The Inner Engineer

The language of a creative maker of 3D objects consists of skills, techniques, and the selection and use of materials and technologies. Language without purpose is pointless, its function being to carry out and communicate intent.

For a maker whose intent lies within a conventional mainstream a conventional language will be sufficient. By contrast the intent of a creative maker driven by a personal vision, a rationale or just intellectual curiosity is unlikely to be adequately served by a standard menu of physical solutions. They would become constrained by the limitations of a previously-defined standard linguistic menu relating to the intents of other, earlier, makers.

It follows that makers whose thinking leads them beyond conventional outcomes extend their language in order to express their intent, to whatever extent is appropriate for them.

Wonderful language with weak intent results in fairly meaningless virtuoso display. Powerful intent expressed through inadequate language will be significantly weakened, assuming that it is communicated at all.

Intent and language must always be in reasonable equilibrium, developing together in response to each other. The work of the most exciting makers is almost invariably led by their thinking, the expansion of their intent then requiring new means of expression, extensions of their personal language, to convey it.

Advances in usable technology in the wider world generally occur through the recognition of the potential of a new combination of existing technologies, often triggered by the arrival of a single new technology which acts as the enabling key, the previously-missing piece of the jigsaw. In much the same way a maker's technical innovation in response to a specific linguistic constraint may then in turn stimulate the extension of their intent. "If I can now do *This* then suddenly *That* and even *That* become possible". Creative leap-frog.

An advance in language may come in the form of a technique invented in response to a specific problem or through the identification and adoption of an enabling technology or material that is in some way appropriate to the development of the intent.

Though intent must be the driver there is an essential dynamic symbiosis between intent and language without which continuing significant creativity and invention are unlikely.

Where this iterative combination of language and intent occurs the power of the resulting work will increase over time, in the process generating a significant personal language, an extension of the conventional language of the maker's medium and discipline.

As a first-year jewellery design student involved in the Hornsey College of Art events of 1968 I was suddenly stimulated to consider the socio-political significance of the making and wearing of jewellery as it had been presented to me. Rapidly rejecting the inherent inferences of precious jewellery and the moribund baggage that comes with it I needed to identify a more socially-useful role for jewellery that could justify continuing in that design specialism, otherwise I would have had to change course. Though frequently unperceived there are widespread and often intense tactile relationships between individuals and their jewellery and other personal objects not intentionally designed for this purpose. I decided that designing and making jewellery for the wearer rather than the observer, encouraging a personal sensual interaction rather than a visual performance for others, justified the activity sufficiently for me to continue.

The selection of materials in which a design will be executed depends largely upon judgements of 'fitness for purpose'. Which material will best convey the intent of this design? For conventional jewellery gold offers wonderful appearance, workability and inferences of wealth. But as soon as my core intent changed from visual to sensual the principal qualities of gold became irrelevant, would even have been counter-productive as a different set of measures came into play. The purpose had changed so the appropriateness of each particular material also changed accordingly.

Silver continued to be part of my work for quite a while because I knew something of how to work with it and in many forms it is physically appealing. But as my craftsmanship and the demands created by the evolution of my perception and intent grew so my use of silver has dwindled to the point that it is now unusual.

My initial ideas took me to flexibility and objects that conformed to and caressed the body, exploiting my existing enthusiasm for natural fibres and rope-work techniques. I had also devised a way of individually hand-making small silver (or gold) beads which enabled simple tactile weight around the neck[i]. But fastenings for these necklaces were a perpetual problem as whatever I used would interrupt and contradict the form of the whole. Commercially available catches were obviously and unattractively just that but making catches by hand was a lengthy process and therefore added hugely to the eventual retail price, discouraging sales and making it harder to earn a living. To keep down this element of cost any hand-made catches tended to be on the crude, obvious side. The same problem meant that bracelets at this stage were almost all bangles, but bangles lie low on the wrist and can be irritating for the wearer, though flexible ones can be worn a little tighter.

