A Recorder Builder's Odyssey

In 1668, Samuel Pepys wrote in his diary about his transformation occasioned by hearing a recorder (or recorder consort) during a theatrical performance:

> *...neither then, nor all the evening going home and at home, I was able to think of anything, but remained all night transported so as I could not believe that ever any musick hath that real command over the soul of a man* [sic] *as this did upon me.*

I had a similar conversion experience when I happened upon a description of a five-day recorder making course on Tim Cranmore's web site. Tim has been hand-building recorders in Malvern, England, for more than 30 years.

I knew at the instant I read about his course that I would take it. In my imagination I was already in England, seated contentedly in a thatched cottage, building my own instrument. This giddy fantasy kept me awake late into the night.

The next morning, I realized the impracticality of it all: I live 3500 miles away, have family and work responsibilities, and possess zero instrument building experience. Nevertheless, the seed of the idea took root that day, and from that moment forward, I found myself drawn to England to take that course.

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Although I have been playing recorders for 35 years, the thought of making one had never occurred to me. I am not much of a builder. I own a few tools, but rarely try my hand at anything more challenging than tightening loose screws or hanging pictures. I can, with difficulty, assemble Ikea furniture.

Building a recorder involves woodturning, but I hadn't touched a lathe since Grade 7 shop class; even then, the teacher did most of the work. Despite my lack of practical skills and the difficulty of getting myself from Canada to England, I was undeterred. Like many transformative experiences, passion trumped reason!

A few months later, I received an invitation to a family function in London. With a trip to England in the works, I exchanged e-mails with Tim and settled on a date. There would be one other student, and we would each build a reproduction of a Stanesby Jr. alto, scaled to 415 Hz, out of Canadian maple.

Preparing for the odyssey

On his web site, Tim guarantees "that you will leave the course with either a working alto recorder or voice flute that contains as much of your own work as you are able to give." Despite this assurance, I wanted a head start. I asked a cabinet maker friend for an afternoon refresher on using a lathe.

Not surprisingly, whatever measly skills I might have started to develop 44 years earlier were long lost. After an hour of practice, however, I was somewhat familiar with the lathe, understood how to hold the chisel, and could shape crude Baroque-like bulges. While putting the final touches on my first bulge, the chisel bit at the wrong angle, and *THWACK*! The wood cracked in two. It was not an auspicious start, but at least I would not be beginning entirely from scratch.

Aware of my limited woodturning skills, I prepared in other ways. I read about acoustics (a difficult topic, but I came to understand how the sound of the recorder is produced); watched videos and read web sites on recorder and

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Acknowledgements

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In March 2012, I traveled to England to take a five-day course on recorder building from Tim Cranmore.

In this article I document my odyssey through stories and photographs—the process of learning to build beautiful recorders from scratch.

woodwind making; and, with a magnifying glass, studied the crannies in every recorder I own. I had never paid much attention to their construction, so my goal was to be familiar with the names of the various bits and pieces.

I found this challenging. The reason for my difficulties, I came to understand during the course, was the sheer complexity of the Baroque recorder. For example, looking through the window into the bore, at least 10 surfaces are visible. Each surface—and its relationship to the others—crucially affects sound color, tuning and responsiveness. I could not hope to understand these intricacies after an hour or two of peering into my instruments.

The master 18th-century builders did not learn it all in a day, either. The Baroque recorder was the culmination of 500 years of evolutionary development. Later, I would learn that the process of incremental improvements continues to this day.

The venue

On the first day of the course, I boarded an early train in London and alighted in Cambridge an hour later. Tim picked me up and drove us eight miles to Bury Farm in the village of Stapleford.

Bury Farm houses the workshops of the Cambridge Woodwind Makers, a charitable organization devoted to preserving traditional instrument making skills.

The site was in the process of being transformed from derelict buildings to offices, classrooms, a concert hall and a workshop. In addition to hosting Tim's course, the Cambridge Woodwind Makers offer hands-on classes on natural trumpets, wooden flutes and mechanical keys for woodwinds, among others.

The workshop had been a stable. Now renovated, it has massive timber ceiling beams, large skylights and sliding glass doors overlooking a quiet marsh. The building is an open-concept design, with a meeting space, a workbench area, a vented machine room, a small kitchen and storage racks. The workshop is well-equipped with power and hand tools.

