Mr. F. R. Davidson, successful violin maker, see page 16.

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GUEST EDITORIAL

Facts and Figures

by Norman Miller

It is with justification that the average professional maker does not want to part with his hard won knowledge, and it is his prerogative to withhold any such knowledge from beginner or others, in violin-making.

There is no doubt that there is a great deal of virtue in this, as it prompts the beginner to think for himself, and to find out, generally the hard way, how different needs are fashioned. Needs necessary for the production of a quality instrument.

This is a good thing, as it promotes thought, and the beginner then might become a finer and more knowledgeable maker.

The anomaly arises, however, in that the beginner with his original thoughts and practices does not always adopt the rigid precepts which professional makers claim should be strictly adhered to, although they do not always do so themselves and which they cannot positively say why such are the rule, and should therefore be followed. Each professional does not follow exactly the same plans and rules as another, but have their own pet ideas and measurements which they find are suitable for their productions; yet, though the beginner is shouted at to use his own head, it would seem that he and his theories are only accepted if he thinks along the lines of thought of his professional critic who endeavours to steer him into predetermined channels and not allow any new idea or original thought to be accepted as feasible. The critic rarely even bother to make a test of the new idea, or to try it out, but condemns it on principle only without even one fair trial.

Mr. N. Nicholas in "Lutherie" has the right approach and says:

"...we often have the most useful remarks coming from complete newcomers, just confirming the belief that the specialist is so surrounded by rules and regulations that some new phenomena remains unnoticed by him, or if noticed remains unappreciated as something unusual. The more a man depends on rules and regulations and less on his intelligence, the more he is in terror of any new departure. It is why we practically never have any new ideas coming from professional makers, and depend for the progress of our art on clever and enthusiastic amateurs."

In so many cases, while the critic finds many words to show where the beginner's idea is wrong, his criticism consists of destructive diatribe only, and never gives one alternative, supported by facts, figures and diagrams that may be followed; offering nothing constructive, and does little more than to spread confusion. Such critics who have nothing to offer and have no intention of making their knowledge public, let them hold their peace. They may sit back completely smug and enjoy the ignorance of bumbling amateurs and beginners trying to help each other to the full extent of their own experiments and practical findings, and by open discussion and debate, backed up by all necessary data. Comparative tests may be then made and the theory fairly judged on its merits.

Let us have a rule, that where condemnation is made, or an idea disagreed with that practical data must be given to substantiate any difference of opinion.

Two heads are still better than one, and those dogs in the manger who have the bone and snarlingly throw others into confusion have no place in developing or encouraging violin making even though they may be prompted by some rather false ideas that they are helping the beginner to use his own head.

Also if an idea is to be criticised, criticism would be on more solid ground if the idea has been tested and tried at least three times by the critic before he be deemed to have authority to charge it as wrong.

Let us have criticism by all means, but let it be constructive, let us have debate, but not argument. Let us not become bitter because our own pet theories are not immediately accepted by all, and no matter how wrong you may think the other chap's idea is, give it a fair trial by actual construction and not rush in and, as some do, write bitter words to condemn it offhand. You see we are told that no one yet has made a violin as good as Stradivarius did. Does that prove then that his methods are wrong, yet how many thousands of violins have been made following exactly as the makers knew how, Strad's ideas, and none we are told are equal to an original Strad. So even with trial, it does not always prove that someone else's idea is a wrong one.
The 1961 International Festival has come and gone. This, Vancouver's seventy-fifth anniversary, and the Festival's Fourth, is a case of the very young saluting the old. This festival is not just a collection of famous artists, it is more. Vancouver, at age seventy-five, by world standards is still very young, with a magnificent future ahead. In one of the finest natural settings of any city in the world, it will provide a gathering place for great creative talent.

This annual International Festival provides our own talented artists in Symphony, Opera, Concert and Chamber Music, drama and the visual arts with the opportunity to prove and develop their talents in collaboration with the world's outstanding artists.

Notably, and of special interest to those of us who are lovers of the violin, was the appearance of the noted violinist, Mr. Isaac Stern, who was conductor and soloist of the Festival Chamber Orchestra in a fine program of works from Bach, Haydn, Beethoven and Mozart.

The famous Paganini Quartet which takes its name from the instruments it uses, all made by Stradivarius, and at one time owned by the great Paganini, also gave two very fine performances in the Vancouver Art Gallery.

Several of our violin makers who attended the performance were afterwards given the opportunity to talk to the Artists and to examine their famous instruments. It was a very successful festival.

Once again the Violin Makers of British Columbia put on an exhibit in the Pacific International Exhibition Hobby Show. This year for the first time saw no instruments entered from areas outside British Columbia, and we had the show to ourselves, so to speak.

The results of the judging were as follows:

First Prize and Cardo Smalley Trophy "For Best Instrument" for a Viola Da Gamba won by George Friess.

First Prize for Violin, and Don White Trophy "For Best Toned Violin" won by Peder Svindsay.

Second Prize for Violin won by Ragner Helin.

Third Prize for Violin won by George Friess.

Third Prize for Violin won by Carl Thoen.

Special Award for a Violin made of Camatong Mahogany back and Spruce top, by Mr. George Wright.

First Prize for Cello won by George Friess.

Of special interest to the public was a miniature violin with a body length of four and one-quarter inches, complete with blocks and linings, which was made by Mr. Morris Rickson, of White Rock, B.C. Our display once again took the Bronze Medal, this being the third time that our Booth has won this award.

"There is nothing, I think, in which the power of art is shown so much as in playing on the fiddle. In all other things we can do something at first,"

... Samuel Johnson
Varnish NOT Sub-Varnish!

Mr. E. H. Sangster corrects Mr. Robert Minster

On page 21 of the July-August Journal you printed a letter in part from Robert Minster "Earle Sangster's recipe." Why do people when you tell them something or try to help them, get it all wrong. I am about ready to give up writing anything for publication.

Mr. Sangster did not give anyone a recipe for a colorless sub-varnish. The recipe Mr. Sangster gave is in Edward Allin's book and the book by Geo. Fry on page 16.

I give it once more.

**Fioravanti (Bologna 1564) Formula No. 11**

- Linseed oil .................................................. 1 part
- Greek pitch (i.e., resin from fir trees of Calabria). 2 parts
- Pine resin .................................................. 1/2 part

Substitute. Venetian turpentine instead of Greek pitch.

The above makes a beautiful golden red varnish.

Sincerely,

E. H. Sangster

---

Mr. Carmen White also comments on Mr. Sangster's Varnish

May I comment on the letter about varnish from Mr. Robert Minster, which appeared on page 21 of the July-August issue?

I hope that Mr. Michelman and Mr. Sangster will answer the questions Mr. Minster has raised--Mr. Sangster's varnish may be made with ordinary rosin, which I believe is what pine resin is called commercially today. Mr. Sangster showed me a violin varnished with the Venetian turpentine and it did not appear to be the least bit tacky. Perhaps he will explain the process in detail for us, or for those who want to use this varnish.

The yellow which turns green or yellowish-green under the varnish is potassium dichromate, widely used as a yellow stain. The yellow it produces is beautiful indeed, and the violin maker will surely think he has found something--but when it oxidizes, it turns a dark olive green in color, and the effect is ghastly to say the least.

I am not familiar with propolis and cannot speak for its permanence but a fine yellow color is obtained with common rosin dissolved in turpentine and a little boiled linseed oil--this mixture applied hot (water bath here!) to the raw wood and wiped off in ten minutes after the wood has absorbed all it will take, will give a permanent yellow color to the wood--and it will not turn green, but many will turn green with envy when they hear the tone of the violin if the instrument has been made properly otherwise.

To return briefly to the Fioravanti recipe #11 submitted by Mr. Sangster: surely we must know that if Italian varnish were this simple and easy in preparation, we would all have had it down through the years. Is anyone of us so naive as to actually believe that this recipe has not been tried thousands of times and found wanting? If the varnish of Cremona were this simple and trivial in nature, these would certainly have been no mystery about it through all these years. Michelman has analyzed the old Italian varnish and found aluminum, iron, and other metallic elements in it. I hope some of you violin makers will tell us exactly how you are going to get aluminum and iron into a varnish made by this Fioravanti recipe #11? I will go further and ask you how you are going to get iron or aluminum into any varnish prepared by dissolving some gum substance in oil and thinning with a solvent--turpentine or otherwise? In my opinion, this is the most burning question about violin varnish today--and the answers should be interesting, to say the least!

