AUTOMATA MAGAZINE

Kim Booth's wonderful clock

I/I—Jan/Feb 2019

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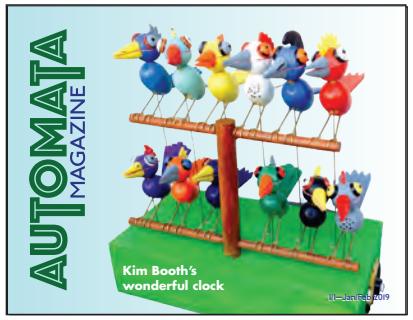

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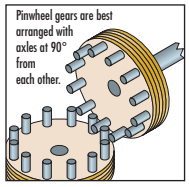

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DEPARTMENTS

Automata Magazine is published six times a year by Sidestreet Bannerworks, Denver Colorado, USA.
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EDITORIAL

Welcome!

by Marc Horovitz

Welcome to *Automata Magazine*! Publishing a magazine on automata, in all their incarnations, is something I've thought about for quite a long time. Until now, though, the moment didn't seem right but the stars finally appear to be in proper alignment for this to come about. Certainly the response to my initial proposal has been overwhelmingly positive, so I thank you all for your enthusiastic support. I am as excited about this magazine as you are!

I want to particularly acknowledge a few people. Thanks to very busy Sara Reast from Timberkits, who nevertheless agreed to write a regular beginners' column for us. And thanks also to Sarah Alexander of Cabaret Mechanical Theatre for mentioning *Automata Magazine* in her regular newsletter. This was a tremendous help in getting us going. Cory Grunkemeyer turned our website into something much more functional, and Cris Thompson and Ryer Appeldoorn have helped to bring me (slightly) up to speed concerning social media. Many thanks to all of them.

I also want to sincerely thank the authors you'll find in this premier edition; they were willing to take a leap into the darkness and send their material to *Automata Magazine*, then an unknown quantity. Without them, the magazine would have been a non-starter. I hope that you enjoy reading their stories as much as I have.

I also hope that the diversity of their subjects and they way they are presented in these digital pages will inspire you to send in your own stories and articles as well. They would certainly be well received.

A magazine is forever hungry for a steady stream of material. In fact, it cannot exist without it. My hope is that this magazine will be both *for* automata enthusiasts and *by* automata enthusiasts, which means that it will need the support of all of its readers in the form of submissions, be they short or long.

It is my objective to cover all areas of this fascinating field, as suggested in the possible list of topics on the "Write!" page of our website: *http://automata-magazine.com/Write.html* Please have a look at it.

There are also guidelines for those of you who might be unsure how to write an article. If you are more comfortable writing in a language other than English, that's fine, too—Google Translate does a pretty good job, and I'll always ask questions if I'm unclear on a point. I'm always available to answer them, too.

Subscriptions

Up until now, subscriptions have been offered free of charge. I'm afraid this cannot go on for much longer, though. There are expenses, both present and future, in running even a digital publication. After the second issue of the magazine comes out and we have shown that the publication is real and viable, we will probably have to start charging for it. I hope to keep the price relatively low. Stay tuned for more information.

The second issue of *Automata Magazine* is already in preparation, and there will be many more after that, all of which will need filling with your imaginative, amusing, and ingenious stories and projects.

Thank you again. Enjoy!

NEWS & EVENTS

Cabaret Mechanical Theatre (CMT) has announced the following touring exhibits:

Curious Contraptions has a selection of CMT exhibits, as well as works from Keith Newstead, Kazu Harada, and the Tinkering Studio Collection. Exploratorium, San Francisco, USA, until 20 January 2019. *https://www.exploratorium.edu/curious-contraptions*

The Mechanical Circus is a collaboration between CMT and Rijksmuseum Boerhaave, Netherlands. The Forum, Norwich, UK, until 27 January 2019. *https://www.theforumnorwich.co.uk/whatson/2018-12-05/mechanical%20christmas/mechanical%20circus*

Banbury Museum, Banbury, UK, May-Sept. 2019

Puke Ariki Museum, New Plymouth, New Zealand, November 2019 to April 2020

Marvellous Machines features automata, hands-on interactives, workshops, and a series of artists events. Ipswich Art Gallery, High Street, Ipswich, UK. 20 July-31 October 2019.

Neugierige Maschinen features automata, with a focus on extended workshop activities and tinkering opportunities. phaeno, Wolfsburg, Germany. November 2019 to February 2020.

The Fantastic Fairground Factory, a new CMT Touring Exhibition. Peek into the Mechanical Marvels behind the Scenes at the Fair. Automata, Games and Hands-on Fun. Debut Venue: Tullie House Museum and Art Gallery, Carlisle, UK. July-October 2019.

Paul Spooner—New Works 2019. Rodic Davidson Architects, London, UK. Dates to be announced.

Send your news items, new-product information, and events to us at:

automatamag@comcast.net

Drop us a note for deadlines or more information.

LETTERS

Thin MDF

You may have discovered that there's now a widely available thin MDF material, used as a hardboard substitute, which was first marketed as SBS (smooth both sides) board but is now just called MDF (medium-density fibreboard). Ask at any framers' for their scrap narrow offcuts (which won't be "narrow" for your needs), since they probably have to pay to have them disposed of. They typically use 2mm thick (a bit over 1/16"), but there's also a 2½mm material (about 3/32") and a 3mm (⅛"), which you see in larger hardware stores in the UK, but in sheets far larger than most automatists would find useful. Some framers may use 3mm for bigger jobs, thus have small (to-them)/large (to-you) offcuts.

At 2mm, MDF is flexible, within limits, so (nailed down) can be used to create curved shapes. If you're of the vintage that had school desks with lids, where you could slide a ruler underneath and "twang" it, with the resultant satisfying spring-bouncing sound, thin MDF can be put to that use, too.

Many framers cut MDF on a guillotine, leaving a neat edge on the offcuts. Others use circular saws (at some risk, unless they know the precautions—some studies link the dust to cancer), with similar results. That's quite handy for re-users, given that the readily available home-based cutting method is, with quite some effort, using a blunt Stanley knife, which leaves a burr. Also, if you are working in batches, it's do-able to get rectangular (or straight-edged) pieces bulk-cut by the same framers on their guillotines, for a small consideration. *—Paul Clark, The First Gallery, Bitterne,UK*

Send your letters, tips, likes, dislikes, ideas, suggestions, etc. to:

automatamag@comcast.net

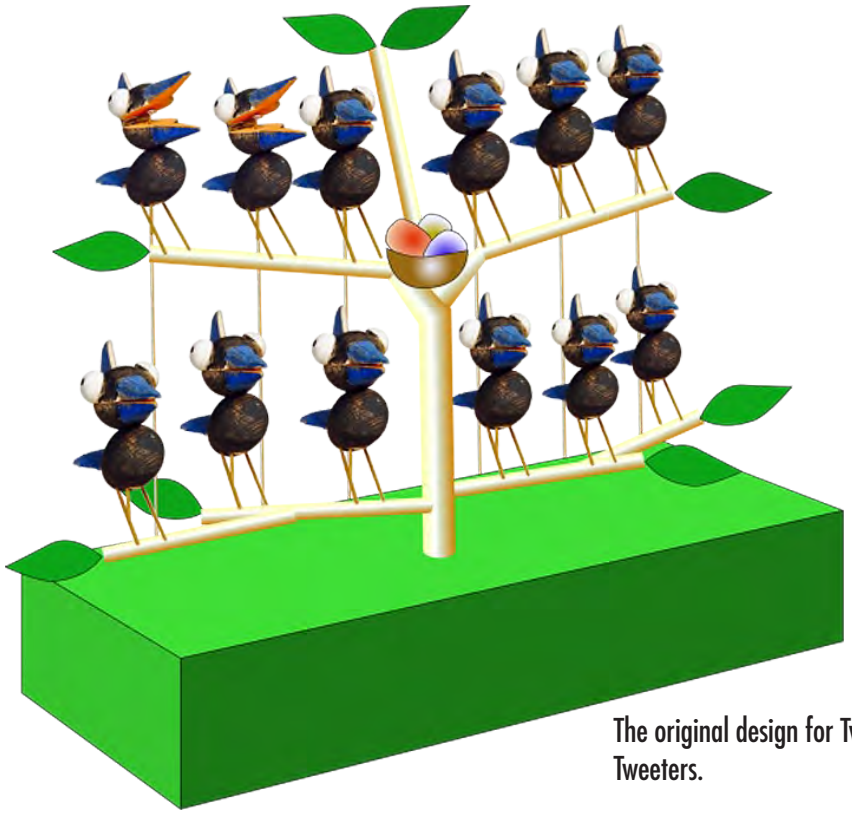
TWELVE TWEETERS

Constructing a functioning automaton clock

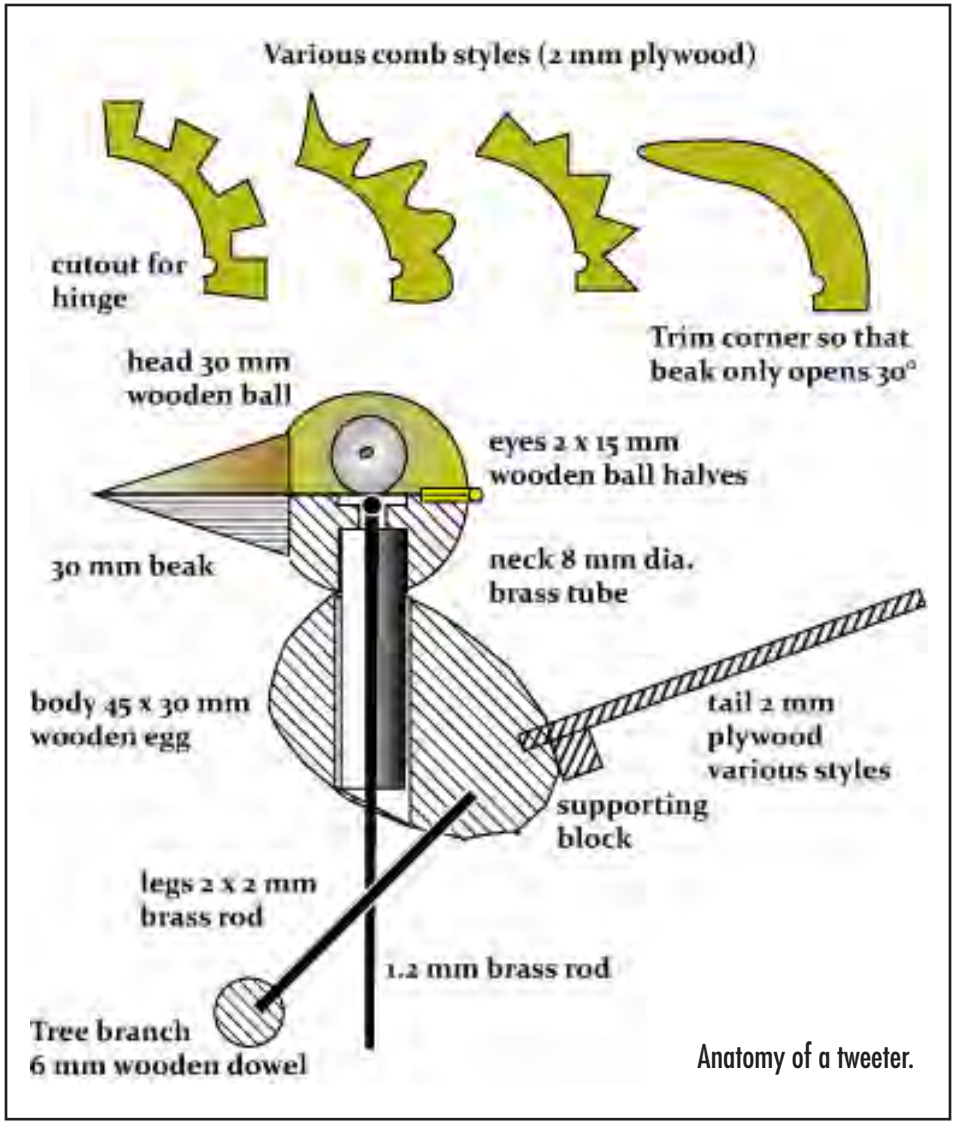
by Kim Booth • Berlin, Germany • Photos by the author

A clock with roots that occasionally hoots.
The time it can tell without even a bell.
Ask it nicely and it will tell you precisely,
But if no one's around it won't make a sound.
A dozen on their perch won't leave you in the lurch,
The assembled dawn chorus will sing something for us.
To make time a pleasure–a real treasure–not just something to measure.

In undertaking this project, my aim was to make a clock that doesn't look like a clock and has no rotating hands to point to the hours and minutes. Cuckoo clocks came to mind, and I really liked "Bird's Tree" by the amazing Carlos Zapata (*https://tinyurl.com/CarlosZapata*), so birds seemed like a good start. Then I heard the BBC's fantastic Tweet of the Day so I just



The original design for Twelve Tweeters.



Anatomy of a tweeter.

had to make it.

Moving from the initial concept to the final design

Things that are interactive are more interesting so, if no one is paying attention to the clock, it shouldn't do anything. Only when you really want to know what the time is, should it do something. Things that constantly move eventually just become part of the background and you don't notice them any more (not to mention the wear and tear on the mechanism).

Remembering Swiss cuckoo clocks, I thought it would be fun if the birds sang to tell us the time. Of course, I had to break the Swiss cuckoo's monopoly and open up the tree to all sorts of birds, so I chose a different bird for each of the twelve hours of the day. To tell whether it's two in the morning or two in the afternoon, you just have to turn around and have a look out of the window.

For the minutes, the birds had to do more than just sing. However, more than one servo motor per bird was too complicated. So, after experimenting with a prototype, I came up with the idea of a two-stage movement. If a brass rod is pushed halfway, the bird's beak opens. If it's

A simple lever on the servo pushes/pulls the brass rod in this prototype, causing the beak to open and the head to rise.

pushed all of the way, the bird's head rises away from its body, apparently stretching its neck.

Now, when you push the button to ask the time, the birds first stretch their necks to show the hour, from one to 12. For example, if it's three o'clock, three birds will stretch up. The second part then follows, where each bird is responsible for five minutes. For example, if five birds open their beaks and the fifth bird sings, that means that it's twenty-five past the hour.

For the ornithologists, each bird has its own voice:

- 1—blackbird
- 2—bee-eater
- 3—chaffinch
- 4—goldfinch
- 5—skylark
- 6—duck
- 7—greenfinch
- 8—great tit
- 9—mistle thrush
- 10—ortolan
- 11—marsh warbler
- 12—nightingale

For more drama, a light shines on the birds perched on their tree as soon as you push the button. This stays on for half a minute or so after a bird has sung the time, and a "dawn chorus" (recorded by someone early in the morning in an English forest) then plays quietly in the background for a while.