Some equipment, purchased from out-of-business instrument makers, has historical significance: a "setting out machine" from the Ward and Winterbourn oboe company had been in continuous use since the 1880s, and a workbench was from the Dolmetsch factory, which closed in 2010.

Why teach recorder building?

Dolmetsch ceased production of hand-built recorders when the longtime members of the company—including its instrument makers—retired. Nobody was left to carry on.

Tim knows about 25 people worldwide who have the ability to craft and voice recorders in ways comparable to those of the 18th-century masters. Tim, who is acquainted with most members of this "cartel," wrote:

> *After many conversations with my colleagues around the world, we have come to an unfortunate conclusion ... none of us [is] getting any younger. We also look around and see the same faces we saw 20 years ago. Great for workspace solidarity, but worrying.*

… worrying, because a dwindling number of individuals possess the skills to carry on the tradition. Younger makers entering the scene "have to compete with our generation, and many have fallen by the wayside." Part of Tim's motivation for offering the course is to prevent recorder building from becoming a lost art. So far, 12 people have signed up. He keeps the classes small: the maximum is two students.

I think Tim had hoped his course would entice young people. Ironically, most who have taken it are unlikely to join the next generation of recorder makers. At age 56, it's a little late for me to change careers. I don't even have transferable skills: I was a freelance computer consultant for 20 years before accepting an administrative position at a Toronto university.

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My fellow student, Jeremy, is a 61-year-old retired doctor who recently took up Baroque oboe building. Jeremy also plays recorder, and although quite handy with tools, his motivation was the chance to enhance his budding skills. Instrument making, however, is Jeremy's hobby, not his vocation.

Jeremy and I may not have been the demographic Tim had in mind when he envisioned the course, but we agreed that Tim generously shared his vast knowledge with us; was a superb instructor; and, overall, provided us with an education impossible to find elsewhere.

A typical day

Each day began with Tim demonstrating the tasks ahead on the recorder he was building. Afterwards, Jeremy and I replicated what he had done. If either of us needed help—which happened often—Tim was close by to lend a hand.

I was game to try doing everything myself. My hand was involved in all aspects of construction, but Tim ensured my recorder would be a good one. If a task proved too difficult, I never hesitated to ask Tim to help—or to complete the step for me. Tim had an uncanny sense of recognizing when I was about to run afoul. Several times he swooped in and prevented me from wreaking irreparable damage: shaving off too much wood, drilling a hole in the wrong place, and so on. He was

always patient, and never stopped explaining, demonstrating and being a model problem solver.

It takes tremendous focus to scratch-build a recorder in five days. Even with the inevitable setbacks, Tim kept us on schedule. We worked at a steady pace all day, usually wrapping up by 5:30 p.m.

Three times a day, we stopped work, sat by the marsh, and drank tea. I knew about British tea culture, but had never experienced it. There is much to recommend about the practice. Now that I am back to my regular routine, I have started taking tea breaks at 3 p.m.

Coincidentally, tea became popular in England around the same time as the recorder. In 1660 Samuel Pepys wrote in his diary, "I did send for a Cupp of Tee (a China drink) of which I never had drank before."

Day 1: Reaming the bore

Tim began the course with a discussion of bore theory. By way of a historical overview, Tim played us tunes on whistle-like instruments and Medieval recorders with straight bores; Renaissance recorders with flared bores; and Baroque recorders with tapered bores. Using this demonstration, he illustrated how the shape of the bore determines an instrument's unique sound and playing characteristics.

The tapered bores of the best surviving 18th-century recorders are exceedingly complex: the middle joint may have three to seven changes in diameter; the foot joint and head joint bores can have multiple tapers.

Modern builders have improved their reproductions of historical instruments by making refinements to the instruments' bores. An experiment, first mentioned by Adrian Brown in his 1980s recorder maintenance manual, shows the effect of narrowing the bore at different points along its length. Tim repeated the experiment for our benefit.

He fastened a thin metal spike to the table top, attached a lump of modeling clay to its end, and lowered a recorder onto the spike. While playing a note and moving the instrument up and down over the spike, the influence of a narrower bore on that note was audible. When the clay was positioned just right, the note became noticeably stronger.

By repeating the experiment for different notes, builders have learned to optimize bores. The burble in low G (or A), once thought to be inevitable, proved to be correctable by making minuscule changes to the dimensions of the bore. My new Stanesby Jr. has a resonant low end with no burbles at normal—and even above-normal—breath pressures.