The article about Dr. Francesco Kresnik was most interesting, but again, it is entirely misleading in this sentence in the description of Dr. Kresnik's varnish: "The varnish was prepared with the most possible care in ACCORDANCE WITH THE METHODS USED BY THE MASTERS OF CREMONA, AS THIS HAS BEEN THE SECRET OF THEIR SUCCESS, IN OTHER WORDS, HE SUCCEEDED IN MAKING THE SAME VARNISH, USED BY THE OLD MASTERS". (Capitals mine.) P. 8, July-August issue.

Now, I submit that this is a case where the writer simply got carried away with himself. There is no authentic and sure record of the methods used by the old masters of Cremona anywhere in the violin literature that I know of. Surely if Dr. Kresnik actually recreated the old Cremona varnish, it would be known and recognized throughout the world of violin connoisseurs. Or would the mighty fact lie buried in a fine eulogy of the man written in the recurrence of the 19th year of his death? Our common sense should provide the obvious answer that this is a fine eulogy and that the good doctor must have indeed done some fine work in violin making, despite the fact that so far as I know, none of his violins ever found their way into the listing of Lyon & Healy or Lewis & Son, or of any of our famous dealers in violins. The testimonials praising his violins are certainly impressive--but again, I am reminded of the true story that one of the greatest violinists of our time wrote just such a testimonial about a certain violin maker
in my own state back in the twenties and signed his name to it—and that maker's violins today are worth at best no more than $150. These violins all have the same faults: neck set too straight, waist too narrow, ff-holes pinched and badly cut, archings too flat and a deep groove inside the purfling, making the violin look like the work of an amateur who never saw a good violin, and finally, a cheap spirit varnish of a dark brown color and opaque in nature—which varnish has powdered off and frizzed over during the past 40 years—and a tone like that of a metal box! As we look at these violins today, we wonder how in the world that a famous violinist and musician could ever have written such a testimonial—but he did—and it was a very impressive testimonial at that. I thoroughly enjoyed reading the material about Dr. Kresnik and would like to see and play one of his violins—he must have indeed been a great musician and violin maker, but on the other hand, if all the other statements are in the same category as the one about the varnish, I am afraid the writer just overreached himself a bit. Perhaps it would be mean on my part to point out that during the period from 1880 to about 1925, such extravagant testimonials and claims among violin makers were quite common and many such may be found by rereading old copies of the ETUDE and other publications which carried these articles.

The above is not to reflect in any way on the work and memory of Dr. Kresnik—quite the contrary, but we would hate to see our own violin makers today become discouraged because of this article—it just says everything has been done, Stradivarius has been equalled if not surpassed, and so on. I think it is in order to point out that these claims may be somewhat exaggerated, to say the least.

Sincerely,

"Carmen White"

* * * * * * * *

COUNT COZIO DI SALABUE (1755 - 1840)
by Carl Farseth

The glory of Cremona had departed by the mid-1700's with the passing of the Amatis, Antonio Stradivari and Joseph Guarneri the Younger. As late as 1775, Englishmen, Germans and other foreigners besought Paolo Stradivari, Antonio's cloth-merchant son, for Cremona violins. No one could make such violins any more. Was their construction a forgotten secret?

Among those mourning the departed greatness of Cremona was an 18-year old Piedmontese nobleman, Count Cozio di Salabue, just fallen heir to his father's estate in 1773.

Count Ignazio Alessandro Cozio di Salabue was born March 14, 1755, at the family palace in Casale Monferrato. He died December 15, 1840, at his summer residence in Salabue. This place lies on the Casale-Asti road some 20 km. southwest from Casale, near Moncalvo.

In 1665 Cozio's great-grandfather had been ennobled, Cozio was educated at the military academy of Turin, and he was serving as a cadet in a regiment of the Saluzzo cavalry when his father's death called him home.

Cozio's wife, Antonia of the Marquiss Dalla Valle di Pomaro family, died early leaving Cozio only one child, the daughter Metilde.

Cozio's father was a lover of violins, and violins were the son's whole existence. A generation after the death of Stradivari there appeared to be one lone possessor of the Cremona secrets. It was the ageing Giovanni Battista Guadagnini, who had recently moved to Turin. Hearing Guadagnini was starving, Cozio supplied him with good wood and Stradivari patterns, and from 1773 to 1776 bought fifty or more of his violins.

But in Milan Cozio contacted the Mantegazzas. His best friend among them seems to have been the restorer Carlo, whom he entrusted with modernizing his Cremonas and varnishing violins still in the white. What Cozio did not learn from Guadagnini he picked up from the Mantegazza brothers.

Cozio bargained with Paolo Stradivari about the "leavings" of his famous sire. Paolo had tried in 1774 to sell his father's house, remaining violins, tools, moulds, etc. to the city of Cremona as a memorial. Failing in this he determined none of his father's belongings should remain in Cremona and he bargained to sell the chattels to Cozio through an agent, the Briatta cloth merchants of Casale.

Paolo dying in 1775, his son Antonio consummated the sale, and Stradivari's tools, moulds, patterns, etc., were shipped by boat the ninety odd miles up the Po late in 1775. Seven violins were sent by stage-coach. A second shipment of overlooked moulds, etc., followed next year.

Cozio's reason for buying the Stradivari shop equipment was to use it for visual instruction purposes in a violin making school he planned to establish in Cremona. For this purpose he wrote a history of violin
minters and he penned one of the very best books on violin making ever written. There isn't a thing Cozio doesn't know about violin making. The Napoleonic wars (1797-1814) put these plans out of action. Seeing a civilization crumbling about him, Cozio started compiling a history of Casale and other Piedmontese cities.

Then came old age--the smiling afternoon of the lotus eater for whom there is always a tomorrow. Most of the manuscript on violin making was ready in 1805, but not till 1950 was it published--after 145 years.

Cozio di Salabue and not Luigi Tarisio was the great collector of Stradivari violins. After Cozio's death in 1840 Tarisio paid Cozio's daughter Metilde, then in straitened circumstances, a few lire apiece for priceless Strads. Incidentally, Tarisio bought the famous Le Messie (Salabue) Stradivari from Carli, Cozio's banker in Milan, in 1824. The 1716 Le Messie has the reputation of being the most beautiful of the Strads.

Cozio's MSS. and letters as well as the Stradivari reliquiae lay with the Dalla Valle family till 1920, when they were bought for 100,000 lire by the ex-Bolognese violin maker Giuseppe Fiorini (1861-1934) of Munich, Germany, and Zurich, Switzerland. Not succeeding in founding a violin-making school in several Italian cities, failing health forced him in 1930 to donate the collection to the city of Cremona 156 years after Paolo Stradivari had attempted to establish a Stradivari memorial. A room in the civic museum was dedicated to Stradivari and other violin relics, and in 1937 a violin-making school was established in Cremona.

According to the New Yorker magazine of July 10, 1948, Attorney Mario Stradivari, of Cremona, says his famous ancestor's house was torn down in 1928 (it had been remodelled in 1888), and Renzo Bachetta, journalist and teacher in Cremona's violin-making school, gives the following bit of history regarding the razing of San Domenico church where Antonio Stradivari was buried: "They say today that the land was needed for a public playground, but the truth is that back in 1869 a wrecker from Milan paid the city fathers of Cremona, a corrupt bunch of politicians, 42,000 lire for the privilege of demolishing the church of San Domenico...He carted the materials away and sold them."

Renzo Bacchetta, who undertook to make Cozio's MSS. readable to editor and printer, says: "It took me nine months, sixteen hours a day, two magnifying glasses, and three secretaries to edit those diaries."

Giovanni Iviglia, Secretary General of the Italian Chamber of Commerce in Zurich, Switzerland, edited Bacchetta's rewrite of Cozio's material and grouped it four ways: history of Italian violin makers, violin making, catalogue of violins handled by Cozio, and correspondence. The publisher of Carteggio is Antonio Cordani of Milan.

Iviglia thinks it likely Stradivari's main varnish secrets were lifted out of Cozio's notes when they were in possession of the Dalla Valle family or when in the hands of the violin maker Fiorini. Since no maker has produced a Stradivari violin lately, this chance is remote.

Yet both Cozio and Iviglia say Stradivari tickets have been faked from the very beginning. They may be right. There is no ticket of Lorenzo Guadagnini or of his son Giovanni dated before 1740. Yet the violins then made by them in Piacenza were near perfect. The ageing Lorenzo died some five years later, and his son was twenty-nine years old in 1740.