In the end, I also succumbed to tradition and allowed the cuckoo to briefly show off on every full hour. When we have visitors, this inevitably tickles their curiosity and is an invitation to push the button and see what happens.

Materials for the birds

Everyone knows that birds hatch from eggs so, for each bird, I used the following:

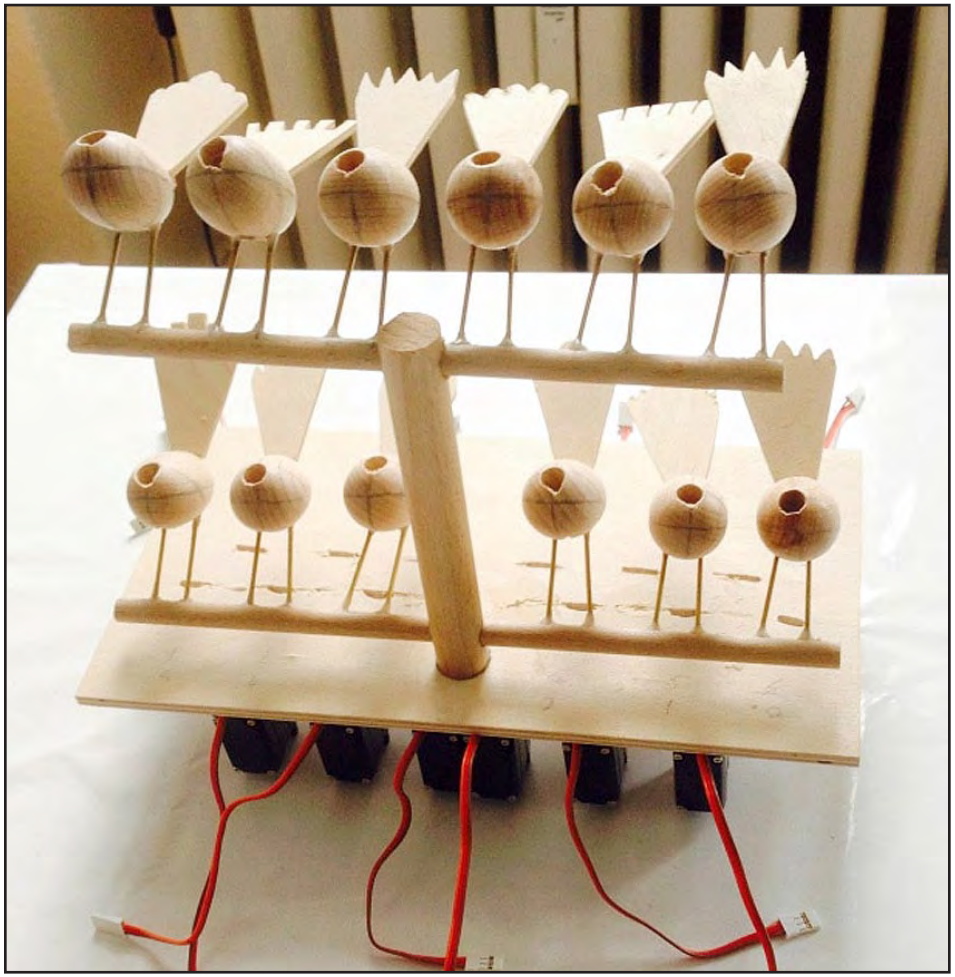
- One 45 x 30mm egg (body)
- One 30mm ball (head)
- Two 15mm ball halves (eyes)
- Two 13 x 10mm wooden strips from which to cut its beak
- An 8mm brass tube for the extensible neck
- A small, free-moving hinge
- 2mm plywood for the comb
- 2mm-diameter brass rod for the birds' legs and feet
- 1.2mm-diameter brass rod to connect to the servo arm

A beech egg, from which a bird will hatch.

Precisely drilling beech eggs and balls is tricky and, although I made some jigs to hold them in a fixed position and drilled pilot

Twelve servo motors with wooden arms to push brass rods up and bring the birds to life.

The birds' heads with their respective animating brass rods. The wooden arms mounted to the servo motors are seen below.



Twelve headless birds waiting for feathers.

holes, each of the 12 birds is slightly different, just as in nature. It wasn't practical to screw or nail the hinges so I used fast-setting, two component, epoxy-resin adhesive instead, taking care not to gum up the mechanism and prevent the beak from moving easily. The 1.2mm brass rod is used to push the beak open until it reaches 45°(ish), at which point it is restrained by the comb and the whole head will move up, exposing the brass neck, which is fixed to the bird's head but not to its body.

Making the birds move

Previous generations would have used clockwork, I suppose, but the flexibility of being able to program the movements and sounds electronically is ideal when you are feeling your way with no exact plan. That's why the base hides 12 cheap-and-cheerful servo motors that turn through an angle set by an Arduino Uno computer.

I collected the bird tweets wherever I could find them on the Internet, and they are kept in a micro SD card, which is read by a Music Maker shield that drives the loudspeaker. A real-time clock board then tells the Arduino what time it is. When I got fed up with having to re-program the Arduino from my laptop for summer time, then for winter time, I added a new button on the back that sets the time to 12 o'clock when pressed.

Ready to paint

It's hard to say how much time one spends working on a project like this. It takes a while to settle on an idea and then try a quick prototype to see if it does what you intended. I suppose, once you start to make 12 of everything, that's when the "work" begins. I needed perhaps a week to make the parts and assemble everything.

These projects are never quite finished. Once I had painted it and put it all together, I found that having a button on the side meant that the whole thing slides around when you push it. I moved the button to the top, which fixed that problem.

Then I put it onto a shelf at the dark end of the room, so each performance required the lights in the room to be turned up. I made a quick trip to get some LED strips, added a new socket to the back and a small power circuit, and now everything is brightly lit, as required.

Now I am content, and every time I hear a cuckoo in the distance, I think, "Is it that time already?" A1.

A brief video of Kim's clock in action may be found at:
https://tinyurl.com/kimbooth

Toy making in New England

25 years of building automata

by Nancy Hart

Orleans, Massachusetts, USA • Photos by David Farquhar, except where noted

Above: A variety of automata on display at the author's home. She never shows or sells her work, but gives it away to friends.
—Photo: Nancy Hart

As a child, I was interested in discovering how things work. Around the age of five or six, I was given three or four marionettes; my friend Alice was also given as many. We spent years giving marionette shows for anyone who would come. Alice gave the orders but I was more interested in how the strings made the puppets work. Here I am, eighty years later, still interested in how the strings make my toys work.

My life has been full of strings. I was a weaver, with several looms. I was also a prolific knitter and needlepointer. I learned how to make baskets and could often be found in the woods, pulling down vines for basket making. I taught weaving and

The Husband, the Wife, and the Cookie Jar. When the husband reaches for cookies, his wife slaps his hand.

basketry at the local art school. I made big rugs—hooked rugs and Swedish rya rugs.

Twenty-five years ago, I was in an art gallery, where I saw a big, dark box in the middle of the floor. I thought it was a coffin. It had a big crank handle and, when I turned it, all sorts of strange sounds emerged: whirrs and whistles, clanks and tinkles, bells and bangs. I thought, wouldn't it be fun to make something like that?

I started fooling around with cardboard and scissors, pins and string. I cut up a big family picture and gave everybody moving arms. Pull the string and everyone waved.

I later discovered Paul Spooner's work when I visited the Cabaret Mechanical Theatre in London, years ago when it first opened. I realized then that making automata, or "toys," as I call them, is a real artform. I moved from cardboard to wood, and from scissors to a coping saw. I insisted at first on remaining a "primitive" artist but eventually caved in and bought a scroll saw and, finally, a drill press. I moved my workspace from a corner of the basement to a sunny shack in the backyard.

I now make two types of toys. The first is the one-of-a-kind crank type where, when you turn the handle, something happens

The Cellist.

NANCY HART

A consort of recorder players. They are animated by wide cams that alternately bear on and release the strings connected to their arms.

Two Goldens at the Bar. The big dog pours from the bottle, then moves aside while the little dog drinks.

on top. My automata often show Golden Retrievers, my friends, or people in my large family.

I use string in many of my automata to help create the motion. This came about because I had so much trouble with the different parts jamming when the cams pushed them up. As a result, I started experimenting with strings. I found that sometimes things worked better by just letting the cam push the string, which is attached to the moving part of the toy. I learned, however, that I had to make wide cams so the strings didn't fall off of them.

I also figured out that one cam could do two jobs: one if the string is in front, and one if it's in back. This is especially clear in "The One Armed Cello Player." One cam with a string on either side does the bowing job—back and forth, back and forth.

The automaton of the recorder players uses a similar construction as that of the cellist. There are two cams. Half of the strings go in front and half in back, so you don't realize that at least two or three players are moving simultaneously. The figures are so silly and the whole action is so ridiculous that you might not realize the action is quite simple. It is extremely important to use string that does not stretch. I use only good-quality fishing line, which is very strong and will never stretch.

In " Two Goldens at the Bar" there had to be two cams timed to one another. First, the big dog pours from the bottle, then gets it out of the way so the little dog can drink. This was both one of my hardest automata and one of the most successful.

My other kind of automaton appears at Christmas, when I

Pull-string ornaments on the wall of the author's workshop.

The Christmas Pigs assembly line. These flying pigs will be Christmas-tree ornaments.

NANCY HART

Nancy Hart and her two Golden Retrievers, outside her workshop.

make 40 or 50 as presents for my friends. These are always the pull-the-string kind, which can be hung on Christmas trees. Making these, and moving to an assembly-line kind of work, provides a welcome change. This past year it was pigs—"Pigs can fly at Christmas." When you pull the string, their wings flap.

I have made wooden Christmas ornaments for 25 years and have made well over a hundred of the crank kind. I give everything to friends, or keep them as decoration in my dining room. I am 86 years old and hope to continue making my toys for many more years.

THE ELEPHANT IN THE ROOM

A visit to the mechanical wonders on L'ile de Nantes

by David Soulsby
Billinghurst, UK
Photos by the author

The four-story-tall elephant, with 40 passengers aboard, makes its way across the square at the site of the former Loire shipyard on L'ile de Nantes, an island in the Loire River, in the middle of the French city of Nantes.

Recently, my wife and I travelled to the French port of Nantes, about 400 km southwest of Paris, in search of a four-story mechanical elephant we'd heard about. It was housed in one of the huge warehouses on the site of the former Loire shipyard. It is part of the Machines de l'ile project, led by François Delarozière and Pierre Orefice, for the ongoing urban renewal of the area. The docks closed in 1987.

Before seeing the elephant, we first visited the Galerie des Machines, where machinists described their work (my O-level French let me down somewhat) and demonstrated some of the mechanical inhabitants, such as a giant spider that rose from a hole in the floor and waved its legs in turn. A few visitors were allowed to ride on the spider as it "walked" backwards to the rear of the warehouse.

The pièce de résistance on which the machinists are currently working is the giant Heron Tree. It will be 30 meters high, 45 meters in diameter, with an estimated weight of 1,000 tons. The tree combines steel branches and plant life, with the trunk being accessed via a staircase

ABOVE: A giant mechanical spider emerges from the pit, in the Galerie des Machines.

LEFT: A full-working prototype model of an enormous heron, part of le Heron Tree, due for completion in 2022.

that will enable guests to visit every floor. A number of mechanical birds will adorn its branches, including two gigantic herons.

Although not due to be completed until 2022, many of the Heron Tree's components were demonstrated in the workshop. These included a giant humming bird, a flock of wild geese, and prototype models of the herons themselves, which enabled a select band of tourists to "fly" to the warehouse roof above. A mechanical caterpillar, intended for the roots of the trees, was also available for a brief ride, if desired. A mock-up of the branches of the Heron Tree was accessible to climb.

Interesting though the vision of the future Heron Tree was, we were eager to get close-up and personal with the object we had travelled so far to see—The Grand Éléphant. By the time we had left the Galerie des Machines, the mechanical pachyderm had left its warehouse and trudged a considerable distance across the square. It was quite impressive to look at, with its massive, striding feet and carrying 40 people. It occasionally trumpeted or sprayed water at groups of kids running alongside.

The elephant, imposing from any angle. The driving cabin can be seen between its front legs.

The stats speak for themselves: the elephant is 12 meters high, 8 wide, and 21 meters long, constructed of over 48 tons of steel and wood, and set in motion by 62 cylinders, 46 of which are hydraulic, six pneumatic, and 10 gas-powered. The elephant travels at speeds of up to 3 km/hr and allegedly costs Machines des l'ile €200,000 a year to run it.

For a mere €8.50 each to ride the giant beast for half an hour, we climbed the adjoining ramp to the terrace, through the portal, and up the circular staircase to the top, for a view of the abandoned dockyards. From inside the beast we were able to see the interesting mechanical parts in motion as we set off across the square.

The city of Nantes is the birthplace of Jules Verne. Given that, there is a strong tradition of celebrating the weird and fantastical. His book *The Steam House* describes a wheeled house pulled by a steam-powered mechanical elephant.

Another of his books, *20,000 Leagues Under the Sea*, is celebrated on the same site, near the Marine Worlds carousel. This is populated by mechanical

View of the head from the back, showing the mechanism operating the ears.

The elephant's wooden "skin," leather ear, and closing eyelid.

ABOVE; A close-up of a leg of the elephant, showing the joints as it trundles across the square.

LEFT: Bystanders scream and laugh as the elephant sprays them with water.

models of sea creatures, operating on three separate levels, and all rotating independently.

The highest level, under a big top and adorned with flying fish, is the surface of the sea, which includes several boats, as well as jellyfish, turtles, and even sea serpents. Surrounding them are 24 moving, mechanical waves. The second level down is the abyss, populated by a deep-sea lantern fish, a manta ray, and many other exotic mechanical fish. The lowest level represents the seabed, with a giant crab, reversing squid, and a bathyscaphe—a total of 14 deep-sea denizens, each of which you can hop aboard for a ride. The creatures are made to move by pushing pedals and moving levers.

Purists may say that the enormous elephant and his mechanical friends are not automata, because of the motorized vehicles involved. However, if you were to stand alongside him and watch his progress, stomping around the naval docks of yesteryear, waving his tail and ears, and you suspend your disbelief, I'm sure you'd believe it was real. That was good enough for me. A1.

ABOVE: The three-level Marine Worlds Carousel, housing a variety of denizens of the deep.

TOP LEFT: Flying fish.

MIDDLE LEFT: Squid.

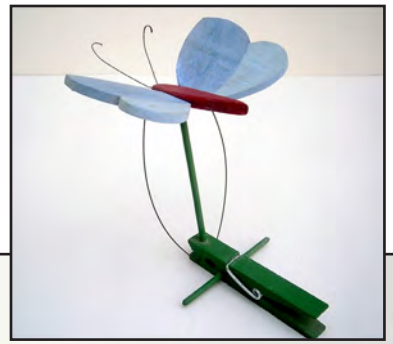
LOWER LEFT: Lantern fish.