As my work progressed I began to understand that rigidity could be as sensuous as flexibility, contrasting with the soft subtlety of the body. At that stage I was not ready to work with entirely rigid materials but became fascinated by the challenge of the combination, of creating a smooth, gradual transition from rigid to flexible so that part of the piece would confront the body, the other part conform to it. Although my first serious attempt was in late 1975 (M127) there was a whole series of low-key explorations of different approaches

(M156, M136, M149) but a sudden transition seemed inescapable, as did the physical vulnerability of the junction between materials.


experiment for M156

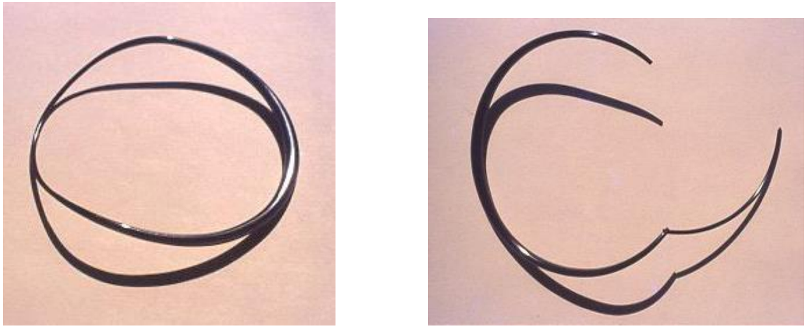
Remaining a frustrating obstacle it took me until 1983 to find my first acceptable solution (M363).


M363

To achieve it required different materials, rigid and sprung cable stainless steel, different technology (micro-plasma welding) and a significant development of my own skills. The development of intention permitted by the extension of language is immediately transparent. Excitedly I showed this piece to other jewellers only to realise that they did not realise how clever I had been because they had never actually perceived rigid-to-flexible as being an issue. I began to fear that I was disappearing inside my own obsessions. The transition in this piece depends upon a series of staged joins hidden within the cable and an understanding of the nature of stainless steel, particularly a recognition of the annealing, softening, effect of the welding heat. More than forty welds are hidden within the apparently-minimal necklace, the sole opening of which is at the front.

In 1976 I began to forge steel, initially in the very traditional coke-fired Lincolnshire forge of the late Fred Phillipson, subsequently operated by the equally hospitable John Joyce of Great Limber. The mutual support between makers of all ages is a continual joy. This quickly led me to entirely rigid work that required joints and clasps. Jewellery presents particular engineering challenges, mechanisms usually needing to be tiny but reliable, sufficiently robust and straightforward to survive use by distracted and unsympathetic wearers. In the past I had seen others deal with the problem by making a conventional mechanical solution a major feature but a disproportionate hinge always seemed a clunky way to pretend that the problem didn’t exist.

I was amazed when in 1977 the first hinge that I cut for a forged mild steel necklace (M168) actually worked.



M168(main forging by Fred Phillipson)

To keep the hinged necklace closed required a spring and catch which on this scale and in such a streamlined context would be very challenging. For me the pleasure of this piece is that the main circular element of the necklace is itself the spring, only a very minor peg-and-hole combination being required for the fastening. At last the mechanical solution did not interfere with the form but unobtrusively supported my intent A pivotal step.

Very quickly a persistent problem emerged, that using a logic unfamiliar to gallery people introducing the work to potential clients was inviting damage. Since several early destructive episodes each logic-dependent piece has been delivered with careful handling instructions accompanied by unambiguous threats; this helps.

Part of the problem was the weakness of mild steel which, combined with its tendency to rust when handled and worn by sweaty bodies, makes it a most unsatisfactory material for structural jewellery. A forging experiment using a stainless steel cloche hoop purloined from my Lincolnshire neighbour's garden first showed me why most people hate working with that metal but then caused me to shift to it entirely. With just a little knowledge and understanding the stainless family of steel alloys is a wonderful, if continually challenging, medium.

Pleased with the integration of form and mechanism I began to experiment further, looking for solutions that did not depend upon a very vulnerable small hinge, in particular using a lathe to make free-running threaded end-fittings. An enjoyable challenge but not a re-think of the problems.

In 1978 I was invited by the state of Victoria in Australia to spend six months working as one of six international craftsmen in residence. The other five would be working in urban centres but they needed one nutter to work in the rural areas. Fran and I spent a month in each of six country towns, living and working in a custom-built caravan complete with a suitably high jeweller's workbench. Having no forge in which to continue working with stainless and, thanks to overwhelming hospitality, very little thinking space in which to invent a new direction that could be shown at the final solo exhibition in Melbourne I returned to making hemp and whipped cotton pieces, back to flexibility, which happened to go down very well with the legion of spinners and weavers I met But it brought me back to the unsolved problem of catches.