Stradivari is said to have left some ninety violins at his death. No violin maker's production exceeds his sales by more than a few instruments. The inference is that Stradivari's sons were hiring their father's shop workers to make post-mortem Strads. Paolo refused to sign a certificate guaranteeing the genuineness of the Strads he sold to Cozio. And if Stradivari's assistants had been the Guadagninis, we withhold the charge of fraud. For the Guadagnini were in the forefront of Italian makers. However, it is doubtful that the Guadagninis made Cremona their home, for Cozio di Salabue's knowledge to the Guarneri, for instance, is based on wild second-generation rumour. The Guadagninis, evidently even then, lived in Piacenza, which is some 18 crow-flight miles up the Po. That Paolo Stradivari, his son Antonio, and di Briatta all took for granted the boatman Gobbi would ship the box of tools and moulds of Paolo's father to Casale could mean Gobbi in the past had transported Guadagnini violins from Piacenza to Cremona. In another letter Paolo says he knows the river freight rates only from Cremona to Piacenza.

Giuseppe Fiorini was such a copyist of old violins till revulsion drove him to adopting his own model and inserting his own ticket. Likewise it may be that G. B. Guadagnini and his father inserted their own tickets only after 1740. The ill fate that dogged the son from town to town till old age in Turin may well have been due to machinations of his former employers, whoever they were.

Cozio was unjust to G. B. Ceruti, Gio. Grancin and Antonio Bagatella. The Piedmontese nobleman worshipped Stradivari, and Bagatella's inference that anyone could make a "perfect" violin by following the Paduan's rules, burned Cozio up.

Yet they agreed on most things. Both followed Stradivari's practice of making the tops of even thickness, six-sixty-fourths of an inch plus. Bagatella used an Hieronymus Amati outline, but Cozio did not criticize that. Cozio's only detailed criticism is Bagatella's lack of a wide arching trough along the edge, in the Amati fashion. Yet he admits a vanishing trough did not impair the tone of violins of Guarneri the Younger. And even Stradivari dug the deepest part of the arching trough right over the
purfling, which seems to have escaped the Piedmontese's attention.

Shortly before Stradivari's birth Cremona violins fetched 12 ducats ($27) and Brescian 4 ducats ($9). Stradivari is said to have charged 4 louis ($16) for his cheapest violins. Paolo Stradivari in 1775 got 10 to 12 zecchini ($23 to $27.60) for Strads he sold to Cozio's agent; this evidently was not a retail price. Meanwhile, in 1775, Amati violins were fetching 40 zecchini ($92). Another letter reveals the retail price in Piedmont coin was 600 lire ($138) for Strads and 1,000 lire ($230) for Amatis.

Cozio rarely mentions Stainer. At this time (1775) in Venice Stainers were outselling Amatis, with Strads in third place (Etude, September, 1947).

Seeing a set of 12 wood carving tools in the window of a sports goods and model makers suppliers, I was intrigued at the card that held the 12 tools attached:

**HIGH QUALITY WOOD CARVING TOOLS**  price 7/6

**BEST SURGICAL STEEL.** Made in Japan.

Thinking Well! Well! Japan in need of steel and exporting it - can it be good? So I bought a set of these 12 tools - the blades about 1 1/8 inch long and the handles included made an over all length of 6 inches. At home, taking one tool out of its rubber bondage I tried a gouge. What an edge -- I tried others, well it takes a very fine steel to get a good edge of razor like cutting on hard grain pine.

There were 4 gouges from 1/8" to 3/8" just the type for scroll work. One 90° angle--and 3 pairs of chisels and one spear head gouge. Actually one pair was similar to the surgical knife type I used to cut a snake bite out of my arm.
They were in pairs like this. They just had some things my Marples set of 6 and Millers Falls set of 6 did not have.

Actually I got the set as a joke, the blades being only 1/8 long - but I found they could be handled like pocket knives as well as used in a very light model makers lathe. The handles are adequate to the blade length.

The gouges were

The set is just that type one needs for a finnicky little finish which sometimes our larger tools are in the way of themselves. (This set can be bought in Canada. Price around $1,50. (Editor))

BIOGRAPHY OF A BUSY MAN

Harry S. Wake

The name Harry Wake has only appeared in the pages of the Journal for the last few issues. In that short time he has supplied us with much valuable information.

In our communications with Harry, reading between the lines, we could see that he was not only a very intelligent and informative individual but also seemed to live such a full life that an investigation into his background was in order. Here is what we came up with.

Harry S. Wake, or as his violin label reads: "H. Sebastian Wake" has spent a lifetime with fiddles. Mr. Wake is well known as a violin maker and connoisseur, accomplished 'cellist; and Engineer in Aeronautics.

Now retired from the Engineering profession and living in the balmy climate of San Diego, California, Mr. Wake devotes all his time to violin making and his collection of about fifty old master violins.
He is the designer, manufacturer and distributor of the "LUTHIER" violin edge router machine which is described in an advertisement elsewhere in this "Journal."

Having long felt the need for a machine to do some of the tedious work in violin making, Wake designed one for his own use. However, all fiddle men who saw the machine and the work that was possible with it, expressed a wish to have one like it, and suggested that they be manufactured and made available to all violin makers.

Not until now, in so called retirement, have the time or facilities been available for the production of a commercial model of the machine, and Mr. Wake only hopes that he will be able to keep up with the demand.

Harry S. Wake was born in England at Newcastle-on-Tyne, July 9th, 1900; the son of a concert violinist, he repaired violins for his father at age nine.

The father was a connoisseur of old master violins and maintained a small collection. Wake tells how his father would prop his latest find on a chair, study it for long periods, and point out the characteristics and fine points of the particular maker to his young son.

Like all collectors the father had a weakness for fiddle shops and fiddle makers; and being a concert violinist, lived in many cities in England and Scotland for periods of from one to three years and he invariably took his young son to the fiddle shops with him; to name just a few of the principal cities in which they lived, Newcastle, Edinburgh, Glasgow, Grimsby, Hull, Birmingham, Liverpool, Manchester, Brighton. What an opportunity for a boy not yet fourteen years old, to learn so much about fiddles and their makers, to meet fiddle makers and see them at work, to witness the "Wheeling and Dealing" and "Horse Trading" that goes on with fiddle collectors.

Before age fifteen young Harry Wake had constructed several violins in collaboration with his father; these were labelled Wake and Son and at this period a considerable amount of experimenting with varnishes is noted, which resulted in the development of a fine orange red varnish similar to that in use by Wake today.

Harry studied the 'cello from age seven, served in World War I, being under age when he enlisted in the Royal Marines; studied engineering after the war, and in 1921 decided to make his future in America.

Resided at Philadelphia for thirty years, working in engineering and as a professional 'cellist; made few violins during this period but never lost his great enthusiasm.

A successful inventor and holder of several U. S. Patents, Mr. Wake has recently sold the patent rights to his "Trigometer", an instrument on which any problem in trigonometry can be set, and the result read directly off the instrument; this is being manufactured in San Diego by the purchasers.

Harry Wake moved to San Diego in 1952 to work in the Aircraft industry, now retired! at age sixty he keeps very busy with his violin collection, some writing, String Quartette, violin making, and now the production of the "Luthier" violin edge router machine.

Altogether we would say he leads a "very busy life",

The Finished Mould

See article on next page "The Technique of Violin Making," by Harry Wake.
Chapter 2, (concluded)  The Making of the Violin Mould or Form by Harry Wake

For top and bottom blocks we will make a cutout of 2" wide, by 9/16" deep measured on the centreline.

Lay out your lines one inch on each side of centerline, then right on the centerline make a mark 9/16" from the top and another 9/16" from the bottom and draw horizontal lines across. This will give you a box at the top and bottom connecting with the outside of the form, make a punch mark in the two comers of each box and drill through at these points with a 3/16" drill and cut out the squares on a bandsaw; the holes in the comers will make this operation a little easier, especially if you are using a narrow blade in the machine, finish with file and sandpaper and we are ready to make the layout for the corner blocks.

Measure down from the top a distance of 3 7/8" and draw a line straight across the face of the form; one inch below this, draw another line straight across: From the bottom of the form measure up a distance of 4 3/4" and make a line right across, one inch above that make another line; you should now have four lines across the face of the form: On the bottom line make a mark 3/4" in from the outside edge of the form on both sides and from this point draw a vertical line; this line will run out of the form; now on the top line measure in a distance of 5/8" on both sides of the form and draw lines at right angles straight down and out of the form; you now should have four small right angles marked on the form, these will now be cut out, but first make a mark with a pointed tool and drill 3/16" right through at the four comers; you will finish with file and sandpaper right to the line, being careful to keep everything true and square.