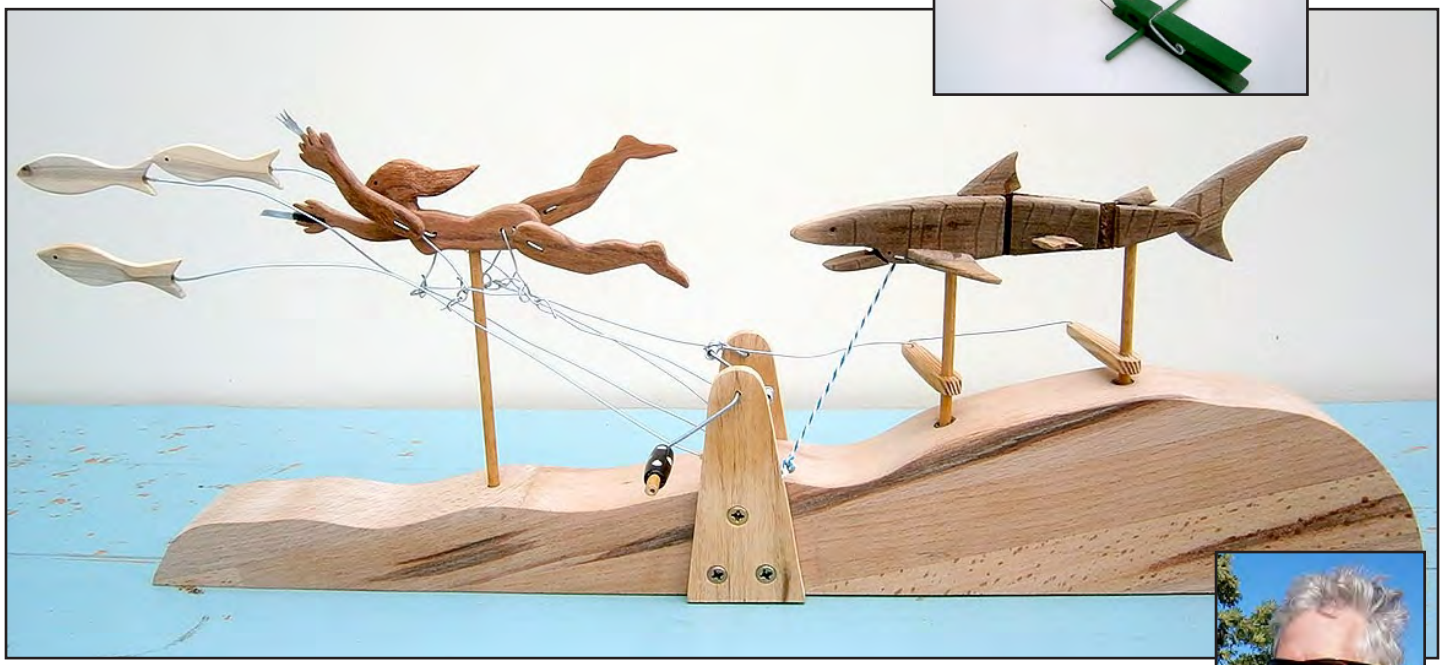
LEFT: Crab.

Building the clothes-peg butterfly and "What's eating you?"

A beginner describes two projects

by Pete Dunstone • Brent Knoll, UK • Photos by the author





ABOVE: The shark chasing the swimmer chasing the fish. This automaton was built to a published plan but modified by the author.
TOP INSET: The butterfly's wings are actuated when the peg is opened.

Living in London in the late 1970s, I had to hand-courier a parcel to Plymouth, and I extended my trip to Falmouth. I arrived a bit late but found a cafe, where I had supper, and, in the twilight, came across an illuminated window filled with automata. Oh, how wonderful! I had never seen such things, but the shop was shut! Having spent all my money on an extra train ride and supper, I had none left for a room, and spent the night on a sea-front bench. It was quite the romantic day, for me. I had to leave Falmouth early, so I never got to go back to that shop.

The butterfly

I'm a beginner at building automata but will show you two I have made. Back in the Seventies, I wasn't a very practical person but, over the years, I have grown in confidence, with tools to match. My interest in automata was reignited by an exhibition in Bridport (Dorset) and also by discovering Rodney Peppe's book, *Automata and Mechanical Toys*. So, thirty(ish) years later, I finally made my first working automaton—a butterfly on a clothes peg.

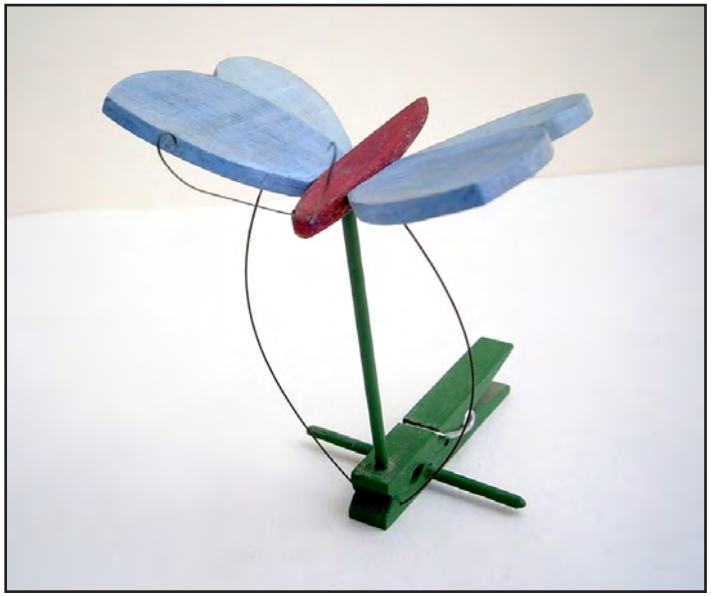
I cut out the pieces on a jigsaw. The wings are hinged by two pieces of plastic from pallet/box strapping. Piano-wire wing supports are one piece, which I pushed through the peg, then superglued into small holes on the wing. I didn't really expect this to work because, when the peg is open, there is a lot of tension on these wing fixings. However, so far (after 10 years), they have not come out.

The antennae are made of bristles from a hand brush. I used acrylic paint to finish the automaton. Today, I would probably swap the wooden dowel stabilizer for a lighter-looking wire arrangement.

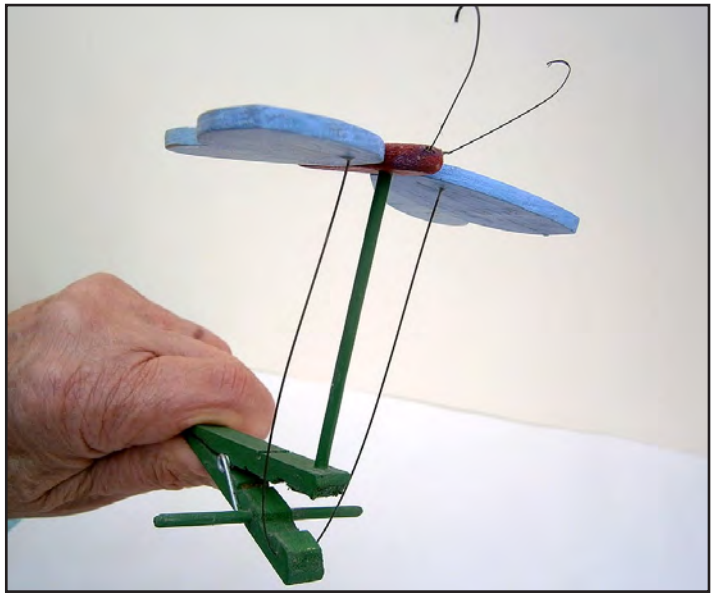
What's Eating You

I made the butterfly 10 years earlier but, in 2018, I made "What's Eating You." Again, an exhibition and two books—*Cabaret Mechanical Movement* by Gary Alexander and Aidan Lawrence Onn, and *Making Simple Automata* by Robert Race, begged me to make another automaton.

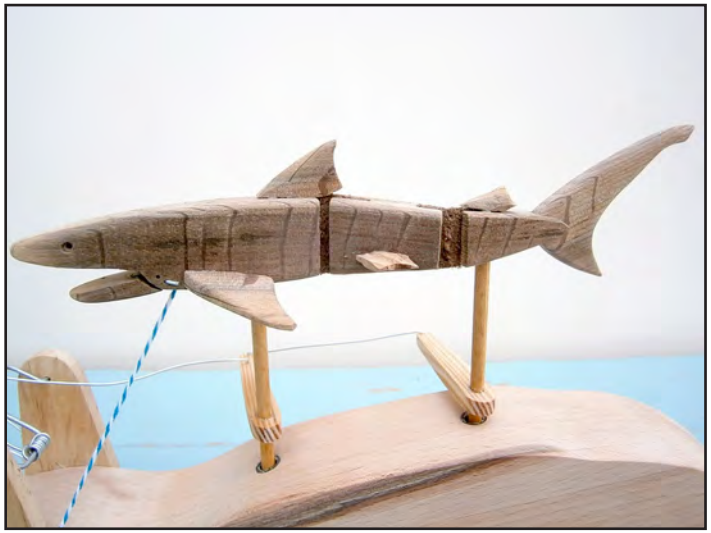
I felt it was better to follow someone else's pattern this time because I wanted to make something more complicated



The butterfly's wings are supported by piano wire. They are hinged to the body with bits of strapping.



When the peg is opened, the wings flap. You can see the tension on the piano wire when the wings are down.



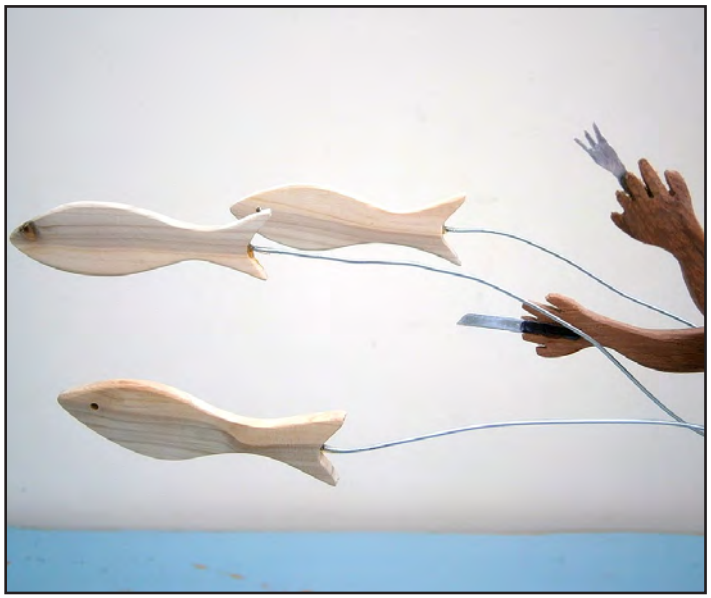
The wood and shaping of the shark. Note the blue-and-white cord, which is attached to the base of the crankshaft support. This controls the opening and closing of the shark's mouth.

The wood and shaping of the swimmer, along with the wirework. Note the swimmer's hair, which was shaped with a spiky burr held in a rotary tool.

than the butterfly but I did not want to have to worry that my design would not work mechanically. I settled on Race's "Shark and Swimmer." I'll not go into the specifics of construction, as all that is laid out in his book but, like navigating according to your sat nav, it's important to keep an eye on reality.

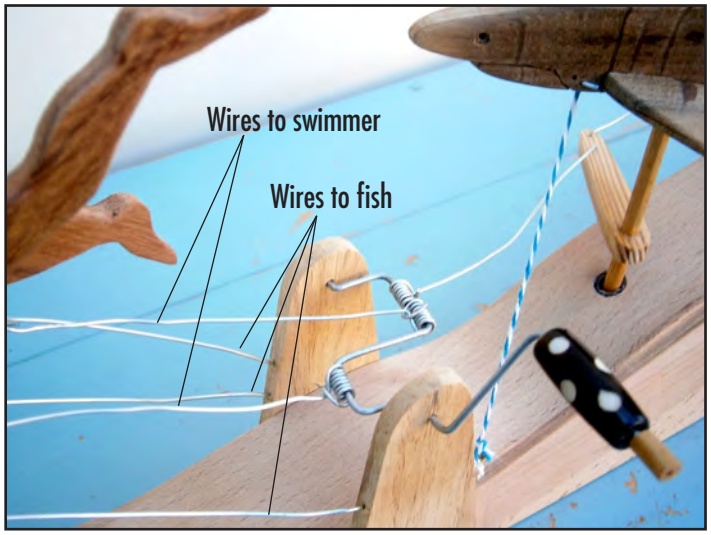
The basic design is of a swimmer being chased by a shark. Figures are mounted on a block of wood, with wire used for the crank and connections. I first made the shark and the swimmer using some interesting pieces of wood, to see how I got on with the more difficult aspects of the design. I used a band saw to cut out the pieces, then tidied and shaped them by a mix of whittling, rotary tools, files, and abrasives. Some of the smaller fins on the shark were a bit tricky. Also, I had some fun styling the hair of the swimmer, by using a spiky burr.

At some point, the idea of using a longer support block made from a piece of old beech work-bench top developed. Race suggests a support block, of about 10.5" (270mm) long. This I doubled, sloping and waving it like a seabed, which gave me



The wooden fish and knife and fork, the latter of which are made from aluminium sheet.

The flexibility and motion of the shark can be seen here, as well as the detail of the links to the crankshaft.



The extremities of the crankshaft movement are shown in these two photos. Two wire connections go forward to the swimmer (left), while the single connection goes back to the shark. The wire attachment to the fish is at the bottom left of the crankshaft supports. Note that, in the left photo, the swimmer's left leg is up and the shark's mouth is closed. The opposite is true in the right photo.

space to add some fish. Putting a knife and fork into the swimmer's hands changed the jeopardy of the piece. The swimmer is no longer panicking to swim away from the shark, but is pursuing something else into deeper water and is, of course, now in more danger.

Having thought I'd done the difficult bit, I hadn't counted on my inexperience with wire. I had to make the crank three times and the swimmer's wire twice, plus mess endlessly with the connections. If the wirework looks a bit wavy, please forgive me.

The added fish were originally glass, borrowed from another project, but they didn't look right. I soon swapped them for wooden ones, which were much better. Piano wire for the fish support was tried but the sweep up from the "seafloor" was too steep so, in the end, I used the same wire as with the swimmer.

In the end, the movement of all this is the shark's body snaking side to side as the mouth opens and closes, the swimmer's legs going up and down, and the fish bobbling up and down.

I can't call myself an experienced automata maker but I would like to be. It's relaxing for me. I don't try to jump to the finished article, as I do with many other projects. Building them is all a question of fitting things in around work, bread making, wood chopping, and haiku! A1.

