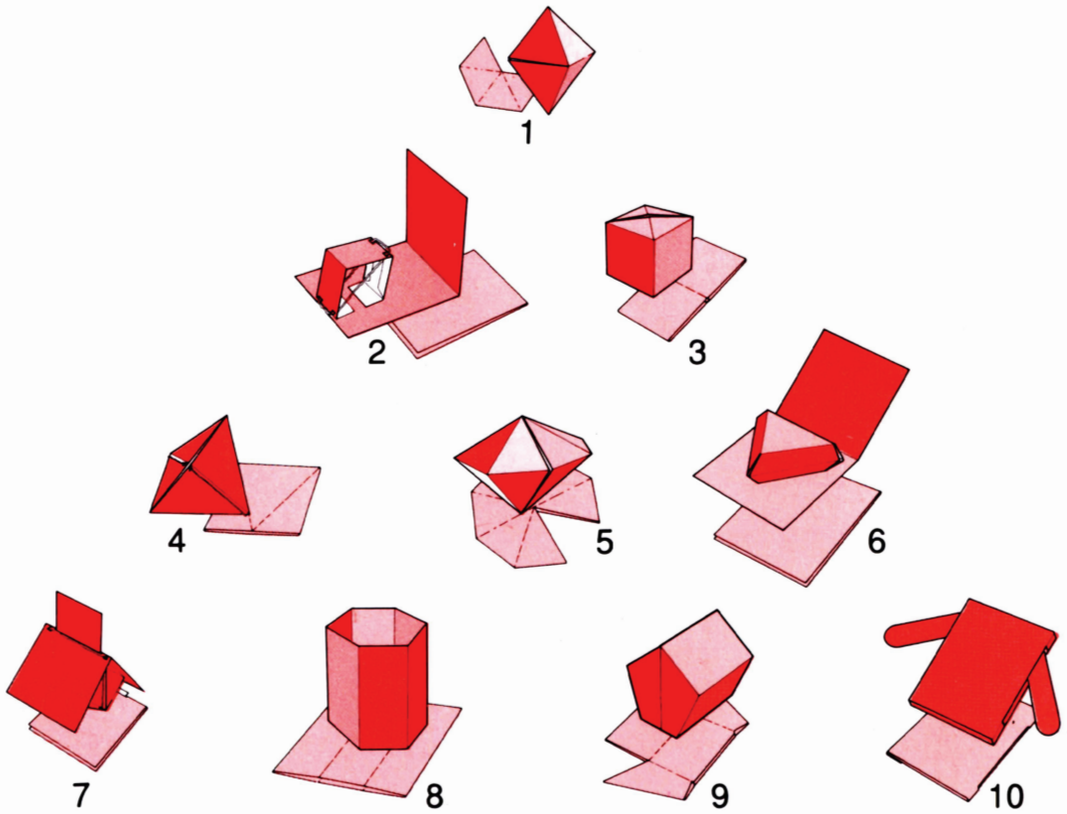
The ten mechanisms

1. Octahedron
2. Flip-step
3. Cube
4. Tetrahedron
5. Double pyramid
6. Bevelled prism
7. Flash card
8. Open container
9. Right prism
10. Signal arms

UP-POPS

paper engineering with elastic bands

Mark Hiner



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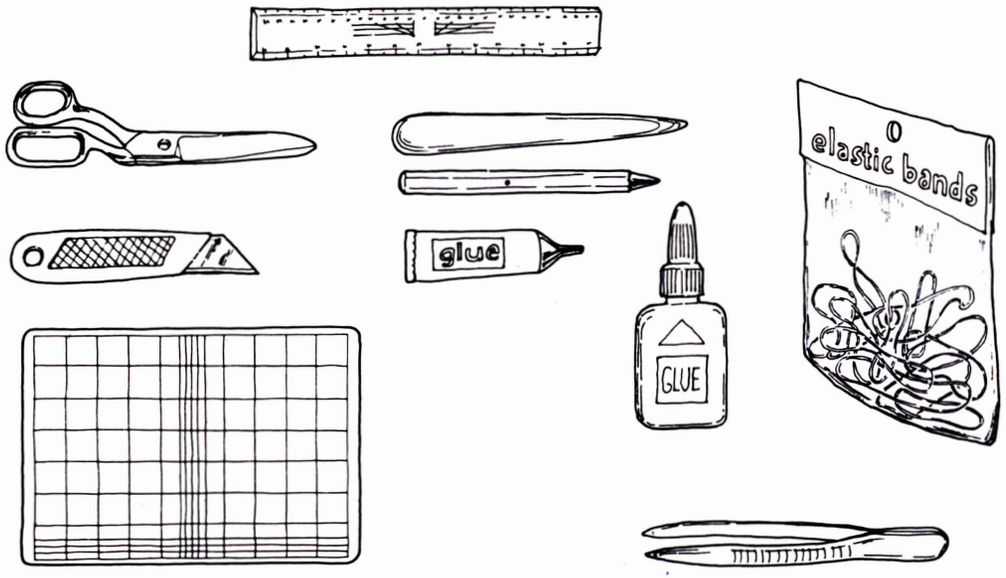
What is an up-pop?