Low-cost experiments are a habit; I tend to fiddle rather than draw, something I generally do only to record an idea or solution that I might otherwise forget. Sitting out in the amazing landscapes of rural Victoria I made a simple circle of hemp cord that provided me with two loops, the puzzle being to join them in an elegant manner that did not interfere with the main form. The first result (M217) worked

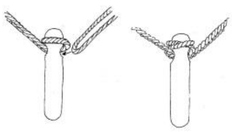
M217

but was unecessarily decorative so I reduced it to a purely functional form.

M218

This was still more complicated than it needed to be so I looked for ways to simplify. The solution was reduced to a short length of rod with one hole through it.

M219



Then I spent a silly amount of time trying to work out how to do it without the hole. (Still working on that one.)

But the elegance of the catches on their loop of cord did not need the decorative coloured whipped work, were minimally, elegantly sufficient on their own, a continuation of the thinking that had been driving the stainless work. The catches had an elegant presence that made them acceptable as pendants in their own right. Because my work moved on I don’t think that I ever actually used those ideas to fasten a whipped necklace.

However, an important lesson came from trying to continue the series of interesting designs after I had effectively minimised the solution. The results became more complex, less easy, secure and direct. Don’t elaborate; solve it and then move on.

Returning (via Japan) to my own workshop in Lincolnshire I realised that the sprung tension between the parts of a rigid piece could work in ways other than just holding a hinge closed. I began to explore physical effects that made use of the dynamic qualities of materials in order to integrate form and function as elegantly and seamlessly as possible.

A rod that perfectly fits inside a tube will slide smoothly in and out as long as they are properly aligned but any sideways pressure will jam them. However what is usually seen as a problem can sometimes be exploited constructively.

Some wearers find bangle bracelets difficult because having had to pass over the bulk of the hand they are then loose on the wrist and, hanging low on the hand, can be irritating. But conventional hinges and fastenings are clunky and costly to make. Pursuing the ideal of the integration of form and opening mechanism this hand-forged stainless steel bracelet (M290) has a short piece of tube at either end set deliberately out of alignment in one plane. When the ends of the bracelet are squeezed towards each other the tubes come into alignment allowing the lathe-turned piece of bamboo chopstick to be passed easily through them both. As soon as the pressure on the outside of the bracelet is released the tubes go out of alignment and jam the bamboo in place. This mechanism will also work using a steel rod but bamboo was chosen initially because as the tubes go out of line they cause the bamboo to bend upwards to create a very delicate curve that adds to the elegance of the bracelet. Form and function in constructive equilibrium.

M290

In pieces like this success depends upon designing the making process every bit as carefully as designing the piece itself. Complex interdependent layers of design in order to achieve an apparently simple, even obvious outcome.

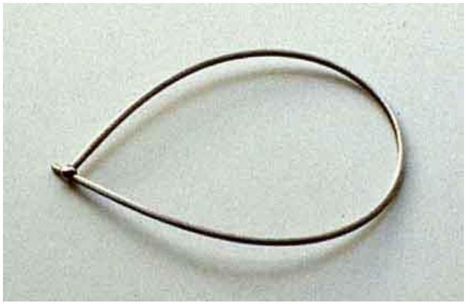
M293

Misalignment under tension can be used in a variety of ways which I enjoyed exploring in forged stainless steel, even though to achieve the necessary quality all the forgings had to be filed-up and polished entirely by hand.