Dimensions

Butterfly on a clothes peg

- Overall length, 4½" (115mm)
- Height, 4¼" (110mm)
- Wing span, 3½" (90mm)
- Body length, 2¼" (56mm)
- Antennae, 1¼" (30mm)
- Wing thickness, 4mm
- Piano wire, 0.5mm diameter

"What's Eating You"

- Base length, 20¼" (515mm
- Width, 1½" (40mm)
- Height, 3¼" (83mm) at peak
- Overall height to top of fish, 8" (202mm)
- Overall width (with handle), 4¾" (120mm)
- Shark length, 8" (202mm
- Swimmer length, 6¼" (160mm)
- Knife length, 1" (25mm)
- Wire: crank, 1.5mm
  Swimmer and connections, 0.9mm

All wood is recycled, except dowels.

GALLERY

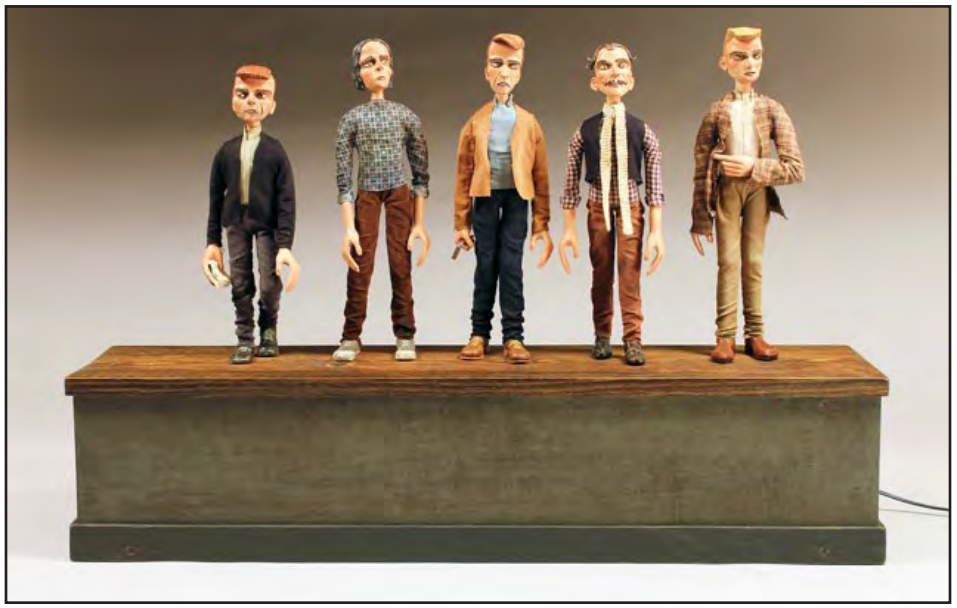
Automata
by Tom Haney
Atlanta, Georgia

LEFT: "Swim the Sea." 2012; 21" x 33" x 12"; powered by an electric motor. The figure is controlled by five cams and levers.

The figure's body is hand-carved from basswood, the head is sculpted from polymer clay. The case was found, then embellished.

BELOW: "The Usual Suspects." 2014; 32" x 21" x 8"; powered by an electric motor. All figures move, each in their own unique way, and are controlled by eight cams and levers.

The bodies are hand-carved from basswood, the heads are sculpted from polymer clay. Clothes are all custom made, as is the base.



Cabaret Mechanical Theatre—a history

Part 1: Falmouth


JUSTIN LYCETT

by Sarah Alexander • London, UK • Photos by Cabaret Mechanical Theatre, except as noted

Cabaret Mechanical Theatre started life in 1980 as a one room, first-floor crafts shop on the High Street in Falmouth, Cornwall, England (**photo 1**). Sue Jackson, its creator and my mother (**photo 2**), simply named it "Cabaret," after the Liza Minelli film. She sold a vast range of locally made delights (**photo 3**), both in the shop and by mail order, including colorful knitted jumpers (new designs every Friday), ceramics, traditional wooden toys, and harlequin merchandise, and she boasted that the merchandise at Cabaret couldn't be purchased anywhere else.

Sue was an enthusiastic shopkeeper, encouraging local makers to contribute their creations to the shop. She even made things herself, including painted plaster ice-cream sundaes and cupcakes. (In the manufacturing process, she continually blocked

A poster from the early days of Cabaret.

the drains in the High Street).

The first pieces of automata that Sue sold at Cabaret were by Peter Markey (**photo 4**), who was an art teacher at our school. When Peter retired from teaching, he diverted some of his boundless energy into painting and making two-dimensional sculptures, and eventually automata (**photo 5**). Peter's great loves—the sea and football—were often featured in his work (**photos 6** and **7**).

Peter also made tiny cardboard peepshows, with intricate sea and landscapes. Sue sold and displayed a variety of Peter's early works but also became frustrated when he took them away for exhibitions. She knew then that automata would be popular.

Paul Spooner (**photo 8**) was the next automata maker to come into Cabaret. Paul initially brought in a series of static, carved wooden elephants in boxes to sell, followed by some pull-along toys. Sue famously used the elephants-in-boxes as plinths on which to display Peter Markey's work in the Cabaret shop window.

Sue encouraged Paul to make something more mechanical, like

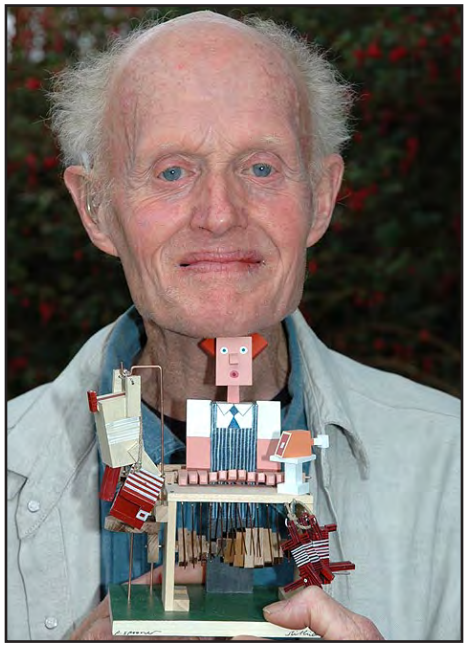
1. Storefront of the original Cabaret in Falmouth.

HEINI SCHNEEBELI

2. Sue Jackson

HEINI SCHNEEBELI

3. A sampling of the available delights at Cabaret, all locally made.



4. Peter Markey

Peter's work. Paul came back with a small edition of the Anubis sausage drawer (**photo 9**). I remember this remarkable day quite clearly. The jackal-headed god Anubis was displayed on our dining table (the small, upstairs shop was actually part of our home). No one had seen anything quite like it before; a friend of my father's, who had come round to play cards, bought one on the spot. Paul made more pieces, mostly featuring Anubis, Lord of the Mummy Wrappings, including Anubis in Montmartre (**photo 10**) and Manet's Olympia (**photo 11**).

During this phase in the life of Cabaret, the automata gained in popularity with collectors, and waiting lists formed. Also, Sue started keeping one of each design, which further irked her waiting customers.

As a way of creating an income for Paul that avoided the continual creation of small editions of work, Sue encouraged him to make a larger piece that could be coin operated. Paul's surprising automaton, known as "The Last Judgement" was the result. (An article about this remarkable piece will appear in the next issue of this magazine.)

STEVE TANNER

5. "Small Jungle." (Peter Markey)

6. "Small Wave Machine." (Peter Markey)

7. "Running Footballers." (Peter Markey)

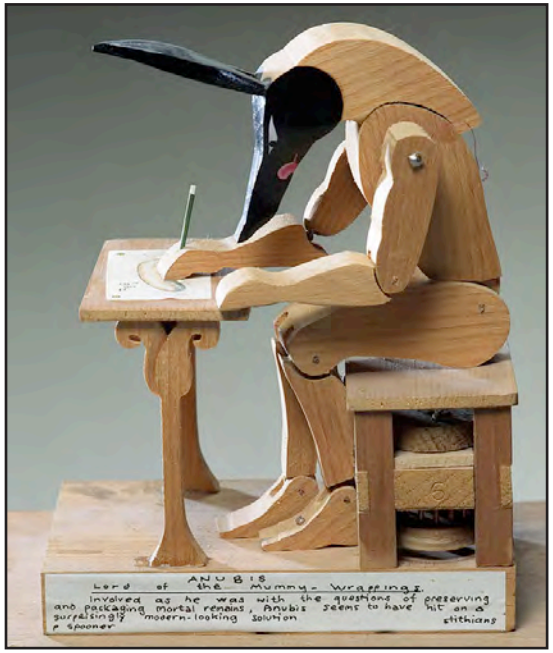
8. Paul Spooner

At this time, Sue also experimented with creating movement in the window of Cabaret. Working with a friend, they added motors to some of the pieces to animate them.

In 1983, in order to create a permanent exhibition alongside her shop, Sue swapped spaces with my father, who had an antique shop further up the High Street. It was at this point that she changed the name to Cabaret Mechanical Theatre. She commissioned more work from Peter Markey and Paul Spooner, and also from other makers, including Richard Windley (**photo 12**) and Ron Fuller (**photos 13** and **14**).

Sue met Ron as a teenager when they were students at Falmouth Art School. A romance had flourished between them at the time but they then lost touch for nearly 20 years. By 1983, Ron was making traditional wooden toys, including elastic-band-powered submarines, hens that laid eggs, and can-can dancers. They were perfect for Sue's Cabaret.

When Sue opened the exhibition, Ron Fuller made a Pink Policeman turnstile, while Peter Markey built a colorful arch at



HEINI SCHNEEBELI

LEFT: 9. "Anubis: Lord of the Mummy Wrappings" (Paul Spooner.)

RIGHT: 10. Spooner's "Anubis in Montmartre"

11. "Manet's Olympia." (Paul Spooner)

12. "Morning Chorus." (Richard Windley)

the front of the exhibition. It cost 50p to go inside and press the buttons that would bring the automata to life. There was a small aquarium with tropical fish built into the entrance, and over 50 pieces of automata lined the walls. The pieces were all motorised, like the ones in the window, and were operated by push-button.

Family friend Matt Smith (**photo 15**) also started making automata for Cabaret in Falmouth and Sue soon found that he had great talent for the work.

CMT gained in notoriety and was often featured on TV and in national magazines, and the Crafts Council included CMT as part of their world tour, in the summer of 1984. CMT was also popular with both locals and tourists but the seasons were short and the premises were somewhat off the beaten track.

After a busy summer in 1984, Sue tried to relocate CMT, again in Falmouth, this time to a more visible spot on the nearby Pier. However, her proposals were turned down by the local council. In an impetuous move, she decided to move to London (**photo 16**). Eleven weeks to the day after first seeing the prem-

13: Ron Fuller outside his workshop.

HEINI SCHNEEBELI

14: Fuller's "Cabaret Tiger."

THE EXPLORATORIUM

15. Matt Smith.

Fuming' model shop owner off to London

FALMOUTH'S colourful Cabaret Museum of Modern Mechanical Models was closed without warning on Saturday — and the proprietor lays the blame on Carrick Council.

Mrs. Sue Jackson had planned to transfer the successful museum and shop — the only collection of modern automata in the country — from High-street to bigger premises at the nearby Prince of Wales Pier.

But she was so angry with the lack of financial support she received from Carrick that she is moving Cabaret to London's Covent Garden.

Her hopes were dashed when Carrick refused to make her a grant to help with the £10,000 cost of renovating the old fish and chip kiosk she had hoped to rent from John Menzies.

The West Country Tourist Board, who have acknowledged that the museum was a tourist attraction, were prepared to make a grant — but only if Carrick Council also helped financially.

Carrick ruled in the summer not to do so.

Said Mrs. Jackson in the elegant bar shop and museum this week: "When I received that letter from Carrick saying that they would not give me any financial assistance I immediately packed up the phone and called the Greater London Council. I was hoping.

Carrick will give me a grant for a bathroom and yet we were going to give us premises. There is no floor in the premises we were going to move into at the entrance of the pier — and there's no wiring.

"We weren't asking for any help with our business. It was to do up a derelict building.

"It was because Carrick turned us down that I contacted the GLC and decided to move Cabaret to somewhere that it would be appreciated by the local authorities.

Mrs. Jackson is now setting up her mechanical theatre at 32-34, Covent Garden Market. She hopes to open her Falmouth premises for the last time on Saturday.

The models are made locally by 14 craftsmen and women. They will continue to make the automata.

Mrs. Jackson with some of her fascinating models.

16. The Falmouth paper reports Cabaret's departure.

ises at 33/34 the Market, Covent Garden, Sue had opened Cabaret Mechanical Theatre in London (**photo 17**).

Peter Markey and Paul Spooner both travelled to London with Sue to help install the shop. By arrangement with the current tenant, CMT only occupied a quarter of the premises during December of 1984, in order that they might both benefit from the Christmas trade. Customers were enchanted by the tiny shop, which had been filled with small editions of automata, wooden toys, and cards. Buyers made frequent visits to the bank, as there was no card machine. One customer even suggested that we make one from wood!

The permanent exhibition opened the following spring, and Cabaret Mechanical Theatre remained in London until March of 2000. These years will be covered in the next issue of *Automata Magazine*.