We must now drill the sixteen holes for clamps and for this purpose a 5/64" extension bit is required. It should perhaps be explained here that instead of drilling holes for the clamps some makers cut out the entire inside of the form to a guitar shape, this gives an inside edge over which to hook the clamps; this method has some advantages perhaps but I find that the holes are quite satisfactory, especially with the type of clamps that I use; these will be explained later, so for the present let's get on with the layout for the holes. As was mentioned before, they will be 5/64" diameter holes, so at each of the locations in the following layout, put through pilot holes of about 3/16" size. These will act as lead holes for the larger drill to follow when the layout is completed.

At a point on the centerline one inch down from the bottom of the upper block cutout, draw a line straight across the form; 1 1/2" below this draw another line straight across; the next line we will draw 1 7/16" below the last one, and at the middle we will draw a line across 7/8" below the first one we drew or 5 7/8" from the bottom of the upper cutout: Now from the BOTTOM of the form measure up one inch from the cutout and make a line across; the next line will be just 7/16" above that, and the next 2" above that one, the final line is 1 1/4" above the last. You should now have eight lines across the face and on these we shall locate our holes.

Starting at the top line, number one hole is located right on the center line so at this point make a punch mark for the pilot hole, numbers 2 and 3 are on the same line 1 1/2" each side of the centerline; on the second line, holes number 4 and 5 are located 1 5/8" each side of centerline and on the third line down number 6 and 7 are 1 1/8" on each side of the centerline; on line four, numbers 8 and 9 are just 3/4" on each side of the centerline; be careful here that you don't run into the small bolts that go through the form; on the next line down we have numbers 10 and 11 located 1 1/2" on each side of centerline; numbers 14 and 15 are on line seven and they are placed 2 1/4 inches on each side and finally number 16 at the bottom is located right on the centerline and line eight.

Drill pilot holes right through at all sixteen points and follow with 5/64" extension bit. You can now take the mould apart; clean up your work and chamfer the edges of all holes; mark 'top' on the upper piece so they will always go together correctly and put on the top face any identification you wish.

We have yet two more holes to drill (in the top piece only) for push out bolts: at a point on the centerline 2 1/2" above the approximate center of the bottom hole make a mark and drill through the top piece only with a number 7 size drill and thread it with a 1/4 - 20 size tap; both drill and tap can be bought at Sears or any hardware store for a few cents: Layout another point on the centerline 2 1/2" down from the approximate center of the top hole; drill and tap this hole 1/4 - 20 also; put machine screws in these two holes size 1/4 - 20 x 1" long, rub a little soap on the threads of the bolts before inserting them in the holes. The purpose of these bolts is to assist in the separation of the two pieces of the form after the ribs are completed. You can now re-assemble the form and you will find that it will be easy (if your work has been carefully done) to tap the two halves of the sandwich into perfect alignment before the final tightening of the screws: The location of the 5/64" holes makes it possible to use them for 'C' clamps by inserting the head of the clamp in the hole; however I find that 'U' clamps or straps are better because they have a flat plate with two holes in it that fits over the threaded end of the 'U' and this plate is just right for clamping the blocks in place, and then for holding the ribs to the form after they are bent and glued in place on the form. These 'U' clamps are used for TV antenna installation and are available in several sizes; the size we want are 2", that is they measure 2" from center to center across the open end of the "U"; they are made of 1/4" rod bent to "U" shape
and the ends threaded; two nuts are supplied and the plate that goes over the ends is 1/8" thick by 5/8" wide so they are quite strong and only cost a few cents each; in fact I bought a dozen of them at Sears for the price I would pay for two small "C" clamps. In use, they are hooked through the holes in the form and the plate put over the ends to rest on the ribs with a piece of felt underneath and then secured with the two nuts.

Our form is now complete; however we cannot truthfully say that we have made a start on the fiddle until we have our blocks made and in place in the form.

The blocks being the foundation as it were, we will lose no time in getting on with it. Starting with the top and bottom blocks, these will be identical except in their height, and their shape will be trimmed after they come out of the form. Our form thickness is 2 1/4" all over, but our finished fiddle will be 3/32" less than this in rib depth at the upper end, dropping from the 2 1/4" inches at the upper corners to 2 5/32" at the top; instead of reducing the form thickness to accomplish this, we will reduce the height of the upper block and after the ribs are removed from the form, reduce the ribs in height with a gradual slope from the upper corners to the top of the fiddle.

Starting with the bottom block, select a nice piece of spruce or willow and shape it to fit easily into the cutout of the form. Do not make this a tight fit or you will have difficulty in removing the rib frame later. When cutting all blocks pay attention to the direction of the wood grain, they must be cut so that the end grain shows on top and bottom of each block where it will attach to back and belly and if possible so that the end grain that shows in top and bottom blocks runs in the direction of fiddle length. Make the depth of the bottom block just a little deeper than the form thickness so that it can be levelled off flush with the form later; also make it so that it projects outside the mould for later trimming to the contour of the form.

The top block is made an easy fit into the cutout with a little projecting underneath and outside the form as we did with the bottom block. However the top face of the block will be 3/32" below the surface of the form when it is glued in place. We will now prepare to glue the top and bottom blocks in place.

It must be explained here that when the ribs are completed around the form, the upper half of the form is lifted out and the linings fitted to the inside, for this reason the blocks that we are now ready to glue into the form will only be temporarily glued to the LOWER HALF, then when the one set of linings are in place, the bottom of the form is removed from underneath by separating the lightly glued blocks from the form with a thin blade; the linings are then fitted to the rest of the violin.

To get back to the glueing, prepare some fresh hot glue, and use only the best grade of cabinet makers glue, the old fashioned hoof glue, and don’t ever use any other kind for any of your fiddle work. Put a little glue on the lower half of the form only in the cutout where the bottom block will be inserted; it is a good idea to rub a little soap on the adjoining wood so that the block will be glued to the lower half only. Slip one of the "U" clamps through the bottom hole on the centerline, put the block in the cutout and clamp snugly with the clamp plate over the block, being sure that the block is properly positioned. You can now do the same with the upper block, using the soap on adjoining wood as before and making sure that the top block surface is 3/32" below the surface of the form; clamp securely and leave to set; in the meantime you can prepare the corner blocks; these will be for the upper corners, size 1 x 1 1/4" x 1 1/4", with the end grain showing as before mentioned, glue these in place to the lower half only as we did with top and bottom blocks; the lower corners will require blocks approximately 1 x 1 x 1/4" and will be clamped in place utilizing nos. 10 and 11 holes in the form; the work can now be put aside for a while.

When clamps are removed from the form, all the blocks must be filed and sanded down level and flush with the face and back of the form; if you have any difficulty cutting the end wood of the blocks try wetting the wood slightly. This usually makes it a little easier.

Now on the top and bottom blocks mark a line for trimming to the contour of the form. Note that these are not cut straight across but at the top and bottom the curve of the bouts is continued and the blocks trimmed to make a continuous curve from one comer right around to the opposite corner.

To mark the corners we now take the half pattern that you made earlier and lay it on the form with the straight edge exactly on the centerline of the form and continue the centerline over the top and bottom blocks, with a fine pointed pencil trace the corner onto the blocks, flip the half pattern over and mark the opposite corners. The excess wood at the corners is cut away ONLY inside the "C"s until after the "C" bouts are made and fitted, then the remainder is cut away and carefully finished to the lines of the half pattern; when this is all completed to your satisfaction you can prepare to start bending ribs and most likely also breaking a few.

* * * * * *

(To be continued) Next Chapter will describe the Bending of the sides, or ribs.
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Chapter 2.

"Earth's crammed with Heaven
And every common bush aflare with God,
But only those who see take off their shoes,
The rest sit round and eat blackberries."

- Elizabeth Barrett Browning

**Literature**

It is my contention that all violin makers should know as much as possible about the woods they use. Wood is their stock in trade, and the more they know about this "stock in trade" the more likely they are to succeed when it comes to the matter of judging strength, resonance, and other qualities which enter into decisions made as to arching and graduations of the violin plates.

Not only knowledge of these qualities is necessary but another and perhaps more important factor is essential to the craftsman, a factor which may be termed aesthetic or moral. I believe that if a man is to become a "Master" violin maker he must be filled with an overwhelming regard for beauty, not only for musical sound and craftsmanship but also for the love of nature herself. Violin making is a creative art and where can we nourish this creative instinct better than by approaching the source of creation - life itself? With our hobby or profession our thoughts should naturally turn to the living tree.