Most people have seen and been intrigued by the magic of pop-up books and there are certainly some wonderful ones being produced nowadays. They are not in fact a modern invention. True pop-up books were first published in England during the 17th century. Even earlier than that, books known as 'flap books' were produced. The main purpose of these was as medical text books, where the advantages of illustrating the anatomy of the body in successive layers could be appreciated by all. During the 19th and early 20th centuries, the production of pop-up books for children gradually came to be dominated by German publishers, with Lothar Megandorfer being acknowledged as perhaps the greatest of all. In the last twenty years there has been another upsurge in interest, this time on a world-wide scale. Advances in accurate colour printing and cutting and creasing has allowed imaginative designs to surpass even what was achieved at the height of the German period.

In my book 'Paper Engineering', I explained many of the ingenious mechanisms which are used in pop-up books and cards. Now, in this title, I explain how to add an element of greater surprise. The use of elastic power to power pop-ups gives them a life of their own. Instead of slowly forming when the page is opened, many of them almost explode into life as they are released from their envelopes or constraints.

It is these elastic powered pop-ups that we call UP-POPS.

M.H.



General Instructions

The design and construction of up-pop mechanisms is essentially a form of paper engineering with the addition of elastic bands. As with any kind of paper model work, there are certain tools and skills which are essential. The illustration below may serve as a reminder of what is required.

Cutting

Scissors are useful for cutting out the shapes roughly but always try to use a good sharp craft knife for the final cut. (Be sure the craft knife blade is very sharp to avoid the paper tearing whilst it is being cut.) Ideally, all the straight lines should be cut by drawing the knife along the edge of a metal ruler. This gives a good, clean, sharp edge to the model, however, curved lines (like around the hook) have to be cut freehand.

If you are using a craft knife make sure you use a cutting mat of some sort to protect the working surface. Expensive professional cutting mats are available from good art shops but a thick piece of card such as the back of a sketch pad should suffice.

Scoring

Successful paper engineering needs creases and folds which are crisp and accurate. This means that the paper must be scored so that it folds precisely along the desired edges. The best method is to rule along the lines with a ball-point pen which is out of ink. Some people will feel happier with a scoring stylus or a blunt craft knife. The aim is to compress the fibres of the paper so that it will fold and flex easily, but not to cut right through.

Glueing

To get the best results you will need a glue which sets quickly but not instantly and which does not make dirty marks. We particularly recommend a petroleum based glue like UHU or Bostic Clear. Good results may also be obtained with white adhesive like Copydex or PVA.

Because of the force which the elastic can exert, it is essential to be patient and to allow the glue to dry properly before testing the mechanism. Leaving it under a heavy book for some hours is the ideal to be aimed at.

Elastic Bands

It is not economical to try to buy elastic bands of precisely the length needed for each mechanism, nor is it necessary. A simple overhand knot will shorten a band and if it seems desirable to cut and rejoin a band then a reef knot will usually hold well enough. It is best to buy a small bag containing a selection of different sizes, choosing natural brown ones in preference to brightly coloured ones because they are usually springier. A few experiments will determine the appropriate thickness of band which is best for the project in hand. Avoid packets which look old, because elastic does age and become tired if kept in stock too long.

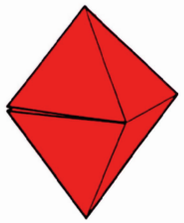
Making the models

Each of the ten working models in this book illustrates a basic up-pop mechanism. Follow these instructions step by step until each model is complete.

When the whole set has been made and has been stored within the book, the collection becomes a useful resource and a reference of possibilities within this branch of paper engineering.

1

Cut out all the pieces for the chosen mechanism from the central pull-out section, keeping well away from the outline.