17. Cabaret in Covent Garden, London. Paul Spooner's *The Last Judgement* can be seen in the left-hand window.

A peek into the mind of an **Automata collector**

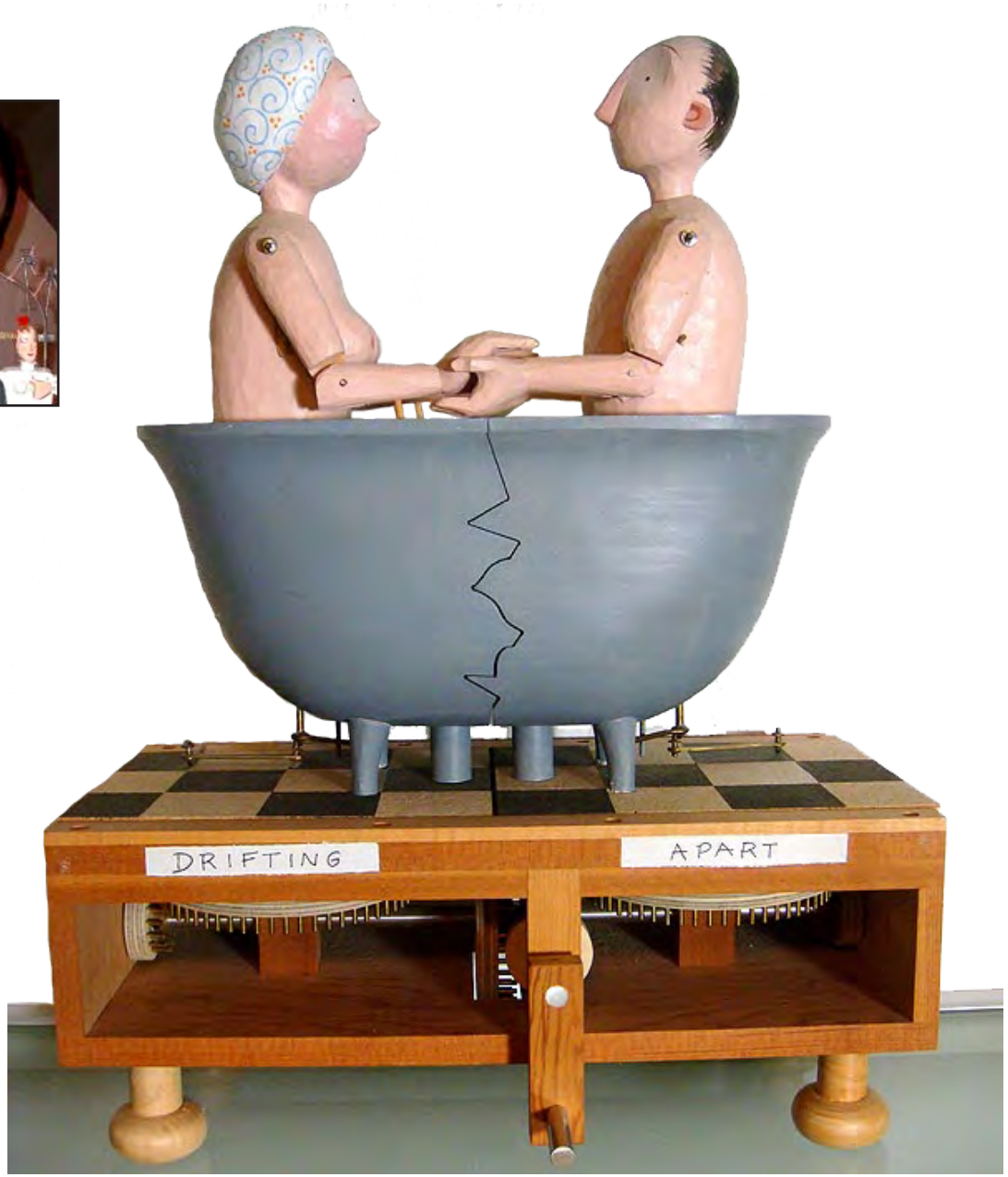
An enthusiast tells his story

by Sergio Pinese • Switzerland • Photos by the author

See these wonderful colors and shapes, and how perfectly the gears mesh and tell a charming little story! I am struck by the sight and want to touch this fascinating automaton, turn the crank with my own hands, feel and hear how the mechanism sets the whole scene, as well as my heart, in motion.

However, this automaton does not belong to me and is not physically in front of me. It's just something in a dream that I long for—two or three pictures on eBay that cause a yearning in me. This longing increases rapidly, the longer I look at the pictures and approach the end of the auction. The strategies of conquest sprout like mushrooms: my "opponent" will offer a maximum of two-and-a-half times the initial price…I absolutely should not make an offer at the beginning…it all depends on the last few seconds of the auction…I cannot betray my own bidding strategy…irritate my competitors with false information….

And then comes the time—3, 2, 1… not mine! What



Drifting Apart, the author's first automaton, made by the Fourteen Balls Toy Company (Matt Smith, to a Paul Spooner design), 2002.

did I do wrong? Why have the prices skyrocketed? Did another collector see through my tactics or did he simply have too much money at his disposal? Honestly, I do not want this machine any more and am glad to have been outbid. I was actually thinking about buying a completely different automaton.

A collector's story

Collectors, in particular automata collectors, are a strange species. How does one begin to collect automata? I can only answer this question from my own point of view. Other collectors are publicly known only on a limited basis. They shy away from the limelight and do not like to reveal their addictive behavior and the contents of their collections. Neither do I, to avoid envy and jealousy.

My beginning as a collector was accidental. In 2003, I stumbled upon the book *Cabaret Mechanical Movement* in the shop of a science museum. The drawings in it aroused my curiosity and my sense of research. Ever since my childhood I have had a fascination for "artfully designed machines." When searching the Internet, I came across contemporary automata and, of course, I wanted to have at least one of them in my home…then one more…and then another, and then I would quit….

My first machine, bought in 2003 with money I had saved, was "Drifting Apart," from the Fourteen Balls Toy Company, through the Cabaret Mechanical Theatre's online store. It was made by Matt Smith, to Paul Spooner's design. That purchase provided me with a real sense of conquest—it was a dream that turned into physical reality.

At the beginning of my collecting, despite extensive research on the Internet, it was not really made clear where automata existed or how many might exist, how the market worked, or through what channels how and when news was communicated.

Honestly, I still do not know exactly—there are no specific mathematical rules. I had a constant feeling that ingenious work was always appearing and I did not get to hear about it.

In the meantime, my restlessness had gone. I couldn't

A collection of Peter Markey (1930-2016) automata. Like fine wines, the author houses his collection in wine boxes.

control the automata world but my childish curiosity about the activities in the automata scene and the wonderful new creations being made has remained unchanged.

I originally looked for automata mainly on eBay but rarely found any there from the late 20th and early 21st centuries. I keep away from the 19th-century automata. Though they're technical masterpieces, I can't connect with them emotionally.

I expanded my inquiries to exhibitions and galleries, and contacted the makers directly. Because of the physical distance between me and the makers, loose contacts with many wonderful people have developed. I always enjoy hearing from them, and sometimes very personal thoughts are exchanged. A sort of family feeling grew between me and these people, distributed over the whole world.

Automata by British artist Ron Fuller (1936-2017).

An enthusiast at heart

To clarify, I seldom call myself a collector and I'm definitely a super small one, compared to others in the art market. Financial and spatial resources are limited at our home. I see myself rather as an automata enthusiast. If possible, I enjoy traveling to places where mechanical things can be seen and touched.

And then there are the automata makers—the creators of these "useless" things that have enriched my life for a long time. I like to personally get to know them and their idiosyncrasies. These unique gatherings create an extra, stronger connection to the automata in my collection—personal experiences and memories that belong only to me.

And a question repeatedly arises: "Why do you not have a Jean Tinguely piece in your collection?" My answer is that I would rather enjoy 100 tiny, working automata than a hundredth of a monstrous Tinguely sculpture! Sorry Jean—I prefer to see your works in public spaces and I never could afford even

LEFT: *Crankahead*, made by the author for his own automata-making contest, January, 2011.

RIGHT: *One can — Toucan*, made by the author, August, 2008.

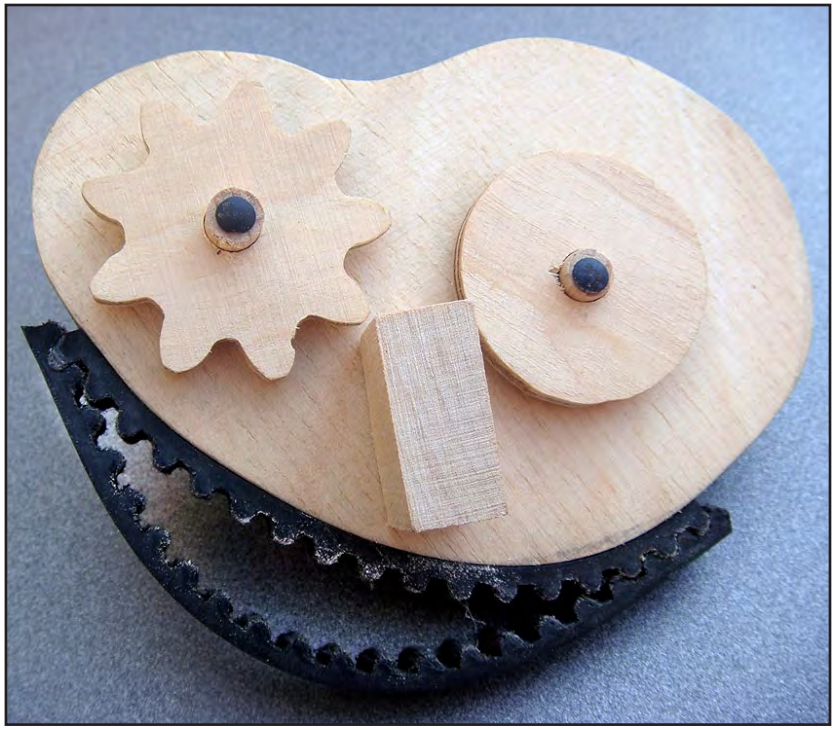
one of your pieces.

What will be the next work to potentially be added to my collection? With the passing of the years, I have seen and held many things in my hands. In the beginning, I wanted to collect as many as possible. After 15 years, my focus is more on individual pieces, still in the process of being created, for which I must wait years.

Honestly, collecting is not something vital and no special skills are needed. It is a constant struggle with your inner self, the desire to be able to call something yours that you find beautiful, due to your own mood. Some people might call it a disease.

I sometimes think that maybe I should sell or donate my whole collection to a museum (my family would probably be thankful), but then I see another automaton that is irresistible, that I must own! After that I'll definitely stop collecting….

LEFT: *Geldwäsche* (*Money laundry*), made as a wedding present by the author (with real Euros on it), September 2009.



RIGHT: *Decelerator*, made by the author for a friend, as a suggestion to slow down in his life, September, 2011.

The collector as maker

In addition to collecting, which is not hard work at all, I occasionally try to be an amateur automata maker. However, all of the work surrounding me makes it hard for me to develop my own ideas. For almost every idea I come up with, I remember a similar, quite ingenious implementation done by someone else. So, if you want to be an automata maker, do not start collecting and don't look too closely at others, but carefully develop your own ideas.

With the passing of the years (and, as I am a hunter-gatherer), I have also collected a few documents and other information concerning automata that is slowly being forgotten. One of those lucky hits was through contact with Frank Nelson, an English automata maker. Unfortunately, Frank passed away in 2012.

Frank was also a collector of automata and he had had a long-standing desire to build an automata museum. Sadly, this never came about. However, he had recorded various contemporary films about automata on two videotapes, which he left to me. Most of these vintage videos, with the help of a good friend, can now be found on my YouTube channel, "MechMinestrone68," where we saved them from oblivion.

I am also one of the three administrators of the *Facebook Automata/Automaton group*, and have been since 2008. Our group surpassed 10,000 members in 2018.

Like many other people, I have to manage all my automata activities as a hobby in my spare time because it is quite difficult and I never had the idea of making a living from it. This hobby just has to do with enthusiasm, and you don't need to be a collector for that.

So keep away from collecting automata—except when you see a magical piece that you really want. It might be the last one, so don't wait!

This automaton gives a raspberry!

A Minion-inspired moving model

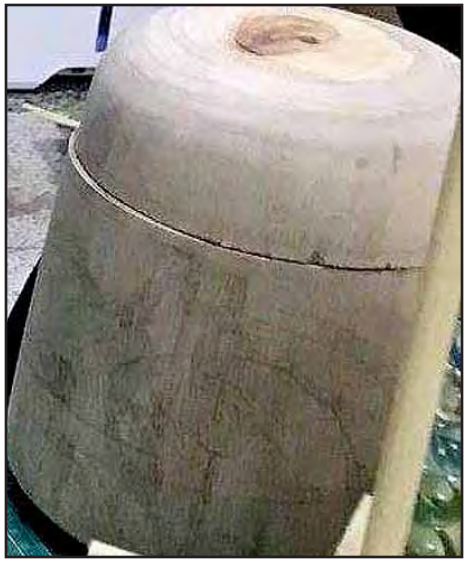
by APon Peng • New Taipei City, Taiwan • Photos by the author

APon Peng

Minions are magical and, because I like to see people laugh, of course, I love them. This was the inspiration for my automaton. I never thought about making a "good automaton." If I don't make things functional, they must just be fun.

I made the Minion's body on my wood lathe. I didn't have a drawing of the automaton on paper but I had a clear picture of it in my mind. It was difficult to explain to friends what I was going to make when they asked. Some of my friends even thought that I was making an urn for ashes (**photo 1**)!

After I finished turning the basic body on the lathe, I cut the body into two parts. I then hollowed out one of them so that I could put the crankshaft inside. On this automaton, the crankshaft converts the rotational motion created by rotating the arms into reciprocating motion for the tongue. In order for this to happen, the crankshaft has "throws" and a crankpin. The throws are the side pieces that connect the crankpin to the crankshaft. The tongue is connected to the crankpin, and the hands provide the crank handles so, when I rotate



1. The basic body, complete. It was turned on the lathe. Friends thought it was an ashes urn.

2. Looking down into the body of the automaton you can see how the crankshaft operates the tongue. The rotary motion is transformed to linear in-and-out motion.

one of the hands, the tongue moves in and out (**photo 2**). **Photo 3** shows how the top of the head fits onto the body.

After finishing the crankshaft, I made the eye and goggle on the lathe as well (**photo 4**). Finally, I carved the hands and the legs, then assembled all of the parts into the automaton. All of the parts I left the natural wood color—even the eye of the Minion is natural wood.

If you are interested in seeing how the automaton works, please visit my post on Facebook: (*https://tinyurl.com/aponpeng*). AM

3. The Minion's top was also turned on the lathe. His headband disguises the joint.

4. The eye being turned on the lathe. All of the automaton's parts were left in a natural wood finish.

Write for *Automata Magazine*!

No magazine can exist without the support of its readers. For a publication like ***AM***, this means articles.