To encourage this admiration of nature and also that you may have on hand some excellent references, I shall, at this time, take a few minutes off to present a short list of publications which will give you a wealth of information on the subject of trees.

First and foremost is a book published by the Canadian Government entitled "Native Trees of Canada". Write to The Department of Northern Affairs and National Resources, Forestry Branch, Ottawa, Canada. The price is only $2.25. It contains a very complete list of all trees native to Canada. Beautifully illustrated, it is a book which, sold commercially, would retail for more than twice the amount stated.

My second selection is: "Canadian Woods, their properties and uses." Published by Forest Branch, Forest Products Laboratories Division. Price is $3.00 and may be obtained direct from: The Queen's Printer, Ottawa, Canada.

As its title implies, it deals only with timber after it leaves the forest.

This very comprehensive book gives the results of much of the Research that has been undertaken by The Forest Products Laboratories in their two Laboratories, namely, at Ottawa and Vancouver. Such subjects as:

- "The Structure of Wood,"
- "The Seasoning of Lumber,"
- "The Mechanical and Physical Properties of Wood" are only a few of the subjects dealt with in this book. Over 350 pages.

Mention should be made of the excellent work being undertaken by The Forest Products Laboratories. They work in connection with the Canadian Government Forestry Department and both combined form one of the largest, if not the largest, forestry departments of any government in the world today.

Supplementary reading to the above I would suggest "Trees, Shrubs and Flowers to Know in British Columbia" by C.P. Lyons, J.M. Dent & Sons (Canada) Ltd., Toronto or Vancouver, Canada. Price $4.00. A delightful little book.

Also write to The Forest Products Laboratories of Canada (above address) for a "List of Publications". Over 200 free publications are listed.

**Description of each Species of violin woods**

You should now have a fair picture in your mind of the geography of B. C. Also you will, I hope, obtain sufficient literature for reference. To complete the pictures it only remains to describe the localities where the different violin woods of B. C. grow, together with a very brief outline of the advantages of each variety, after which we can at our leisure dwell longer and complete the discussion of all suitable woods and their adaptability for instrument making.

I shall deal with four different trees, namely:

- Broadleaf Maple (*Acer macrophyllum*)
- Sitka Spruce (*Picea sitchensis*)
- Engelmann Spruce (*Picea engelmannii*), and
- Western Red Cedar (*Thuja plicata*).

**Sitka Spruce**

Seldom found more than 50 miles from tide water and never at elevations over 1,000 ft., although it does creep scarcely up the Famous Fraser Valley. It grows right up the Pacific coast and into Alaska. On the Queen Charlotte Islands it attains perfection.
May I suggest you take particular notice of the location of the Queen Charlotte Islands. These islands are the pride of the lumber industry. Not only do they contain some of the finest timber in B.C., but they are a naturalist’s paradise for rare flora is found, also wild bird life flock there as an escape from civilization.

**Sitka Spruce**

Not found West of the Coast Range (of mountains). It covers a wide area of Central British Columbia growing at altitudes of from 3,000 to 6,000 ft. Sometimes grows in mixed stands with White Spruce but is the sole spruce of higher elevations of over 4,000 ft. or near timber line.

**Engelmann Spruce**

This is the giant of our forests. It grows west of the Coast Range, preferring the cool moist soil of the coast line. When found inland the trees are quite stunted.

In the north it associates with Sitka spruce and with Yellow Cedar, while in the south it likes the company of those beautiful trees, Western Hemlock and Douglas-fir.

**Western Red Cedar**

This is the giant of our forests. It grows west of the Coast Range, preferring the cool moist soil of the coast line. When found inland the trees are quite stunted.

In the north it associates with Sitka spruce and with Yellow Cedar, while in the south it likes the company of those beautiful trees, Western Hemlock and Douglas-fir.
Broadleaf Maple

Grows west of Coast Range, at sea level or on elevation of under 1,000 feet. Extends well to the north. Is found around the edges of Vancouver Island and on the Queen Charlotte Islands.

* * * * * * * *

To be continued

In the next issue we will talk about Sitka spruce.
Violin by F. R. Davidson. See particulars on next page.
A VIOLIN BY F. R. DAVIDSON

We are very proud to feature in this issue a violin by Mr. F. R. Davidson. Proud not only because we feature it but because we have known Mr. Davidson almost since the first issue of the Journal. Exchange of letters has developed a friendship which we value beyond words.

This instrument especially this one, are of the first rank. Mr. Herman Weaver, Violin specialist, of Washington, D.C. (another sincere friend) has seen and played this Davidson violin. Herman wrote me especially to tell of his delight in handling the instrument. The tone, he says, is first class, the workmanship and finish excellent! He confided in me:

"In my opinion he is a 'natural' .......... These kind of artists only come along once in a great while, in other words, just born that way. The good Lord was kind to him."

This is praise indeed, from a maker who himself sells his creations for as high as $1,700.00.

Violin No. 17 has won highest honors wherever shown in competition.

I will now let Mr. Davidson give you particulars of his violin,

<table>
<thead>
<tr>
<th>VIOLIN NO. 17</th>
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<tbody>
<tr>
<td>Strad Pattern</td>
</tr>
<tr>
<td>Top - Lewis and Son - good</td>
</tr>
<tr>
<td>Back - Old Germ. - from Bob Wallace</td>
</tr>
<tr>
<td>Blocks - Willow - John's Note, Pittsburgh</td>
</tr>
<tr>
<td>Linings - Old basswood</td>
</tr>
<tr>
<td>Neck block - German</td>
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</tbody>
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Halves on top reversed before gluing. Back normal procedure. Outside of top and back finished before hollowing out, including purfling.

Weight of top when outside finished and before hollowing out was 200 3/4 gr. Weight of back in same condition was 219 gr. with button unfinished.

top before ff's F. 10 at 64 grams - Gilbert Method
top after ff's E. 75 at 62 1/2 grams
Bass bar 3 gr. - Arizona wood - Wallace
Top after bass bar and sizing with propolis inside only was F. 25 at 66.8 grams
Back without sizing - F#, 30 at 96.3 grams
Crack buttons 2" apart top and back, put in diagonally.

The top wood had a very high ring to it. Back was very light but with a high pitch.

Back and ribs assembled without sizing weighed 145.7 gr.

Air tone - D, 60

Finish. Sized inside and out with propolis, then outside 1 extra coat propolis.

| Upper bouts - 6 1/2" | 3 ct. " 1/2 780 - Bis. Red. - 1/2 CX780-Walnut |
| Lower " - 8 1/8" | 1 ct. " 651 |
| Center " - 4 5/16" | 3 ct. " 1/2 780 - " - 1/2 " " |
| String length - 12 15/16" | 1 ct. " CX 780 - Natural |

F. R. Davidson
137 E. Main Street
Leipsic, Ohio, U. S. A.
A few words about glue would not be out of place here and I've been waiting for many years for an opportunity to castigate those arch enemies of the fiddle repairer, those poor misguided charlatans who ruin good fiddles by using any and all kinds of cements and modern plastic concoctions for so-called repair work.

Never, not on any account or for any reason, should any glue other than the good old fashioned animal glue, or cabinet makers glue be used on a fiddle.

I have taken samples of cement from the top of a so-called repaired violin, to the laboratory to see if a solvent could be found for it, nothing; not even the strongest solvents would touch it, so I had to abandon any thought of doing any good for it; the fiddle is doomed, and it might have had many more years of life had it not been for that so-called glue.

Another case was an old Italian fiddle; it had been through the hands of one of these so-called repairers; it looked good on the outside but on closer inspection I found that the belly had been put back on with some kind of iron cement, and the entire inside of the fiddle had been painted with a transparent, insoluble solution that had the appearance of glass; pity the poor man who ever attempts to take the top off that fiddle.

I find that a small glue pot is in many ways much better than a larger one, even if you have a considerable amount of work to do. Most repair work and even violin making, only requires small amounts of glue anyway, so here is an idea for a practical small electric glue pot that is quite efficient, does not burn the glue, and keeps a small amount of fresh hot glue available at all times.

Take an electric baby bottle warmer, the type that has an open top and holds about six ounces of water; this will be the outside container; now take a small glass jar about 2 ozs, size for the inside container; wrap a piece of stiff wire around the neck of this smaller jar and arrange it in such a way as to support it in the larger jar.

Now this being a small container, only small amounts can be prepared; buy the glue in granulated form and keep about a pound of it in a handy container together with a small spoon.