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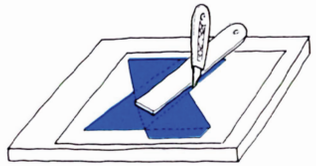
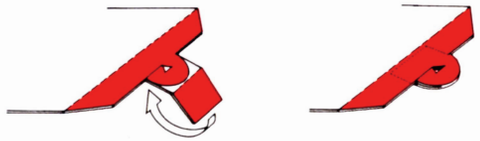


Score along all score lines. Cut out all pieces precisely using scissors or a craft knife. Do not be tempted to cut along straight edges without using a metal ruler as a guide. A cutting mat is a useful asset.

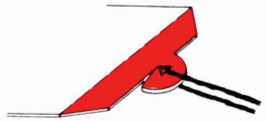
3



Glue the pieces together in the order shown in the illustration, taking particular care over the hooks for the elastic bands.

Only cut out the hook and the slot once the glue is thoroughly dry.

4

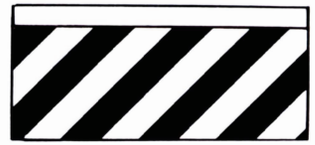


● E ●

The elastic band is best fixed at a certain stage in the assembly.

At this stage the elastic band can be adjusted for length. As a reminder of the deadline for fitting the elastic band, all flaps which have to be glued later are marked with two dots. If you miss that time, you may need tweezers to fit the band.

5



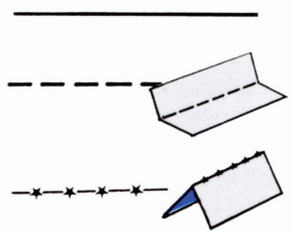
Glue the restraining band for each mechanism on to its appropriate page.

6



When the mechanism is fully assembled and works properly, store it within its band until it is required.

Symbols



cut line

score and fold towards you to make a valley fold

score and fold away from you to make a hill fold

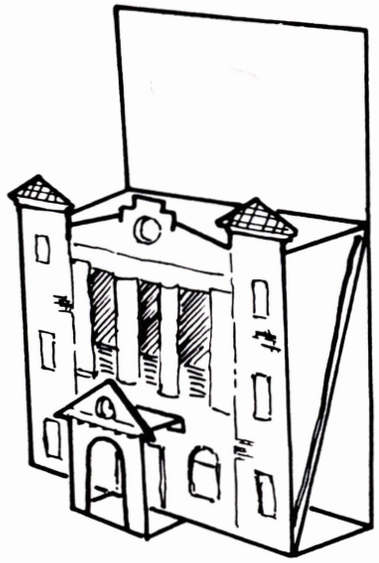
Delay cutting the slot for the elastic band until the hook is complete.

● E ●

Glue these flaps <u>after</u> the elastic band has been fitted.

Designing your own up-pops.

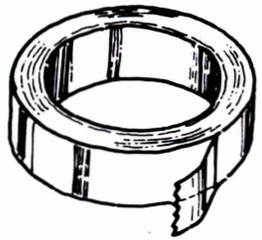
The ten mechanisms in this book set out the basic ground rules for successful up-pop designs. Each can be regarded as a starting point for a whole range of interesting possibilities. Develop them for your own needs to express an idea, send a message or advertise a product in an inventive and individual way. Surprise people by sending out an unusual greetings card or an imaginative party invitation.

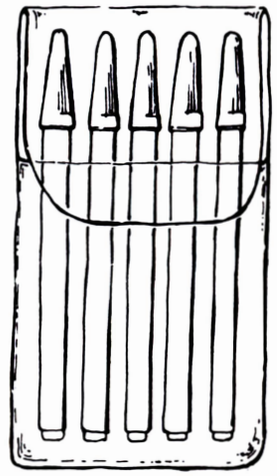


The right stuff.

Try to find a good art shop or graphic artists supplier which stocks a wide range of different cards and boards, as the material you use is rather important. Some cards are naturally much stiffer than others and stiffness is a particularly important property for up-pop mechanisms. The material used for the mechanisms in this book is 240gsm Chromocard and you will have noticed that it has a shiny side and a dull side. For the same grammage or weight two-sided card is rather weaker than this material and so it will be necessary to go to 280gsm or 300gsm. It is seldom wise to go for heavier weights than this because it becomes difficult to get clean folds. Indeed very thick material may even split apart when it is flexed. Usually only a few parts have to resist the pressure of the elastic and it is a sound strategy to double the thickness at a few selected places, rather than make the whole device too thick and clumsy.

The size that you make your up-pop mechanism is actually rather important. Do not try to make them too small. There is a sort of optimum size where the card is thick enough to withstand the stress of the elastic band and yet is thin enough to be still flexible. It is also apparent that larger mechanisms are much less awkward to assemble.