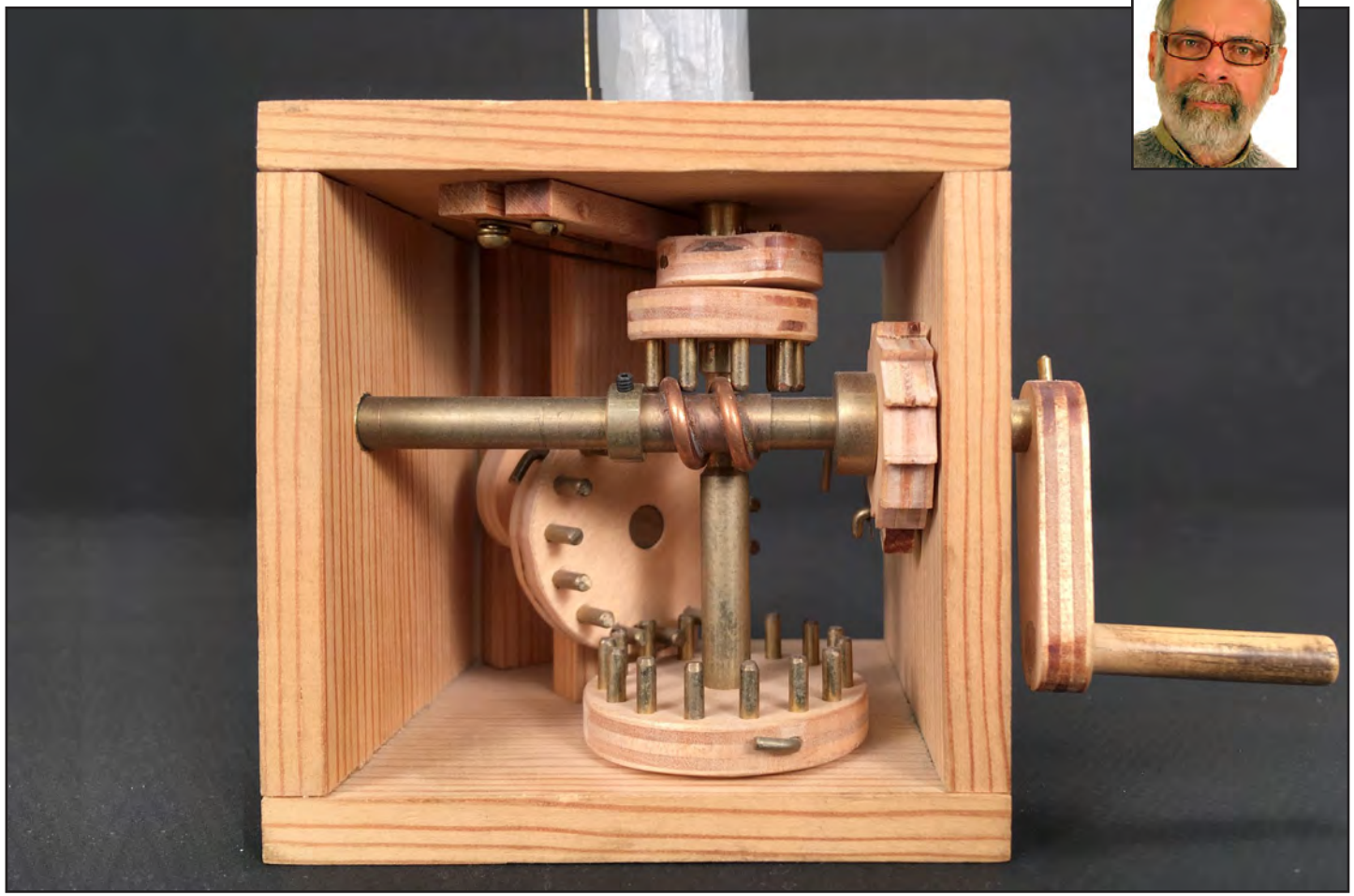
Writing an article is not as difficult as you might think. We've prepared some submission guidelines for a variety of different types of stories. You can find them (with links to downloadable PDFs), along with a partial list of the kinds of stories we'd like to see, on the "Write!" page of our website: *http://automatamagazine.com*

Please consider writing about your projects, visits to places of automata interest, your collection, or what-have-you. This is a fascinating field of endeavor that encompasses all skill levels, ages, geographical locations, and interests. Don't be shy. Everyone has something of interest to say. Please drop us a note (*automatamag@comcast.net*) telling us what you have in mind for your article.

MAKING PINWHEEL GEARS

Different methods for successful gearing: part 1

by Marc Horovitz • Denver, Colorado, USA • Photos by the author



Pinwheel gears are both an effective and visually interesting way of making gearing for automata. They are not difficult to make but care must be taken to construct them accurately or they will not function properly.

When a gear rotates, its teeth bear against the teeth of an adjacent gear, causing the second gear to rotate. In industry, gears must be efficiently designed and made, and there are certain types of standard gearing that accomplish this. Gears' teeth do not slide across one another but actually roll against each other with little friction.

Pinwheel gears are not efficient, nor do they need to be. Absolute precision is not necessary for them to function well, but some understanding about how gears work will be helpful.

How gears work

Without going into a lot of gear theory, here is some basic information. Two or more gears

Pinwheel gears not only function well and are relatively easy to make, they can add character and interest to your automata.

working together is called a gear train. All of the gears in the train must be compatible with one another, meaning that the distance between the teeth in each gear must be the same as that in all the others. This is not difficult to accomplish, as will be described later.

One of the most useful things about gears is gear reduction, which can be handy when creating automata. Consider two gears, one twice as big as the other, working together. If you drive the small gear, the larger will revolve half as fast as the little one. If, on the other hand, you drive the large gear, the smaller one will revolve twice as fast (**figure 1**). Also, two gears working together will revolve in opposite directions. If you want them to revolve in the same direction, just insert a third gear (of any size) between them. This is called an idler gear, as it doesn't do any work aside from changing the direction of rotation of the third gear (**figure 2**).

Pinwheel gears work best when one shaft runs 90° from the other. However, if the teeth are fat enough, they can be made to work on parallel shafts (**figure 3**).

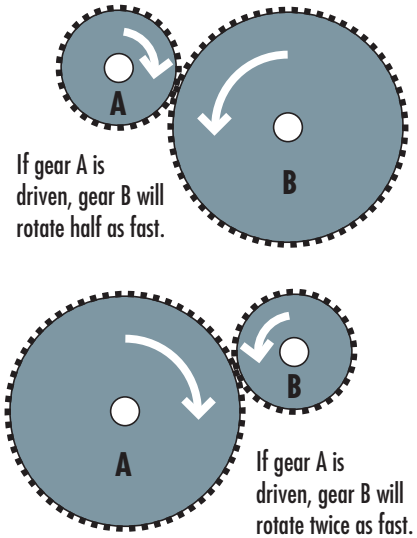
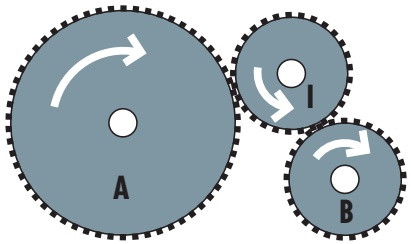


Figure 1



If an idler gear (any size) is introduced between two gears, the rotational speed of gears A and B is unchanged. However, gear B will now rotate in the same direction as gear A

Figure 2

Designing your gears

Perhaps the first thing to decide is the pitch of your gears, meaning how much space there

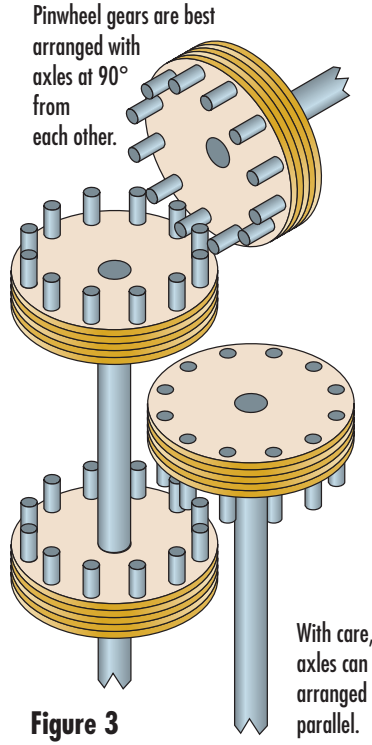


Figure 3

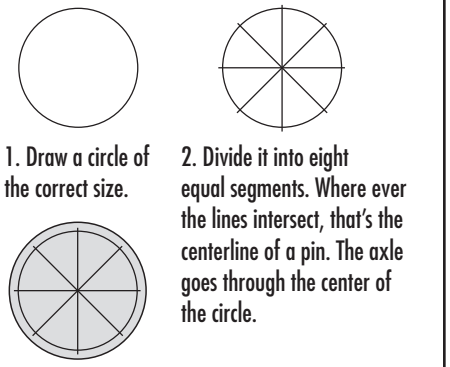


Figure 4

should be between each tooth. I find that ¼" (6mm, for 3⁄16"-diameter [4.8mm] pins) or 3⁄16" (4.8mm, for 1⁄16" [1.6mm] pins) works well. Any dimension will do—there just needs to be more space between the pins than the diameter of the pin.

For this example, though, I'll use 3⁄8" (.375" or 9.5mm) pitch and 1⁄8" (3mm) wood dowel for the pins. This means that there must be .375" between each tooth, as measured from the centerline of the teeth.

Suppose I want to make a pinwheel gear that has eight teeth. There will, naturally, be eight spaces between the teeth. So, eight (teeth) x .375" (space between the teeth) = 3" (76mm), which is the circumference of the circle around which the teeth will be spaced.

Circumference is calculated by this simple formula: $C = \pi D$, where C is the circumference, π (pi) = 3.1416, and D = the diameter. Since we know the circumference and the value of pi, we can find the diameter of the circle by dividing the circumference by pi: 3 ÷ 3.1416 = .955" (24.3mm).

The easiest way to draw a circle that's precisely .955" in

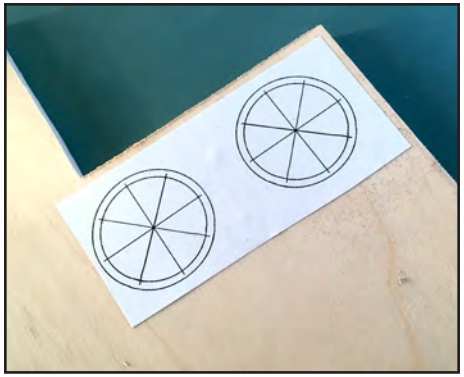
diameter is by using a drawing or drafting program on your computer. (There are several free ones online.) Then you simply divide the circle into eight equal parts (**figure 4**). Wherever a line intersects the circle, there a pin is placed. Draw a larger circle to represent the outside edge of the pinwheel. This method works for pinwheels of any size, though six pins is about as small as is practical. If you are very careful and use tools such as a compass, caliper, and protractor, it would be possible to hand-draw the circle and its divisions.

Making your pinwheels

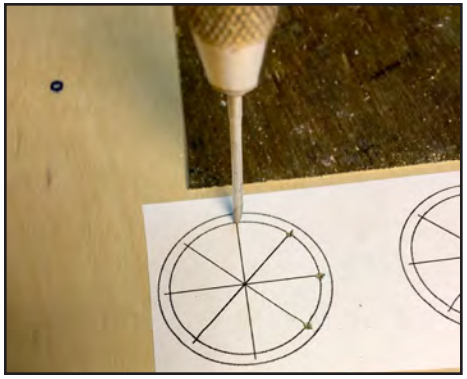
There are different ways of making pinwheels. I'll describe a couple of them in these articles.

Once you have your drawing, print it out. Decide what the body of the wheel is to be made of. I like using Baltic birch plywood, either 3/16" (4.8mm) or ¼" (6mm) thick. For this wheel, I'll use ¼" ply.

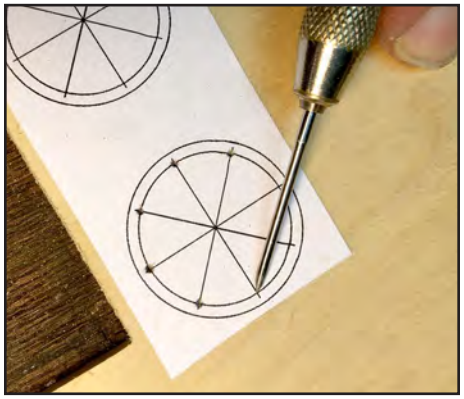
Glue the printout to the wood (**photo 1**). Then, carefully place the point of a sharp awl or bodkin precisely on the intersection of two lines, and press it into the wood (**photo 2**) to form a dimple. This dimple will be a guide for your drill. When aligning the point of the awl with the intersection, I find it useful to approach it from a 45° angle, laying the awl nearly flat on the work until the point is where I want it (**photo 3**), then standing it up and pressing.



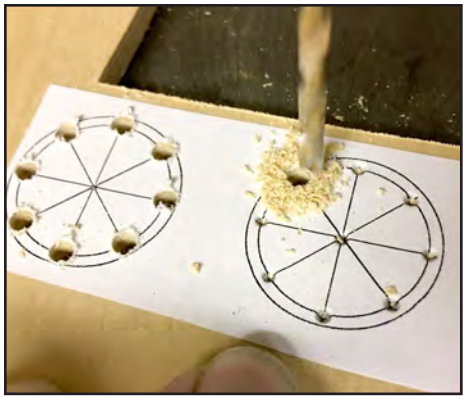
1. The computer printout is glued to the wood.



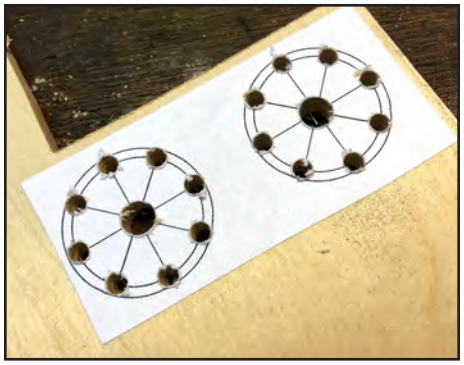
2. A sharp awl is used to mark the holes.



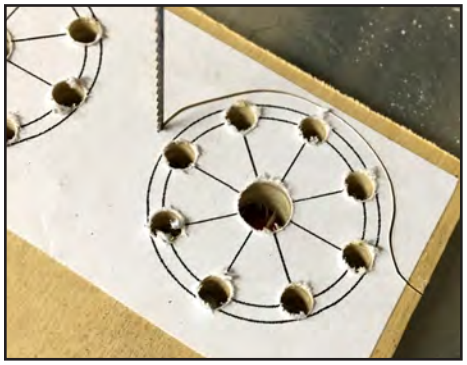
3. To precisely locate the center of the hole with the point, lay the awl flat.



4. Holes must be drilled parallel to one another, preferably with a drill press.



5. Finished holes. Note the outer circle is too close to the holes.



6. Wheels are roughly cut out with a scroll saw or coping saw.

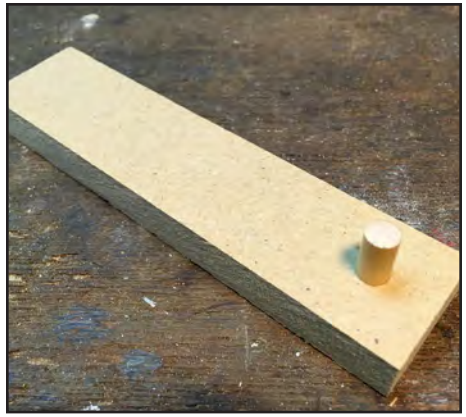
Once you have gone all the way around the circle, it's time to drill the holes. It's important that the holes be perpendicular to the wheel. The best way of doing this is with a drill press. Mount a 1/8" drill in your machine and drill the holes (**photo 4**). Drill the center hole the size of your shaft—¼" (6mm) is good. If you use a backing board under your work piece, the holes will be clean on the bottom side, too.