The bottle warmer never gets too hot, just hot enough, and quite efficient: put water in both containers and add glue to the smaller one; proper care and a little water added to the glue and the container occasionally will take care of evaporation. Just plug into the electrical outlet and in five minutes you have clean hot glue.

I find it handy to keep one brush in the glue and another in the hot water because there is just as much need for a brushful of hot water as there is for glue most of the time in fiddle work.

We learn by our mistakes, and, of course, the man who never made a mistake, never made a fiddle; bringing us to the subject of this writing which deals with the button on top of the back of our fiddle; and the correction of an error.

The unfortunate thing happened while cutting the outline of a nice two piece back, using the bandsaw: The back had already been rough cut around, well clear of the line, the wood reduced in thickness, and another cut was being made close to the line; while concentrating on the outline, the button was completely forgotten until it was too late; so now we have a back without a button, and what shall we do.

All's well that ends well, and so it turned out: The work on the back is continued just as though nothing had happened. All thicknessing is done and the edge work finished; before cutting the purfling groove an inlay is prepared for insertion in the underside of the back, (detail A) in the area where the button will be; the inlay depth must be a little less than HALF the thickness of the back in that area (about .050 inch), and larger than the finish size of the button; it also must extend down over the area of the top block and fan out slightly in dovetail form (Fig. 2); so that actually when the violin is assembled, the flat surface of the inlay will be glued directly onto the face of the block; it can't pull out on account of the dovetail and that can not be seen.

We now have a foundation on which to place a false button but the inlay is not glued in place until after
the purfling groove is cut. The finished button will appear as shown at Fig. 2 and will have an ebony (or ivory) rim, with points extending down to the purfling (detail B, Fig. 2); if this is not done a telltale line will show on each side of the button when the work is finished.

Use fresh hot glue on all this work; when it is set, the excess wood of the dovetailed inlay is out away; the purfling can now be inserted and all finishing on the button left until after the neck is fitted in place; if this work has been carefully done, it will never be known that a stupid mistake was once made here, (or should we just say that the wood was too short).

When fitting a new bass bar, it is sometimes difficult to make a good fit lengthwise and at the same time keep the bar at right angles to the horizontal plane of the fiddle belly.

Try this idea next time you fit a bar: First trim the wood until you have it fitting fairly close along its entire length and then with a \(\frac{1}{4}\)" round (rat tail) file, file a slight hollow groove lengthwise along the center of the contact face or edge of the bar; you can now see readily where the high spots are to be removed.

When the bar is finally fitted and ready for glueing in place, if there should be a spot or two where the slight groove remains, it will be filled with glue anyway; it is essential that the groove be very slight.

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JAN HILBERT NORLANDER
GUNNILSE, SWEDEN
The following is part of a letter received from Raymond Elgar, author of the book "Introduction to the Double Bass". This enlightening work should be in the library of every maker, including Violin Makers.

Mr. Raymond Elgar's remarks:

"I feel that any of your readers who wish to make a Bass will be able to do so after reading my book and Heron Allen's work; they will get the general outline of construction and dimensions. The rest will come with practice. From my experience I would say that European timbers should be used, I am referring to some notes I have about a fine Prescott bass (one of the earliest U.S. makers). His (Prescott's) principal fault was that of using U.S. wood; the workmanship is very good. There is much mineral matter in the U.S. soil which tends to be introduced and leaves the wood less elastic in substance, and a hard tone results. The only book in which I have seen an article dealing with Bass construction is "Violins and Other String Instruments and How to Make Them." No author or date. An illustration gives the method of obtaining the outline by the squares system and there are two pages of information which the author states he obtained by measuring a 3/4 size bass. Therefore any of your readers can do this, a half outline model will suffice and can be reversed to make both sides symmetrical. The mould used is made from solid 4" x 4" timber, beech or similar, several sections being used to make the outline and the mould is duplicated each part filling half the depth of the ribs. One section can be withdrawn whilst the linings of one side are fitted in."

Mr. Howard Apps describes the Form:

"I have had an opportunity to read Raymond Elgar's "An Introduction to the Double Bass" which I mention to you as a possible source of information. As its title implies, the book treats of the subject generally so as to make an appeal to players, makers, and music lovers generally, but its chief interest for the maker lies, I think, in the excellent photographs of nearly a dozen basses of master makers, including an elegantly shaped chamber bass by Gaspara da Salo, authenticated by Hill's. Each photograph is accompanied by a table giving the principal dimensions and interesting facts on the history of the instrument. A chapter is devoted to the construction of the bass and it is evident from this that the author has studied the subject at first hand for he gives such details as thicknesses and height of arching. I gather from the description that the instrument is built on an inside mould that is in two parts like the mould described by Heron Allen for the construction of the Guarnerius violin in his book. Naturally such a mould would be built as a frame only—it would need a crane to move it if it were made of solid wood! There is a similar mould illustrated in Robert Alton's "Violin and 'Celló Building and Repairing" (1946) for making a 'cello but it is all in one piece. A two-piece mould would have two identical halves, one of which could be removed after the ribs had been glued in position to enable the linings to be inserted in the manner described by Heron Allen for the violin. It should not be beyond the capacity of your enthusiastic bass maker to build himself such a mould from a pattern. Bass wood is, of course, very expensive on account of its size, but you should have some spruce big enough for the purpose somewhere in Canada. I was astonished to read that the author had come across a bass with a one-piece back: it must have come from a prodigious maple. By the way, there is a chapter describing the bow and its evolution which took my memory back to the days when an uncle of mine used to play on an old 3-stringer with a Dragonetti type bow that looked more like a hacksaw than the bow of a stringed instrument.

Since writing my last letter I have taken the liberty of approaching Mr. Raymond Elgar, author of "Introduction to the Double Bass" and I understand that he has kindly sent you a brochure together with some pages of the section of his book dealing with the constructional side of the instrument. He has also been most helpful in sending a sketch of a double bass mould which I reproduce at the foot of this letter. The mould is made of very solid stuff indeed, each of the two sections (which fit one on top of the other so as to give a rib depth of about 6") being constructed of timber four inches wide by four inches deep, accurately jointed as shown in sketch. Mr. Elgar points out that a batten mould such as that described by Alton for the construction of the 'cello would not be substantial enough for the bass and would be liable to twist or warp. When we consider the size of the mould and the amount of pressure that would be applied by the cramps, it would be a very serious defect if the mould were liable to distortion under the stresses put upon it, for it will readily be seen that a very small inaccuracy would be vastly magnified on a mould of this size and might throw the whole instrument out of truth. So your aspiring bass maker will have to provide himself with a good strong mould if he wants to produce a satisfactory instrument. Incidentally, I have seen an illustration of a very similar mould in an old print depicting the interior of an eighteenth century instrument maker's atelier in France, although in this case the mould is even further strengthened by two struts across the centre bouts. There can be no doubt that the moulds seen by Mr. Elgar on his visits to the instrument-making centres have altered very little during the past two hundred years.

Mr. Elgar also states that only the flat-backed
basses have the re-inforcing batten running horizontally across their backs: the modelled, or swell-backed instruments have only studs along the centre joint to strengthen it, as in the violin.

Well, this just about exhausts all I can tell you about the double bass which, as Mr. Elgar points out, has had very little written about it in comparison with, say, the violin, and I hope the information will be of some help to readers.

* * * * * * * *

Letter from Mr. Jacklin

"Dear Mr. White:

It is unfortunate that Mr. Robert Minster had all that trouble with the Sangster varnish, but it's a cold climate down there, and maybe he should have added a little rattlesnake oil or a shot of Bourbon.

People love a mystery, don't they? Up to the present we have no definite proof that oil treatments or gum varnishes have ever helped the tone of anything. We do know they have ruined many good instruments.

Guadagnini used the original Italian varnish until he died in 1786. He made just about 250 instruments. Most are just good; a couple dozen are very good; less than a dozen are superlative. If varnish has some magic tonal properties why aren't they all tops?

Go and look at a Gofriller cello, with its thin, faded varnish that looks like it was put on by some kid, and what's the price? $15,000.00--maybe more.

We all need to do a little thinking on our own. Why, for instance, keep on glueing the neck in cellos, when a 3/16" bolt will hold as much as all the glue we can smear on it. Then we can work the instrument, find the true bridge height, and if we want to ship it, a 33" box contain it? I have made 14 cellos like this, and no kicks.

Why polishing powder? Carbonundem paper is much faster. The car painters use it.

A six inch woolly cotton buffer in a drill press will give a better finish in 10% of the time for hand work.

I made my own drill press. Factory machines don't have enough reach for cello work and cost too much. I also use it for sanding heads and a 3 1/2" router. It was simple to make, and outside of the motor cost less than $10.00.