M344

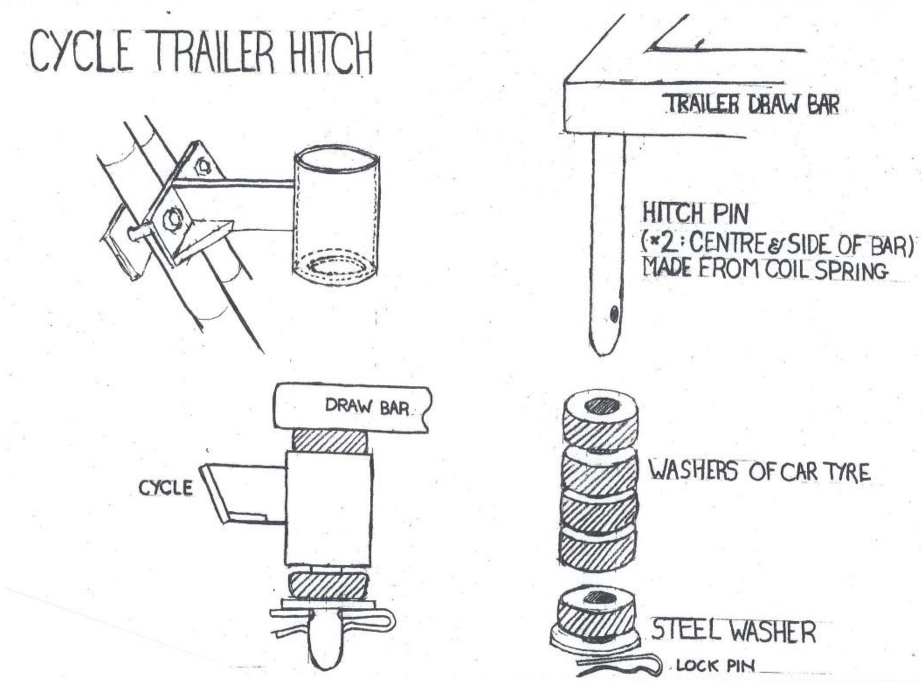
Industrially-made hard-drawn stainless steel cable is very springy but if heated loses the work-hardened spring and bends easily. A pub conversation with a technician from the Boscombe Down research establishment gave me a clue that allowed me to melt a ball out of the end of a piece of hard-drawn cable without softening the area immediately next to the ball, which I then drilled at right-angles to the slight 'natural' curve of the cable. When the tail of the cable is bent round to pass through the hole in the ball it is forced to twist in order to enter the hole. This increases the friction caused by the spring in the cable while also inducing a 3-dimensional curve into the cable so that it lies elegantly on the wrist.



M412

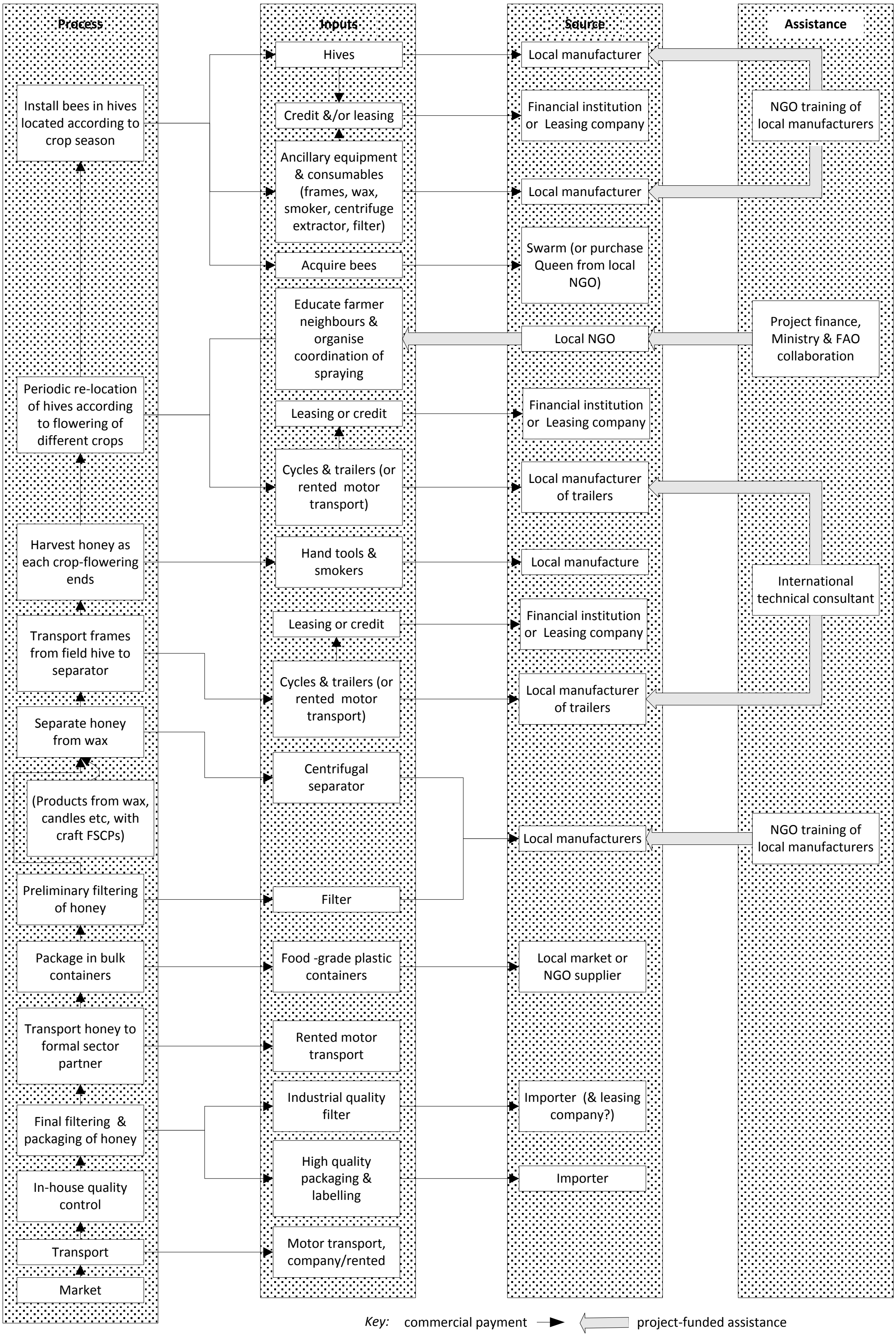
Working from 1986 in Africa for small-scale development, first for the Intermediate Technology Development Group (ITDG, since renamed Practical Action) and subsequently as a freelance for a variety of agencies I quickly discovered that the design skills and concern for elegant integrated solutions that I had learned at the jewellery bench were extremely useful and applied equally to transferring or designing technologies appropriate to a specific context or to designing systems of skills transfer or commercial organisation that would deliver sustainable solutions that meet the needs defined by rural people.