Now roughly cut the wheel out of your base piece. A scroll saw (fret saw) is good for this (**photo 5**) or you could do it by hand using a coping saw. I drew the outer diameter of my wheels too close to the pins so, when I cut the wheels out, I just cut them a little bigger. Also, you can see in **photo 6** that my wheels are nowhere near round. To make them really round, you can make a simple jig (**photo 7**) and use a belt sander. Clamp the jig

loosely to the sander bed and slip the wheel over the pin. Then move the wheel into the moving belt until it sands the edge up to your line (**photo 8**). Tighten the clamp, then slowly rotate the wheel into the belt, which will true it up nicely (**photo 9**). Remove the paper, sand off any glue, and clean up any rough edges. You should be left with good wheels (**photo 10**).

Now it's time to make the pins. I cut my pins to a length of 5/8" (16mm). To do that, I made a simple L-shaped gauge out of a scrap of plywood (**photo 11**). The inside dimension of the long leg of the "L" is 5/8". I like to hold my work in the vise for cutting but you can do it on any flat surface with care. Hold the gauge up to the dowel, hooking the short leg over the end. Position the saw blade at the end of the gauge, and cut the pin (**photo 12**). When you have cut all the pins (**photo 13**), chamfer the ends. This means to sand the edges to around 45° to relieve the corners and remove any burrs. A good way to do this is with the belt sander, twirling the pin against the belt as its running (**photos 14, 15**). You could also do it with a piece of sand-

7. The rough-cut wheels.

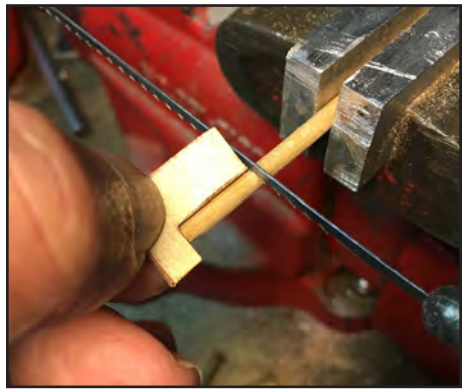


8. A sanding fixture made from scrap.

9. A wheel, mounted on the fixture, is sanded round on the belt sander.

10. Finished wheels.

11. Cutting gauge for the wooden pins.



12. The gauge is used to position the saw.

13. Rough-cut pins.

14. Chamfering a pin by twirling it against the moving sanding belt.

15. Finished pins, ready for the wheel.

paper laid on your bench.

When all the pins have been cut and chamfered, they can be put into the wheels. Put a drop of glue into the hole (not on the pin—**photo 16**) and slide the pin into place. Do this on a flat surface. Excess glue will squeeze out the bottom, which can be wiped off. When finished, set the wheel aside for the glue to dry (**photo 17**). When it's dry, you can sand off the bottom side where the glue squeezed out, to pretty it up.

The wheels can now be test run. Assuming you have their frames in place, with axle holes drilled for the shafts, cut the shafts to length and slip the wheels onto them (**photo 18**). *Don't* fix them in place yet. Note: It's fairly important that the centerlines of the two shafts be in the same plane, as shown in **figure 5**. You'll get much better results this way. Rotate the wheels against each other, making sure that they engage properly and smoothly. When you've determined the optimum positions for the wheels, mark them on the shafts.

There are a couple of ways to mount the wheels on their respective shafts. One way is to glue them in place. If you're comfortable with that idea, go for it. I like my automata to be as completely disassemble-able as possible. Given that, I prefer to pin the wheels to their shafts.

To do this, I first drill a hole for the pin (usually a piece of 1/16"-diameter [1.6mm] brass rod) into the edge of the wheel, through the center hole, and part way into the other side (**photo 19**). I then insert the shaft into the wheel, in its proper position, holding it in place with some tape, if necessary. Then I lower the running drill into the hole just drilled, and drill through the shaft. With the pin in place (**photo 20**), a secure connection is made that can be unmade in a moment simply by withdrawing the pin. Be sure the pin is long enough that it can't be accidentally pushed in too far, making it impossible to remove. If you like, you can bend the end of the pin over 90°.

From this point, you should be able to make pinwheels of any size to suit your needs. In part two of this two-part series, I'll talk about a way to make more precise pinwheels quickly through the use of a specialized tool that you can make.

16. Glue is applied to the inside of the holes.

17. Finished pinwheels.

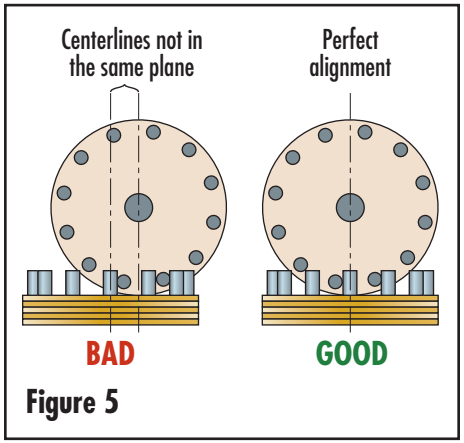
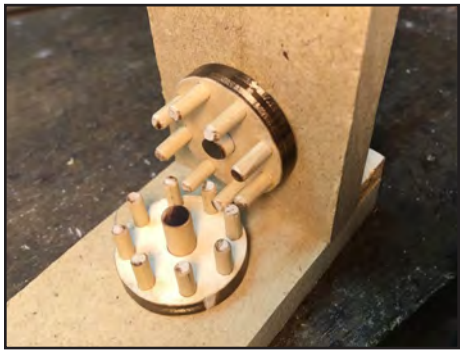


Figure 5



18. Gears being test fitted to determine their optimum positions on their shafts .

19. Gear being drilled for the retaining pin.

20. The finished assembly, smoothly turning. The ends of the retaining pins can be seen.

A visit to

The Boyer Museum of Animated Carvings

Whimsical automata in an unlikely place

by Vance Bass • Albuquerque, New Mexico, USA • Photos by M. Horovitz, unless noted


2


1

Two goats size each other up, then run full speed to butt their heads together. The rest of the flock indifferently munches grass, while a gopher ducks just in time to miss the collision. The goats back up slowly and the contest begins again (**photos 1** and **2**).

A horse reads a newspaper in the waiting-room chair of a blacksmith operation, while other horses get new shoes and then try them out on a treadmill. Meanwhile, workers turn out more shoes using machinery driven by an overhead-belt system (**photo 3**).

An enterprising hillbilly has set up an assembly line to fill crockery jugs with moonshine whiskey. The assembly line is staffed by an assortment of incompetents and loafers but, despite their antics, the jugs keep on rolling through the line (**photo 4**).

In a box underneath each of these scenes is an eye-popping tangle of levers, gears, and cams—all fashioned from brass wire—spinning and moving to create the animated tableaus above (**photo 5**).

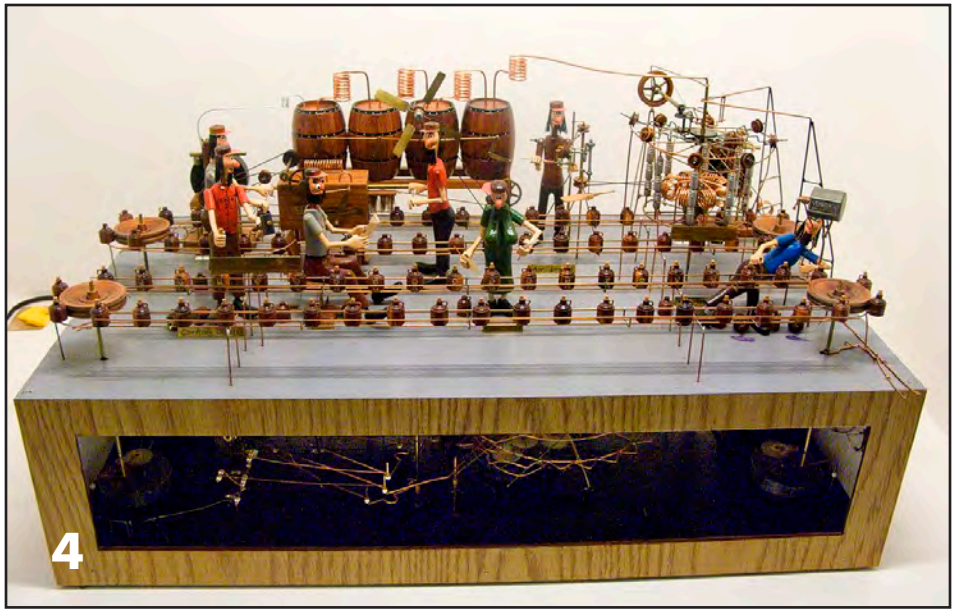
These are just some of the huge array of animated scenes—some comic, some representational—that were carved and brought to life by self-taught Kansas artist Paul Boyer (born 1930). There are some simple automata with one or two motions, but at the center of his creations are complex spreads of multiple figures doing different and often hilarious things.

3

Paul Boyer was always a creative type, as are many farm kids. In addition to the usual tractor repairs and watching Dad do mechanical jobs around the farm, Paul sketched, painted, and carved comic figures. He tinkered constantly. He built go karts that eventually evolved into full-size dirt-track racers. He served in the US Army and he was a farmer—he led quite an active life.

He made his first automaton when still a pre-teen, at age 12. That piece got broken and he chucked it in the trash bin, from which his mother rescued it, storing it away as a memento.

When he was 35, Boyer was involved in a serious accident on a farm tractor, resulting in the loss of a leg. With his world

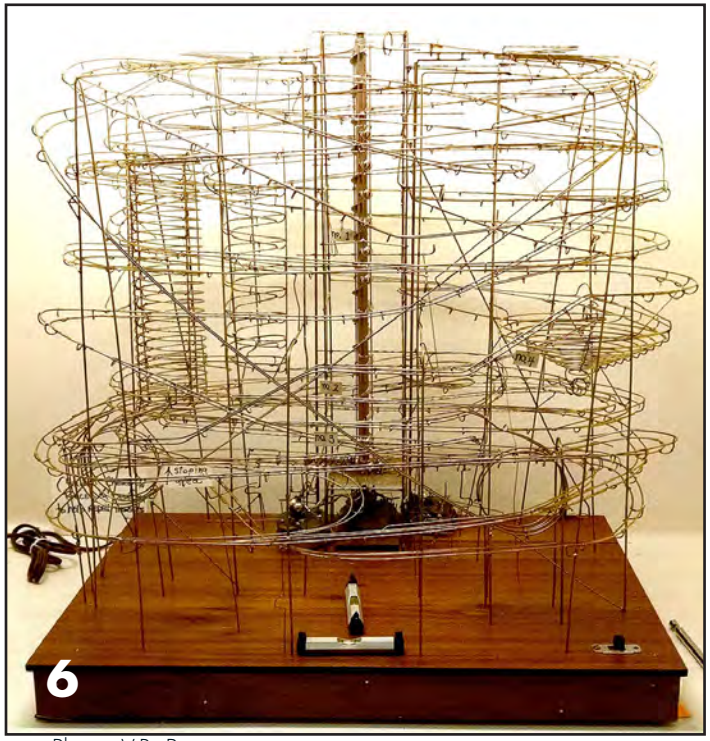


4

5

turned upside down, Boyer lay in bed recuperating, depressed and unable to work. His mother, remembering the broken automaton, brought it to him, suggesting that repairing it might take his mind off his situation. It did.

With lots of time on his hands, Boyer made more automata, then more still, until he finally had to buy an unused storefront in Belleville, Kansas, to house his creations. The gallery opened in 1997 and is now operated by his daughters. He has also built rolling-ball sculptures (**photo 6**), working mechanical models, and abstract metal kinetic sculptures (**photo 7**), many



6

—Photo: V.R. Bass

7

of which are also displayed. The Boyer Museum houses over 60 of these creations in glass-front cases built into the walls, each automaton being driven by small electric motors that are activated when a visitor presses a button.

Belleville is not a major population area, nor is it anywhere near one. It's about halfway across Kansas, east to west, and just a few miles from the Nebraska border to the north. You really have to want to go to Belleville to end up there but it is definitely worth the effort. Be sure to include a detour to Belleville the next time you are anywhere in the vicinity. Only the gallery's location keeps the Boyer Museum from being overcrowded with delighted visitors.

Since photographs show only two-dimensional representations of three-dimensional objects that have a fourth dimension of movement in time, the illustrations in this article will only give you a hint of Boyer's genius. I strongly suggest viewing the videos linked from *kansastravel.org* below. Additionally, a search on YouTube for "Boyer Gallery" and "Boyer Museum" will turn up a good number of visitors' videos. A1

The Boyer Museum of Animated Carvings

1205 M Street
Belleville, Kansas 66935 USA
Phone: (785) 527-5884

Open May–September,
Wednesday–Saturday 1-5pm;
other days and times by appointment

Further reading

The Boyer Museum has no website, but links to further information are available at *https://en.wikipedia.org/wiki/Boyer_Gallery*

- *http://kansastravel.org/boyergallery.htm* has several videos, along with still photos and general information.

More photos and info can be found at:

- *http://kansassampler.org/8wonders/artresults.php?id=89*
- *http://www.detourart.com/fantastic-mechanical-art-in-an-old-ice-cream-shop-paul-boyers-gallery-2/*
- The museum was featured in the book *Rare Visions & Roadside Revelations: Coast to Coast Travel-o-Pedia*, published in 2009. (*https://www.amazon.com/gp/product/1935362437*)

Two pianists and a spinner. The charm and country wit in Paul Boyer's work is evident in these ladies' faces.

AUTOMATA FOR BEGINNERS

Working with kids

by Sarah Reast • Llanbrynmair, Wales, UK • Photos by the author

"I need something to get them off their screens." If I had a pound for every time I've heard a customer say that, I would be quite wealthy! As a mother of three, with all the same concerns about screen time as the next parent, this is a subject I have thought long and hard about. Obviously, we need to find ways to get children thinking and working with their hands and brains. Practical skills are harder to come by these days.

I ran a children's automata workshop recently as part of the Brighton Science Festival. I was somewhat bewildered to arrive at the venue, only to find it was actually a gaming café. There was an entire wall of screens, gaggles of hyped-up kids (big and small) shouting at them, and

Lots of smiling faces can be seen, as the kids show their completed Timberkits' Timbertech Cams kits, as made by the American Robotics Academy.