All the best.

"Walter A. Jacklin"

Vancouver, B. C.
A great deal has been written on the matter of thicknessing and the reasons for various types of thickness.

Many of us as makers only use a particular type of thickness because a certain old master used such a one. It is true that in many cases the use of a thickness something similar to the maker we follow does often produce favourable results but that could be in spite of the rule and not because of it. Taking it a step further are we completely sure why we have used such a thickness, apart from knowing that the old chap did it? In doing so are we only getting, say 80% result from the wood being used instead of nearer 90-100%.

Many of us have evolved and use systems and principles in regard to the thickness and the particular tap-tone we have accepted as being the one (for each plate) that will help produce the quality we are seeking. Again we are guided by some old master’s creation. This is of course commendable as a good number of these old instruments are indeed patterns that we should be proud to follow.

However we find some anomalies in the fact that these old makers did not always use exactly the same thicknesses or tap-tones, although from what I can gather the tap-tone varied less than did the thicknesses, which were varied for reasons best known to the old makers. We have some firm ground with the suggestions that density, weight, width of reed etc. all require a difference in thickness, and that the maker made compensations.

One can be confused, however, if one is a follower of two schools of thought. Tap-tone, and the strict adherence to a given thickness.

What course should we follow if the two factors do not agree? Take thickness first; we make a plate that is 1/8th inch all over and then find that instead of the note we desire, it is a tone or two higher, or lower, than we wish. What do we do? In the top-plate we can help matters a bit by inserting a bass-bar of altered (?) dimensions, but that is contrary to all accepted practice and the theory that a bass bar should be 10 1/2 inches long and so on.

It is interesting to imagine what procedure is followed in these cases by those makers who are so adamant that no alteration should be allowed from the accepted ‘mean’. That word explains a lot. Try and not forget that it is only a “mean” averaged out from many measurements of old instruments. Each instrument should be built according to the demands of the wood being used, and variations and changes made accordingly. This of course brings up the questions, How, and Why?

Apart from arriving at an understanding about the density of wood being used and proceeding accordingly, we could still finish with a plate that does not give us the thickness we want and the note we want at the one time. It is time now for the maker to accept tap-tone as being the most important, and exactitude to a pre-conceived thickness must be forsaken. One must be prepared to thin the plate in certain areas. The maker has in his power to raise or lower the tone of the plate by the removal of wood. Before we discuss the removal of wood from the plate, try this experiment.

Take a piece of spruce about 10 or 11 inches long by one inch deep and half an inch thick. The measurements are not important, but at the beginning it must be an unbroken rectangle all over. Hold it between your thumb and forefinger about one-third of its length from the top, and by tapping it you get its tap-tone. Make a note of this tone. Now by means of a gouge or small saw remove from the centre of one edge a small arc an inch in diameter and about 1/4 inch deep.
Tap it again and you will see that the tone has lowered; now cut small arcs from each end of the wood and you will find that the tone is again raised. How much is removed is determined by how much you wish to raise or lower the original tap-tone.

The tones of our plates can be controlled in the same way by the removal of wood. If the tone is too high, take wood away from the centre of the plate. If too low remove it from the edges. The parts removed being smoothed and blended into the lines of the plate and not left as holes or hollows.

In the case of the top plate, when trimming the bar, this control can also be utilised. When the bar has been trimmed to approximate size, and the plate note is too high, it can be lowered by taking away wood from the centre of the bar. Not as shown on the diagrams however, but by the reduction of height in the centre, and still more by removing wood from the sides of the centre portion of the bar.

By the same rule if the note becomes too low, shorten the bar by taking away wood from the ends; cut the bar shorter in doing so if necessary.

The possession and use of this principle will allow the maker to obtain the tap-tone he wishes, but of course his thicknesses will have varied, but is that not following a precept set by the old masters? This could account for those violins that have a centre thinner than the edges, and could cause us to assume that tap-tone relationship to be more important than thickness. By arriving at this relationship by the above means, the maker has some positive knowledge, why, and where to remove wood. It means less working in the dark, and thicknessing the plate with a purpose probably not far removed from that which caused the old makers to vary their thicknesses.

Now, let us discuss an entirely different subject, that of varnish.

The Possibilities of Lac as a Varnish

Two things must be clear in the reader's mind before proclaiming conclusions, whether they are foregone, or an after thought engendered by this article. One is that the Lac referred to is not Shellac, or French Polish; this will be made clear in the body of the article. Secondly, that the writer has always been a staunch advocate for oil varnish, this has been brought about mainly by the cheap brittle nature of spirit varnishes as applied to most of the factory made instruments, and the general acceptance expressed by many authors that a spirit varnish is hard and that as it dries it contracts and chokes the instrument. Indeed many spirit varnishes do just that, but to condemn all spirit varnishes on that score is not justified. To condemn the use of Lac because it is generally accepted that Shellac applied to a fiddle is detrimental to tonal quality has just as little justification. It may be here that the transition of the product of the lac insect could be mentioned. The insect lives on trees and when it is gathered it is known as "Stick Lac". This stick-lac is removed from the sticks and twigs and is known as Seed Lac. The seed lac is cleansed and most of the twigs etc. are removed. The seed-lac is purified and formed into round discs and is called Button-Lac. To make Shellac Button-Lac is melted; the wax and dye are removed and the remainder is poured out onto stone slabs. While it is not a small piece approximately 6 inches square is taken up by a workman and stretched out by means of his feet, hands and even teeth into a sheet about six feet square. This is eventually broken into the flakes that we know as the shellac of commerce.

I have obtained a book, a reprint of an old volume originally published in 1688 and containing much lore on varnish and its application. All the recipes were given for Spirit Varnishes, included one or two using lac. It is given as a varnish and not as a French Polish. Indeed all the varnishes mentioned are put on by means of a brush and rubbed and cut with Tripoli to bring to its final surface and brilliance.

It would be apparent that the method that we know as French Polishing was not known. It is not mentioned at any stage in the book.

The method of mixing and the application seemed to be at a variance with most modern methods of using spirit varnish, and especially Lac that several trials were made and as far as could be judged the tonal quality of the instruments on which it was tried were all to be desired, both from appearance and the tonal quality. If the tone was not enhanced, it certainly did not suffer any harm. Frankly I feel that the tone was brighter than if an old varnish had been applied.

Let me repeat what is said of Lac.

"Lac is the product of the lac bug of India which converts the sap of trees into the Lac of Commerce. It originates from the living wood itself, and has a strength, durability, and attractive appearance unequalled by any
other gum. It has ideal qualities for the purpose of wood finishing: hard, yet elastic, denting but never cracking even under a hammer blow; delicate and lustrous in appearance yet extremely durable; very fast drying, yet never peeling from the surface into which it sinks, forming a dense bond, ageing well with no perceptible darkening. Forms protection against injuries of time and weather; no damp air or corroding time can deface it.

The book recommends Seed-Lac as being the best to use. I have not been able to obtain this, but have used Button Lac. It works well.

In the recommendation of Seed-Lac, the book says this of Shellac.

"Whosoever designs a neat glossy piece of work, must banish this (shellac) as unserviceable for, and inconsistent with, the rarities of our art, and differs from Seed-Lac varnish, as it is much inferior. Shellac will never be fine, clear and transparent and therefore twill be labour lost to endeavour, either by art or industry to make it so, for though it may be polished and look well for the present, it hath no security against the injuries of time".

Herewith are the Rules and General Cautions, as given.

1. The wood to be very smooth, free from greasiness and well rush'd.
   (It may be observed that for smoothing down and finishing both the wood and the subsequent coats of varnish, Dutch Rushes are recommended. This is of course Equisetum).

2. Lay on the varnish exquisitely smooth and even; and wherever knobs or asperities and roughness offer to appear, with your rush sweep them off.

3. Keep your work always warm, by no means hot, which will certainly blister and crack it.

4. Let your work be thoroughly dry after every application, for neglect in this point will introduce roughness and unevenness.

5. Let your work lie by and rest, as long as your convenience will admit, after it is varnished; for the better will your endeavour prove, the longer it stands after this operation.

6. When you come to polish, use Tripoli and water. For fine work, let your rags be of fine linen, and the Tripoli fine and powderlike; and for coarser work, coarser linen and tripoli will be serviceable. Let your hand be moderately hard and very even in all your polishing strokes. Remember, never to polish your work as smooth as you intend at one time, but let it rest two or three days if you can after the first polishing, and then give it the finishing and concluding stroke. Be circumspect likewise that you come not near the wood to make your piece look thin and hungry and threadbare.