To make a Baroque recorder, one needs three pieces of hardwood (for the head, middle and foot joints); a piece of cedar (for the block); and many tools. Lathes, drills and scalpels are readily available, but some tools must be custom-made. Because the lack of specialized tools could be a barrier for a novice maker, Tim taught us how to make a head joint reamer in under 30 minutes. (Jeremy and I labored all afternoon making ours.)

A homemade reamer for shaping the tapered bore. Top: After turning a piece of hardwood to the correct dimensions and cutting it lengthwise, a saw blade is aligned along its length. Bottom: Securing the blade into position with screws.

This reamer produces the tapered bore for the head joint. Tim constructed it from a hardwood dowel, a worn-out band-saw blade, and five small screws. These "improvised" reamers are cheap, accurate and durable—with minor maintenance they will last a lifetime. I have kept mine as a souvenir.

The final task for Day 1 was reaming our instruments. Beginning with three "blanks" (pre-drilled maple blocks), we used our homemade reamers to enlarge the holes in the head joints to their final size, and used reamers that Tim provided to create the bores for the middle and foot joints.

Day 2: Shaping the exterior

On Day 1 we worked on the interior of our instruments; on Day 2 we produced their exteriors. Referring to detailed drawings of the Stanesby Jr. alto in the Warwick County Museum, we spent the entire day reproducing its elegant lines, bulges and embellishments.

Reaming the bore. Top: Checking the dimensions of the head joint bore. Bottom: The head joint after reaming.

This was precision lathe work requiring great concentration. We measured distances and diameters with calipers accurate to 0.1 mm (0.04 inch). Using increasingly finer cutting tools, we slowly coaxed our recorders to assume their final shapes.

Once the profiles were right, we polished them on a spinning lathe with 400- and 600-grit sandpaper. Last, we applied several coats of finishing oil to protect and waterproof the exteriors. We set the pieces aside to dry overnight.

Day 3: Making the windway

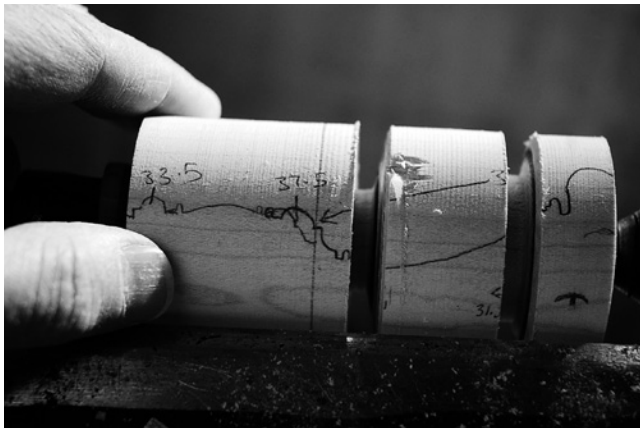
At the end of Day 2, Tim demonstrated an ingenious, manually-operated machine that greatly simplified the process of carving a windway. On Day 3, Jeremy and I got to try it ourselves.

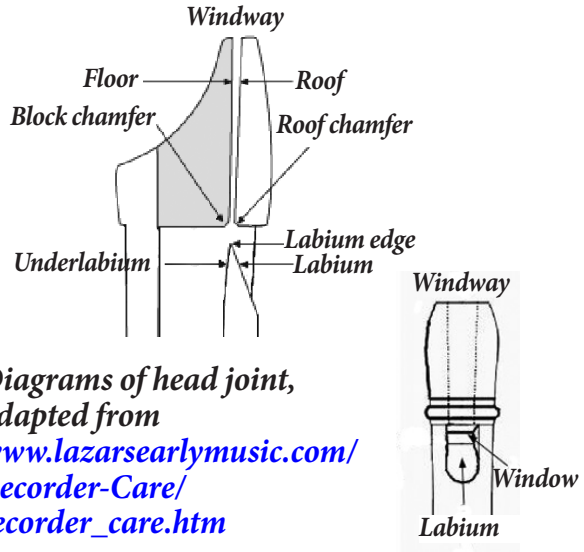
Although considerable skill was needed to set up the machine, once done, it formed the windway in less than a minute. Moving a lever back and forth caused a razor to plane paper-thin slices from the "roof" of the head joint, leaving clean, perpendicular edges.

Without the cutter, carving a windway would take hours of precision filing and scraping through the small opening at the end of the head joint. A purist might choose to carve a windway by hand; as a novice, I appreciated the convenience of this clever tool. Most professional builders, according to Tim, use a windway cutter.