A technology solution at the simplest end of the scale is a hitch to attach a small trailer to a bicycle so that more produce and goods could be transported over greater distances than is possible walking with 25kg balanced on your head. Intermediate Technology Transport had done superb work on cycle-based transport in the Indian sub-continent, including off-setting the trailer hitch point and extending the wheel-base of normal cycles for load-carrying, but in that region access to lathes is common so they had employed a classic ball-hitch. In rural sub-Saharan Africa lathes are few and far between so for southern Tanzania I designed a hitch which avoided any metal-on-metal contact, minimising wear and not clanking noisily as it went over the interminable bumps. It had the added benefit that, left unattended, the bicycle would remain upright while still attached to the trailer. To be successful in these circumstances a technology has to spread autonomously, making it essential that any local welder could copy and make the hitch from easily available scrap materials.



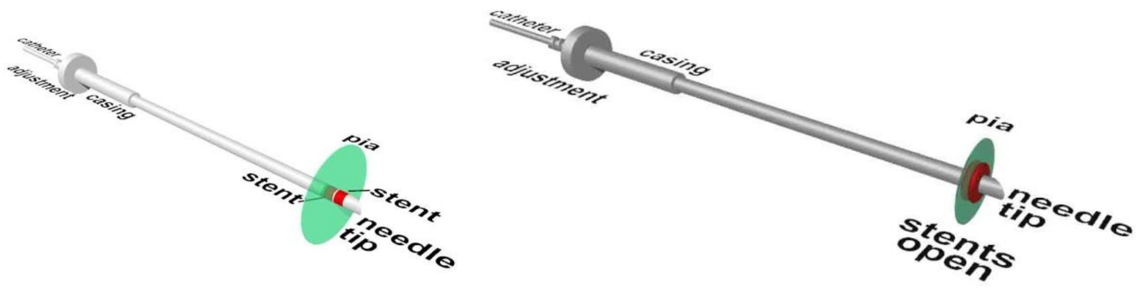
Latterly a great deal of my work in Africa concerned the improvement and creation of 'Value Chains', the linkages through which value is added in stages to a primary resource such as a crop produced in a village to the point where it is sold to an end-user, a consumer. The more stages of the chain that could be made to take place in the village the greater the economic benefit to the primary producer, the farmer, generally very poor and often female. Working out the stages of a chain, existing or proposed, is reasonably straightforward but making sure that all the elements necessary to sustain it are in place, including the training or other inputs that a facilitating project must provide, is more complicated. To be able to describe and present the entire equation in a manner that can easily be understood and commented upon by all stake-holders and potential funders is a considerable challenge. On a four-month job in Singapore I learned a great deal through doing some inventive Clinical Informatics design work for the Centre for Information Enhanced Medicine (CieMed) and Johns Hopkins. In Rwanda I subsequently devised a flow chart that could be used to describe an entire value-chain-related system on a single page, though the font did sometimes get very small. Below is one describing honey production, a single example from among the flow charts using this principle that I compiled for a significant variety of commodities and enterprises.