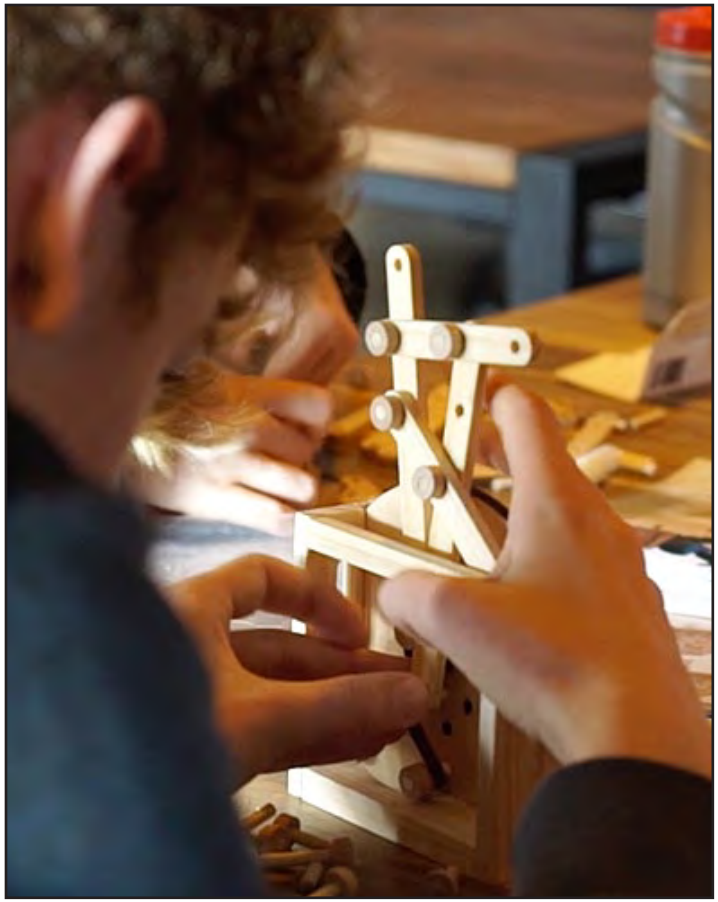
tables leading straight out onto the beach, where everyone's conversations competed with hordes of marauding seagulls. How was I going to engage my young delegates in an activity involving wood, glue, scissors, card, pipe cleaners, and googly eyes, with all that going on at their elbows?

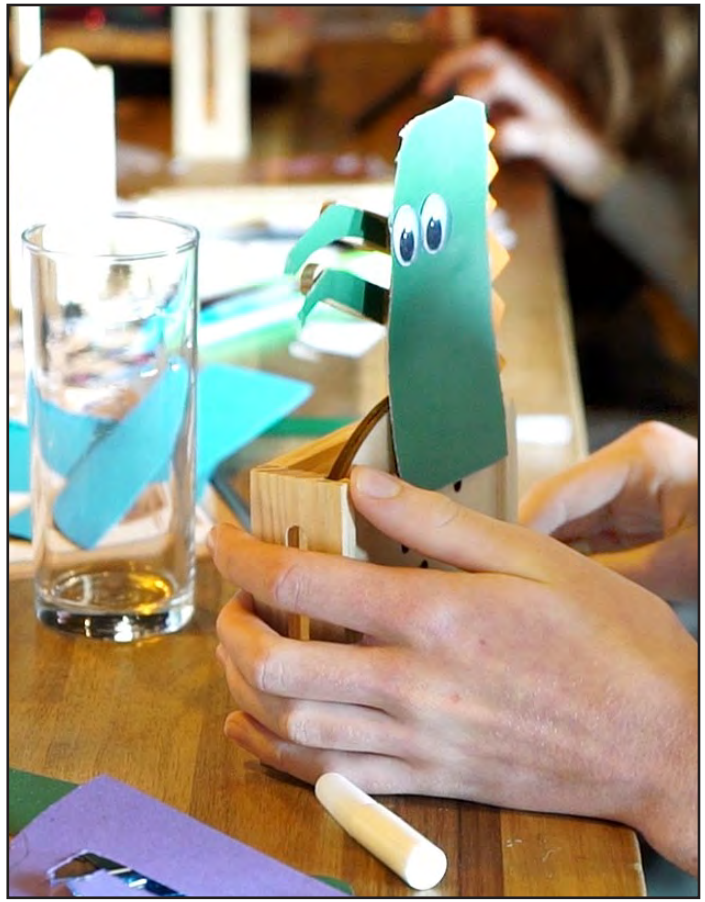
As it happened, there was no problem whatsoever. From the minute we began to the minute I awarded a final prize for the best model, the children were all totally absorbed. I think this is largely to do with the fact that they just love getting messy, and boy did we get messy! I think it's also because you can't beat mucking about with raw materials and the quest to "make something work."

Raw materials are a joy. When you learn to master and manipulate them, you become part of a kind of magic. Wood is particularly fun because it is so accommodating and flexible and can easily be combined with many other materials. It's warm to the touch and smells nice, and its qualities are varied and rich.

To learn how something works, you have to develop the now-much-neglected sense of touch. This is where screen-based activities cannot compete. No amount of clever CGI can help you sense friction, for example, and friction is a huge deal. Is it rough, slippy, heavy, light, easy, awkward, etc.? If you get that wrong, nothing works. Get it right, and the satisfaction of operating a smooth-running mechanism is not to be underestimated. When asked what motivates me, I always answer, "To see the moment someone's face lights up as they complete a model and say, 'Look, I made it work!'" Job satisfaction doesn't get any better than that.

The other really great thing about working with children is that they are effortlessly innovative. I learn far more from them than they do from me. I'm not saying that to be sentimental about kids—I really mean it. They are not hidebound by theory and fear of failure—they jump right in, and to hell with the consequences. The best designs





Timberkits' Timbertech Linkages kits being assembled by young automatists at the Brighton Science Festival.

Succesful completion of a simple automaton is an empowering experience for kids.

are a result of happy accidents, and kids are the professionals in that department.

Videos

Watch this video to see Sarah and Timberkits at the Brighton Science Festival: *https://www.youtube.com/watch?v=ZJqrHrWm3v4&t=2*

This Timberkits video is an example of the author's creativity: *https://youtu.be/2bVDqZnm8Ho*

I feel that the interest in automata is thriving today in a way that it did not when I was growing up. The Internet has enabled us to share this niche interest globally, which is a treat for otherwise lonely enthusiasts. To ensure its future however, we have to get the kids involved. We need to feed off their expertise and, in turn, we need to feed their appetite. Give them a messy space with lots of materials and glue-tolerant clothes, and let them get on with it. I can guarantee that they will. Even better, jump in yourself and learn with them.

In the upcoming issues of *Automata Magazine*, I will be focusing on different aspects of the educational journey of working with a variety of mechanisms, and will happily engage with other research, conversations, and suggestions in different ways that you would like me to. This column will not only focus on children but will also address the challenges of starting to build automata for any age group and ability level. I look forward to meeting you. AM

Contacting Sarah

If you have questions or comments for Sarah Reast about this column, you may write to her in care of *Automata Magazine*: *automatamag@comcast.net* Just put "Message for Sarah" in the subject line.

Sarah is the designer and director of Timberkits Ltd., which create wooden mechanical models sold in kit form. To learn more about her company, visit *https://www.timberkits.com/*

In the next issue of AUTOMATA MAGAZINE

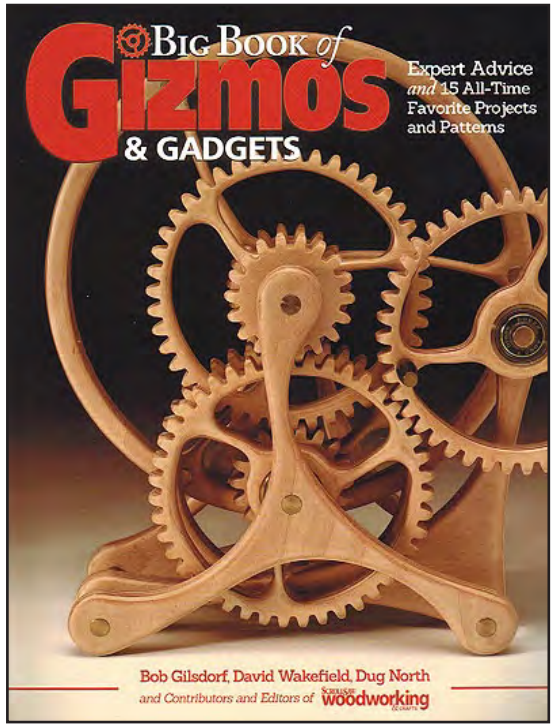
- **Eric Schade** builds a wooden moose walking on a treadmill
- **Paul Spooner** describes "The Last Judgement," his coin-operated automaton for Cabaret
- **John Cervenka** discusses his beautiful automata made of tinplate in the old-world way
- **Sarah Alexander** continues her history of Cabaret Mechanical Theatre
- And much more!

REVIEWS

BOOK REVIEW
Big Book of Gizmos & Gadgets
by Bob Gilsdorf, David Wakefield, Dug North, and contributors and editors of *Scrollsaw Woodworking & Crafts*
Fox Chapel Publishing
https://foxchapelpublishing.com
8½ x 11" (21.5 x 28cm), 96 pp., softbound
ISBN: 978-1-56523-901-2
Price: $16.99US

Big Book of Gizmos & Gadgets is essentially a woodworking book, which is not surprising, as it was produced by the same company that publishes *Scrollsaw Woodworking & Crafts* magazine. It is a how-to book containing 15 kinetic wooden projects.

Each project is described in detail, step by step, accompanied by a plethora of beautiful color photographs. There is also an abundance of templates, full-size drawings of parts, and exploded-view illustrations to clarify assembly. Each project has a parts list, giving name, quantity, material, dimensions, and a note on how the part is presented in the project (drawing, pattern, dimensions, etc.). A list of suggested tools is also supplied. Given the publication's origin, the scrollsaw figures prominently in most of the projects. Other power tools, such as the table saw, router, sander, and drill press, are also used—all common power tools in a woodworking shop. However, with care and patience, many of the projects can be completed with hand tools.



Each project is designed by a different person, and each begins with a large photograph of the finished piece, along with a brief introduction by its designer. From that point, work commences step by step. Each step is clearly numbered and is prefaced with a statement labeling what's happening in that step; i.e., "Cut the front from wood." The extended caption goes on to describe the procedure, the required materials, and the tools needed to do the job.

Of particular interest to automatists are no fewer than five automata projects, with another one or two that might be considered such. These range from relatively simple to fairly complex. "Bounding Seas" features moving waves with a boat being tossed around. "Katz & Maus" is a cat perpetually trying to smack a mouse (and perpetually failing). In another, a cowboy rides a galloping horse. In "Dancing Ballerinas," four dancers pirouette in different ways. Perhaps the most interesting (and complex) is Dug North's amusing "Unwelcome Dinner Guest," in which a dog, whose leash has become unfortunately involved with a birdhouse pole, helplessly yaps at a bird perched on his bowl of dogfood and calmly munching the dog's dinner.

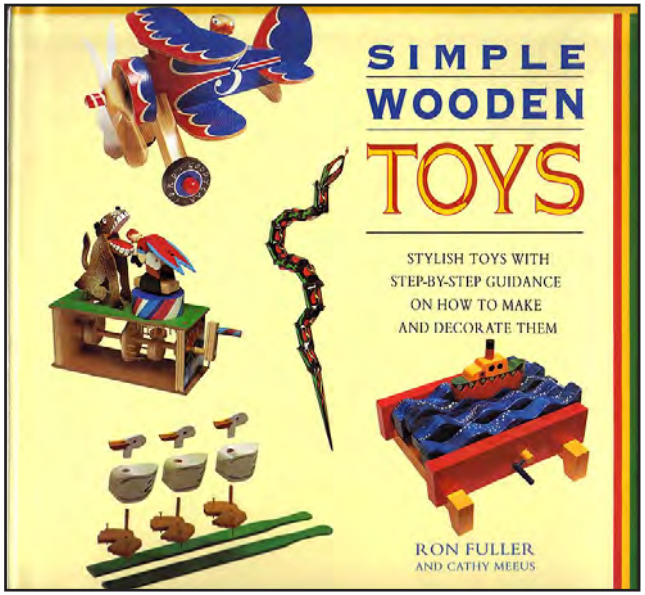
Other projects in the book include a toucan floor toy, whose beak opens and closes; a marble-run race game; a rubber-band gun, and more.

As a bonus, in the back of the book, attached to the inside back cover, is an envelope containing a 21 x 31" (53.3 x 78.7cm) fold-out sheet of patterns for all of the larger parts that were not contained in the book proper. The sheet is printed on both sides, and is intended to be photocopied before the patterns are put to use.

Even if you're not interested in the non-automata projects per se, they shouldn't be ignored. Each contains valuable tips and guides for creative (and safe) woodworking and each involves problems that had to be solved by the designer.

This is a fine book, printed on good quality, glossy paper. Photo reproduction is excellent. Recommended. *—M. Horovitz*

BOOK REVIEW
Simple Wooden Toys
by Ron Fuller and Cathy Meeus
Quarto Publishing plc, 1995 (out of print)
9⅛ x 9" (23 x 22.8cm)
175pp., hardbound with color-printed dust jacket
ISBN 0-7472-1288-0



Ron Fuller (1936-2017) was a widely known and sought-after artist, as well as being one of the founding automatists in the Cabaret Mechanical Theatre. He has authored several books on making wooden toys, but this one in particular has plans for some charming automata and moving toys.

The book begins with a discussion of tools and materials required or suitable for these projects. The tool list is short but there are some specialty items that won't be in everyone's toolbox, so it's good to get his perspective on what's essential. Likewise, he evaluates different types of wood for their appropriate uses. This introductory section, with photos, also functions as a visual dictionary, which is quite useful to those whose native language is not UK English (terminology is especially localized for tools and fasteners).

The second chapter covers basic techniques, such as scaling plans to enlarge them, making paper cutting templates, cutting and drilling, gluing and soldering, and finishing and painting. There are some gems of hard-won experience for most of us.

Beginning makers will appreciate the thorough tools and materials lists for each project (though experienced workers may also learn something here or there). Everyone will find the detailed, dimensioned plans and thorough instructions useful. All of the toys are well illustrated with color photographs (toys are all brightly painted), as well as perspective drawings showing the building procedures.

There are four contributors of designs: Fuller, Pippa Greenwood, and prolific toy writers David and Jill Hancock. Some are classic handmade toys, such as the articulated snake, the waddling ducks, or the pecking hen. My favorites are the two classic automata designs: Fuller's "Lion Tamer" and the Hancocks' "Boat on the Ocean," the latter being a fundamental design that you'll see again and again. These are also the most complicated projects in the book and contain more sophisticated techniques, such as making pinwheel gears and drop cams. The other toys are charming, too, and some probably qualify as simple automata as well (the egg-laying puffin and "Jungle Race," in particular). There is a short video of a reader's "Lion Tamer" here: *https://youtu.be/zMb2-7pi87Y*

While the book is out of print, websites like *bookfinder.com* will turn up multiple copies, some in new condition, for reasonable prices. This is a beautifully produced book and thus well worth having, especially at used-book prices. —*Vance Bass* AL

Many books about automata, and of interest to automatists, are now out of print. However, they are still valuable and most are available on the used-book market. Given that, in this and upcoming issues of *AM* we'll be reviewing some them.

The End