Carving the windway can be automated with a machine; cutting the labium and window is best done by hand. It took Tim 20 or 30 minutes, but I spent nearly three hours—and loved every moment of it.

Footjoint and lathe work. Top: Using a lathe to form the exterior contours of the foot joint while checking its dimensions with Vernier calipers. Next: The initial turning of the foot joint exterior, marked with its dimensions and a sketch of its final shape. Last: Finishing the foot joint with superfine sandpaper.





Diagrams of head joint, adapted from www.lazarsearlymusic.com/Recorder-Care/recorder_care.htm

While preparing at home, I had tried to understand how these same parts fit together. Now, inspired by the Dolmetsch factory bench I was perched over, referring to the technical drawing beside me, and peeling back layer after layer of wood, the surfaces that had perplexed me came into existence under my hands and before my eyes.

I had needed help with woodturning, but discovered that woodcarving was within my grasp. Although I asked Tim to do the final sculpting of the labium, I felt that for the first time, the detailed handwork necessary to make a great instrument had been mostly my own.

Day 4: Carving the block

The better part of Day 4 was devoted to carving the block (*shaded area in the above diagram*). We began with a cylinder of cedar of the same diameter as the head joint opening, and cut a flat surface along its length. (Once the block is inserted into the head joint, this surface becomes the "floor" of the windway.) The task was to whittle away exactly enough block to fit snugly into the head joint socket.

The process was rhythmic and engrossing: push the block as far as it will go into the head joint; knock it out with the block hammer; note the areas where the block resists moving inside the socket; and scrape away a little wood from those spots.

Top: Tim sets up the windway cutter. Next: The windway cutter uses bolts to hold the head joint firmly in position. A razor-sharp surface (not visible in the photo) at the end of the metal shaft is inserted into the bore, carving an arched windway. Third and last photos: After clamping the head joint securely, the labium and window are meticulously shaped by hand.

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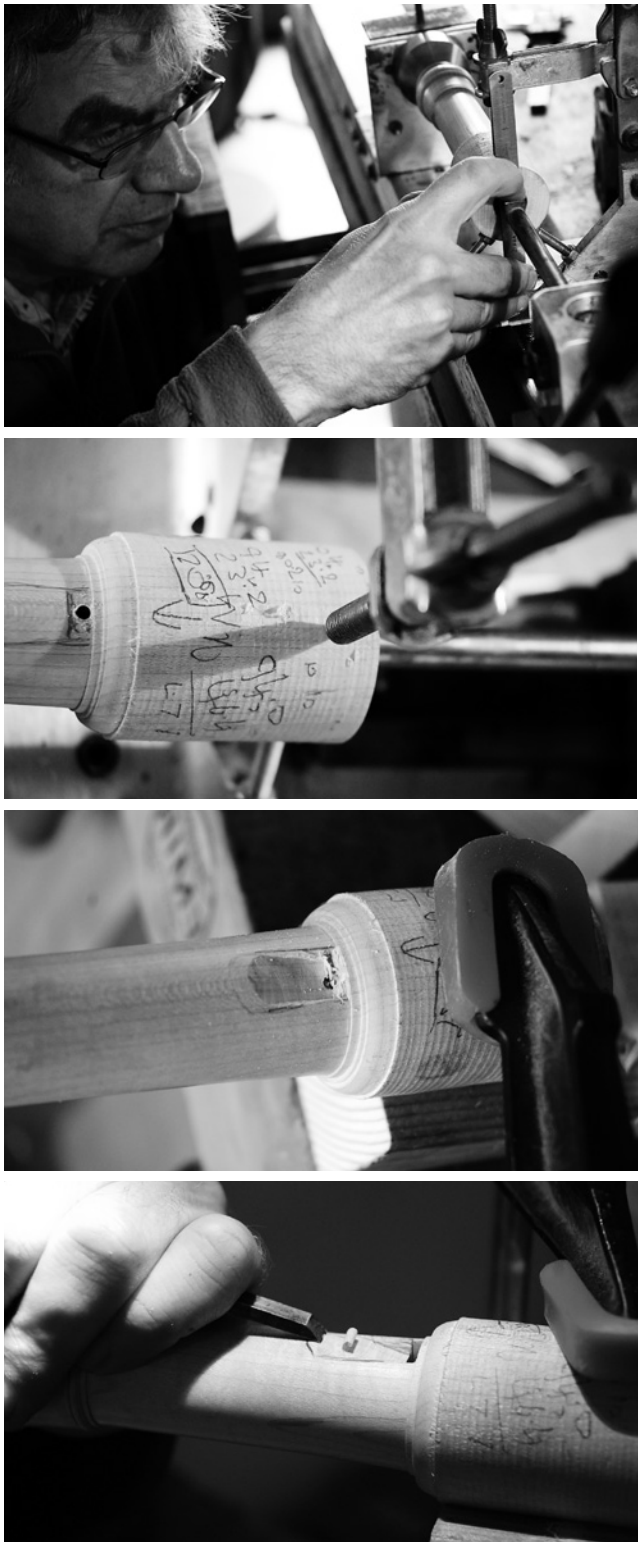