Schematic example of Honey production & Industrial Linkage with supporting commercial infrastructure



One of the joys of being freelance is that you never know what someone might ask you to do next.

There are significant challenges to the delivery of therapeutic drugs to the brain to combat certain diseases. In 2004 Therataxis, a brain research company in Baltimore, offered the fascinating opportunity of trying to find a novel means of drug delivery that would circumvent the brain's defence systems, in particular the protective *pia mater* membrane and the fluid it contains. My solution was a catheter that could seal its own pathway through the membrane so that the injected drug would not immediately return back along the side of the needle rather than remain within the cortex where it was needed. If it worked precise targeting would become possible so far less drug would need to be used than is presently the case. Having drawn up the design and agreed with Therataxis' CEO Raghu Raghavan that it might be worth pursuing I returned to the UK and fabricated the stainless steel and silicon prototype at my jewellery bench, using the laser welding machine. A phone call to the neurosurgeons at the Royal Veterinary School and I found myself watching it being successfully tested in their pathology lab. (Out of respect for the squeamish I shall not include photographs of the actual tests.)



Twin-stent cortical catheter ©Therataxis 2005

Upon reflection I find it most entertaining if not slightly scary that I use exactly the same approach, design skills and thought processes when I am inventing a cortical catheter as I do when designing or adapting agricultural engineering equipment for use in Africa.

When imaginative people make it possible for an ostensibly non-specialist designer to get past the institutional gate-keepers so that s/he can play new games in new places with new toys the results can surprise everyone, not least the designer. Collaborative inter-disciplinary invention and design is just the best game in town. I give joyful thanks for all those hospitable perceptive professionals who have not been fazed by my unlikely jewellery design origins.

Reflecting on what my 'comparative advantage' might be I once came to the conclusion that it is that, working in alien specialist areas, I just don't know anything. Because I don't know anything I can't make assumptions or be trapped by preconceptions and therefore have to depend entirely upon objective analysis and looking out for any aberrations within the logic patterns being described to me. Technical specialists initially acquire much of their expert knowledge in the form of received information delivered in an essentially linear form so, with notable exceptions, the tendency is to assume that the next solution will lie within the same linear progression. Since in my ignorance I don't know the direction of the progression I remain free to look all over the place for possible clues to solutions, drawing on all the accumulated eclectic knowledge of a technological jackdaw.

Returning to my bench after a couple of decades of sabbatical I was introduced to laser welding and started to play with putting the thin sheet steel from used painted food tins over wooden cores to make light but amazingly stiff components. Able to hide any mechanism that I wanted inside the wooden core offered intriguing freedom. One of the first bracelets I made in this way involved two separate elements, the tail of one passing through the other and incorporating a spring-loaded latch. When the bracelet is assembled the only clue to how it works is a little stainless steel button concealed on the inside of the junction.


M602

Integrating the mechanics and the desired form has become a habit to the extent that sometimes one provides the impetus, sometimes the other. For example, when I discovered a source of small powerful magnets making use of them was irresistible even though I thought I had moved on from the welded tin work.


M852, magnetic fastening

Most recently I have found a different way to approach the shortcomings of bangle bracelets by making a linked pair that, when turned round within each other act as wedges that reduce the size of the opening through which the wrist passes.


M867

The tediously-cut angled grooves on each component bind together when there is pressure from the flesh of the arm within the aperture, preventing the bracelet from opening further. But this unobtrusiveness means that the fastening solution only works when the bangle is worn on the upper arm. On my bench as I write is the crude test-piece double-bangle that I have already worn for a working day to make sure that the aperture stays small even when it is worn as a normal bracelet, comfortably loose on the wrist. Cracked it!

David Poston 15.09.14

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[i] Much later Dr Liz Goring, formerly curator of Middle Eastern Antiquities at the National Museums of Scotland, suggested that the method I had invented for making precious metal beads may possibly be an accidental replication of that used by the ancient Egyptians.