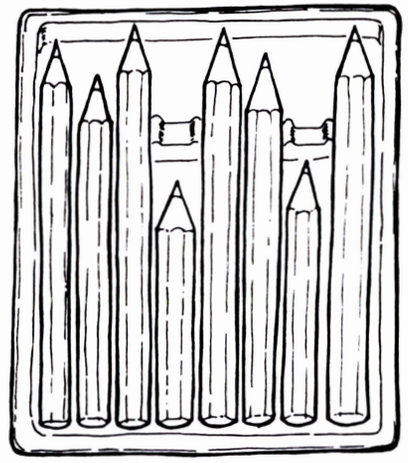




The right idea

It is not easy to consider all the problems associated with a new idea at the same time. It is best, therefore, to start by making a rough dummy and to use this dummy to see if the idea will work. Masking tape or clear tape can be handy to hold it together for a few trials. However, it should not be used for the final version, as it looks very messy and unprofessional.

Any decorations or drawings are much easier to do before the mechanism is glued together, but if you have second thoughts, at least all up-pop mechanisms will press flat and can be worked on then, one side at a time. Water-based paints may weaken the fibres and leave a crinkled surface and wax crayons may prevent the glue sticking, but there is no shortage of alternative materials to experiment with.



The right restraint

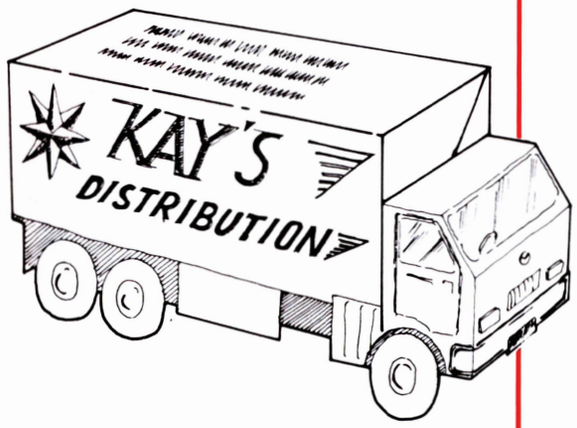
The essential element of an up-pop mechanism is that it jumps suddenly from a two-dimensional form into a three-dimensional form when it is released from its restraint. The design of the restraint is an integral part of the mechanism as a whole. The examples in this book demonstrate the effectiveness of a single band, but you may well prefer to use an envelope for your own design. If the intention is surprise, then perhaps using an ordinary commercial envelope might offer an advantage over making one specially. In which case, it is not a difficult task to determine the size of the finished mechanism by the need for it to fit snugly into a standard envelope.

Commercial applications.

Elasticated up-pop mechanisms are seldom seen in traditional pop-up books for children and it is interesting to consider why this should be. Most pop-up books nowadays are produced in countries like Colombia, Singapore and Hong Kong where labour is cheaper and where there is a tradition of quality printing and nimble handwork. Such books are produced in large quantities for world-wide distribution and editions are often produced in several different languages simply by changing the text plates as the printing continues. By such means can the costs of production and assembly be brought down and wonderful books can be produced for sale at a cost which is acceptable to the final consumer.

The addition of elastic power at certain stages of the production process would not present an insuperable problem, but it would add to the cost. For a sufficiently ingenious and appropriate application this cost might well be thought acceptable, but it has not generally been done. Perhaps the explanation lies in the length of the distribution chain and the fact that elastic does eventually perish. With the need to print and produce several years' supply at a time, there is perhaps the fear that the bands would have perished by the time they reach the final customer. Alternatively, and more positively, it may be that no first-class designer has yet come forward with a book so good that these difficulties will be accepted and overcome. Opportunities often come disguised as hard work and solutions to tricky problems, so perhaps we shall soon see the first examples of these up-pop mechanisms being used in imaginative children's books.

At present, the main applications are in business to business advertising. These elasticated up-pop mechanisms are used for publicity mailers because their dramatic, surprising action draws attention amidst an avalanche of junk mail. The cost of even the most imaginative up-pop mailer is very small indeed, set against the sale of an expensive computer or large capital item. Such mailers are usually produced in the home country in relatively small quantities for immediate use. Because of the particular problems of production, most up-pops are produced by specialist printers who have the necessary expertise in both printing and die-cutting and who also have a large workforce to assemble the up-pops.



Another modern trend which would appear to offer opportunities to up-pop designers is the increasing production and sale of expensive greetings cards. Customers are willing to pay surprising sums of money for a single card to mark some special occasion or event. Since many of these cards are already humorous and gimmicky, it would seem an ideal field for imaginative up-pop ideas.