I repeated this cycle of actions hundreds of times. Again, I was in my element (*above, learning to carve a cedar block*). After three hours of meditative sculpting, I felt a growing confidence. Maybe I could quit my job and set up shop as a professional recorder maker!

The reality was that I was overconfident. On the verge of completing my block, I removed a sliver too much and was forced to start again. I was faster the second time and, with Tim's assistance, completed my block before afternoon tea.

With the block secured in its socket, I blew air into the recorder for the first time. Without finger holes, it didn't sound like much, but it was an exciting moment. The end was in sight.

After tea, we used a hacksaw to form the end of the head joint into the beak; smoothed the curved surface of the beak with sandpaper mounted on a rotating drum; drilled finger holes; sanded off the sharp edges from the beak and finger holes; and, with a circular file, created the "dimples" that encircle the double holes.

Finally, we wrapped the tendons with red cotton thread, and impregnated the thread with glue and paraffin. Now the three sections fit snugly together and the recorders were actually playable—although they sounded very rough. Tim assured us that tomorrow's voicing would fix that. Most new instruments need to be played and

To sharpen a note that is slightly flat, Tim undercuts a finger hole with a scalpel.

revoiced several times before the sound settles, but the initial voicing would be a good start.

Normally at this point in the process, a builder removes the block and plunges the instrument into boiled linseed oil for days, weeks or months. In time, the oil seeps deeply into the fibers to seal, waterproof and stabilize the wood. But because this course was short, our instruments were only soaked overnight.

Day 5: Voicing the recorders

When I arrived the final morning, Tim had already removed the recorders from the oil and was wiping them dry. We gathered at a workbench to begin voicing our instruments—the delicate shaping of the block, windway and bore that critically determines sound quality.

Until this moment, the course was hands-on and experiential. The voicing module was the only activity without expectation that students do anything other than observe. Voicing is not quickly or easily learned. Tim admitted:

> *I have been voicing recorders for 30 years and I still don't really understand it. All I do know is that ... all parts of the tube contribute, and all of them have to be considered. A mistake that I often made, as presumably did everyone else, is to look for a magic bullet that will conquer all the faults in one fell swoop .... The fact is that ... you are balancing surfaces, angles, directions, air flows, air pressures, any one of which could profoundly disturb the sound if you get it wrong .... For example, at the windway exit there are many angles, surfaces and dimensions, all of which have to match, be symmetrical, and correctly guide the airflow.*

While voicing the instrument, Tim uses a hand reamer to slightly increase the diameter of the bore.

While voicing the instruments (*above center, and above*), Tim provided a running commentary of what he was doing and why. He began with low F, moved up a semi-tone, and methodically worked up to high G. He repeated the cycle twice, making adjustments after listening to each note as well as to other notes that had been affected.

Adjustments he made included smoothing surfaces; widening the bore; undercutting finger holes; enlarging the windway exit chamfers; sharpening the labium; modifying the contour of the underlabium; and reworking the curvature of the windway roof and floor. He may have made other modifications as well. I watched intently, but there was a lot of information to absorb.

After almost two hours of voicing my instrument, Tim handed it to me. I played a few tunes. Outwardly I smiled. Inwardly, I could have been channeling Samuel Pepys: my new recorder "did please me beyond anything in the whole world ... so sweet that it ravished me."

Post-odyssey

When I tell the story of my trip to England, the question people ask most often is, "are you going to start making recorders?" My answer is "no." I don't have a workshop, power tools (other than a drill), or the proper hand tools. Although my skills improved during the course, they did not advance to the point that I could confidently perform the steps myself. I would need a lot of handholding.

I thoroughly enjoyed Tim's course—but, back at home, my normal life resumed. I was left with happy memories, hundreds of photographs, a fantastic new instrument, an appreciation for the English tea ritual, and two new friends. Although I have no desire to build recorders for a living, I would gladly take the course a second time.

My experience of being immersed in the recorder making world, however, did have an unexpected upshot. I discovered that I had absorbed and integrated a far greater understanding than I would have imagined possible.

At home, I continued to blow-in my Stanesby Jr. for 15 or 20 minutes a day. But gradually, the sound became stuffy; certain notes developed an edginess. I tried oiling the bore with almond oil, but the sound failed to improve.

In a flash, I knew exactly what to do. I grabbed a wooden spoon from the kitchen, and used it as a block hammer. *THWACK*! The block came out with one strike.

I lightly touched the block's top surface (the windway floor): it was rougher than I remembered; ditto for the windway roof. I peered into the bore and noticed tiny slivers protruding from one of the finger holes. I looked through the bore under a strong light and spied a rough spot. I inserted a finger into the bore. It was bone dry.

With an X-ACTO knife, I sliced a Popsicle stick lengthwise into two strips that were slightly narrower than the windway. I glued 400-grit sandpaper to one strip and 600-grit sandpaper to the other. Using my improvised flexible sanding tools, I smoothed the roof and floor of the windway without altering their curvatures.

Stiffening my sanding tool with a finger, I smoothed the top of the labium. Inserting it into the head joint, I was just able to reach the underlabium and smooth it. Spotting a subtle asymmetry on one side of the window, I corrected it.

I purchased a metal spike at a hardware store, tightened it into my drill chuck, wrapped its length in super-fine steel wool, and, with the motor running, gingerly polished the bore. The rough spot and the protruding slivers were reduced to dust. Reinserting the block, I played and listened closely. The stuffiness and edginess were gone, and the sound was like honey—but I was not done.

The overnight oil soak at Bury Farm had not been enough. I returned to the hardware store and bought boiled linseed oil. I placed the instrument in a bucket and poured in enough oil to cover the wood. Because boiled linseed oil can spontaneously combust, I moved the bucket to a well-ventilated shed and left it for 10 days.

I discovered that I had absorbed and integrated a far greater understanding than I would have imagined possible.

The oil imbued the wood with a golden patina, and its grain appeared more striking than before. I wiped off the oil repeatedly with clean cloths, as I had observed Tim doing, and let the oil evaporate for a day. Before reinserting the block, I rubbed its sides with beeswax to prevent contamination by residual oil seepage from the socket.

I played non-stop for a long time. The instrument had never sounded better. I knew I should treat it as new and blow it in gradually, but I couldn't stop. Passion trumped reason again. As I played, I felt myself transported into the wood fibers. I felt my breath accelerate through the windway, strike the labium's edge, exhale through the open holes, and vibrate as a sonorous column of air. The recorder was singing.

There is no "perfect" recorder, and mine is no exception. My Stanesby Jr. has a few minor quirks, and, not surprisingly, it is not as good as the ones Tim builds himself. Nevertheless, it is an outstanding instrument, and my current favorite. Although I had the *chutzpah* to attack it with sandpaper and spinning steel wool, I recognize the limits of my abilities. After playing it a month longer, I mailed it to Tim for a professional tune-up. It arrived home sounding and responding better than ever.

I continue to derive tremendous pleasure from the knowledge and skills I gained during and after the course. My participation has given me a strong, albeit imperfect, sense of how and why those bits and pieces harmonize together to produce the sweet sounds of the recorder.

Further information

Cambridge Woodwind Makers:
www.cambridgewoodwindmakers.org
Hand Tools for Recorder Making, by Gary Cook:
www.recorderhomepage.net/tools.html
How a Recorder is Made, featuring Jean-Luc Boudreau:
www.youtube.com/watch?v=WiSW6LPchSc
Making a Recorder, by Philippe Bolton:
www.flute-a-bec.com/fabricatgb.html
Obedience Training for Recorders, by Tim Cranmore:
www.recordermail.co.uk/acatalog/Books.html
The Recorder: A Basic Workshop Manual, by Adrian Brown: ***www.dolce-edition.com/workshop.html***
Tim Cranmore: ***www.fippleflute.co.uk***
Visit ***www.youtube.com/user/americanrecordermag*** *to see more of, and hear, Alan Cantor's scratch-made recorder.*