7. Take a large quantity of Tripoli at the first polishing till it begins to come smooth; afterwards, a very small parcel will suffice. Circumspectly examine your Tripoli and clout, lest some mischievous unwelcome gravel, grittiness or grating part steal in and nase or scratch your work."

These rules will apply to all types of varnishing, Oil or Spirit, and even if you do not wish to try Lac, it would be well to observe the principles.

To Make Seed-Lac Varnish:

I used Button-Lac in place of Seed-lac and it acts the same. Shellac will not. It may be well here to mention that storing of the varnish should be done in bottles, dark glass or stone preferably. Never in metal.

"Take one gallon of pure spirit. (I used absolute alcohol). Put it as wide mouthed a bottle as you can procure. To the spirits add one pound and a half of the best Seed-lac; let it stand the space of 24 hours or longer; observe to shake it well and often to keep the gums from clogging. When it hath stood its time, strain through flannel into another container.

Let the container be close stopped and let it remain undisturbed for several days. Then into another clean bottle pour off very gently the top of your varnish so long as you perceive it to run clear, and no longer, for as soon as you observe it become thick and muddy you must by all means desist give it time to settle again and draw off more clear varnish. The varnish which you draw off from the top is of extraordinary use to adorn your work and render it glossy and beautiful. The thick yellow coloured remainder may be set aside for preliminary coats or to use where a less fine finish is required."

To apply the varnish:

Take your piece which has been well rush't and set by a weak fire or some place where it may receive heat; and in this warm condition wash it over ten or twelve times with Seed-lac varnish, (that which remained after you had poured off the top-varnish) being sure that you draw your brush evenly over the work and not repeat or go over a brush streak when once made. Let it dry thoroughly between each wash; and if any roughness appear, rush it off. After all this welcome it with your rush till it is all smooth, and when very dry anoint it several times with the top or finest part of the aforesaid Seed-lac Varnish. After standing three days, with Tripoli and water, polish and rub it till it acquires a smoothness and gloss: if when you have laboured for some time, you use the rag often wetted, without tripoli you will obtain the better gloss. Then wipe off your Tripoli with a sponge full of water, the water with a dry rag. Grease it all lightly over with Oyl; wipe that off with a cloth and clear it up with another. If after all this the work look dull or your varnish misty, which polishing before it is dry and damp weather will affect give it a slight polish, clear it up, and that will restore its pristine beauty.

If you have been too niggardly of your varnish, and
there is not enough to bear and endure a polish, use again your finest seed-lac, and afford it four or five coats more; after two days quietness, polish and clear it up.

A final word about polishing; that you allow three times distinct from each other for polishing; for the first, labour at it till it is almost smooth, and let it stand still two days; the next time, polish it till it is very near smooth enough and sufficient; lay it aside then for five or six days; after which lastly, polish off and clear it up as instructed".

Instructions are given for the colouring of the varnish by means of Cambogium, Dragons Blood, Saffron dissolved in spirit and added separately or by combinations.

There is a recipe for a rather elaborate type of spirit varnish made with gums that are hard to obtain today and indeed some are impossible to procure. The method of mixing and dissolving the gums is interesting and the resultant varnish is of high quality. It is fairly difficult to apply and requires care and skill in application. It polishes and looks well.

A more simple one, and one over which the maker has good control as to its degree of hardness and elasticity, is as follows:

"Take three quarters of a pound gum Sandarac, mix it with two quarts of Spirit, by well shaking and standing for about two days; decant it into a bottle.

Take also of clean pickt Mastick the same proportion to an equal quantity of Spirit with the former, and in ever particular observe the rules for settling, shaking decanting it, and straining it.

The proportion usually is to add a double part of Mastick varnish to a single part of Sandarac, mix just before you wish to use it. After varnishing your work and having set it by for two days, you may try its qualities, if, by pressing your warm finger on it, you leave your print behind you, tis a sign that it is too soft and a wash or two of the Sandarac will harden it; if it not only resist your touch but hath some streaks or flaws or cracks. Like scratches, you may be sure that it is too hard and it must be remedied by a wash or two of your Mastick varnish. Some usually dissolve these gums together beforehand, and by so doing are not certain how their varnish will succeed, for it is often that some parts of each gum are softer than others, and so to the contrary. Should therefore a varnished piece prove too soft or too hard, this way cannot remedy it; for to wash it over again with the same varnish is only repetition of the former miscarriage. These things being premised, I need not infer which way will prove the most rational, certain, and satisfactory."

Apart from the very good rules on vanishing and polishing, it is interesting to note that during the application, several coats may be put on as soon as each coat is dry to the touch. But the author is most emphatic that at least four or five days should elapse before any polishing or rubbing down is done. I draw attention to this because I think that it is generally a popular belief that spirit varnishes dry in a very short while. In fact they do to the touch. However sufficient time should be given for the gums to settle and dry out completely, and it is wise to allow at least the time recommended for this before polishing.

By personal trial with these varnishes and their application the results were most gratifying, both for appearance and tone. When the final polishing is done you may bring the finish to your individual liking for a dull gloss or a highly bright one.

The appearance gives very little indication as to whether spirit or oil varnish has been used. The patina is soft and lustrous, and I feel sure that with some years handling it would be impossible to detect if it is an oil or spirit varnish.

For those who are sceptical about lac, I can only advise, test and try thoroughly according to the above rules before levelling any condemnation off hand without a fair trial. Remember that used as given it has these admirable qualities. Hard yet elastic; extremely durable; bonding with the wood; delicate and lustrous. I can only repeat that from my experiences with it, that if it does not actually enhance the tone it most certainly does not harm it. It does not choke stifle or restrain vibrations, and most certainly I feel that it assists the open voice of the instrument.

The following threat was overheard by an exasperated violin teacher to his uncooperative student. "If you don't behave I'll tell your parents you have talent!"

... Submitted by Gordon Rook
The Mail Bag

The opening of my mail during this last two months has been a gratifying experience. Not only are our readers well pleased with the material contained in our Journal but express so many new thoughts that it is hard to digest them all. It is also a thrill to open a letter and find it to be from a "new subscriber" who relates his experiences and starts right off giving information to those less fortunate. Several times lately I have received "little" parcels which contain small booklets or photographs of violins, etc. Some of these are worthy of immediate mention. Let us take them one at a time.

John Bolander, Jr.

I have corresponded with Mr. Bolander for years but only recently (so modest is the man), did I discover that he was an outstanding Bow maker. This came about by receiving from him a most complete booklet on Bows, called "1000 bows and a Tribute". The "Tribute" is to his teacher, the late Mr. Alfred Lanini, not only teacher but his closest friend. The "1000 bows" refers to the fact that John has just completed his 1,000th bow. The book celebrates this achievement! I am indeed proud to have received the second copy off the press, autographed by the author! We will have a lot more to say when we review Mr. Bolander's career, as we hope to do in the immediate future.

Violin Library

Herbert K. Goodkind has an advertisement in our Journal but I had no idea of the importance of the Library he mentions until he sent me a catalogue of its contents; also a few sample photographs of some of the illustrations taken at random. This must be an astounding collection, in fact Herbert, himself, appears no ordinary person. A writeup about his collection and himself is certainly a must as soon as we can.

Enos Turney

The third item was a package I received from an old subscriber--(but young in years!). Mr. Enos Turney of Arlington, U. S. A.

In the package were two unique illustrations, one of Enos, himself, and another of one of his fiddles. I cannot figure out if these are pencil sketches photographed or reproductions of photographs by some special process. With these he sent several pages of a magazine, now defunct, called "The Violinist". The pages are dated November, 1928. This must have been a very lively periodical as all the articles are exceedingly informative. You will hear more about Enos Turney and the old "Violinist" in future issues and you'll see these illustrations! Have any of our readers copies of "The Violinist" on hand?

The Home of Strad

Another glance into future issues! I received a very fine report of a trip made by Sgt. John Murray this summer. He travelled through Italy visiting the haunts of Old Master violin makers. Photographs and description of Strad's home are most interesting and revealing to the modern maker. John is a Sergeant in the Canadian Army in Europe--plays an instrument in one of the Bands; also makes violins.

So you can see there are several articles of interest forming for the future.

Smiley's "Science for The Maker"

I receive varied opinions as to the value of publishing this work. Those against it have, I fear, made no attempt to study this series or carry out the experiments. Those who have done their "homework" are loud in proclaiming it one of the most important works yet attempted in determining what makes a violin tick! I can say this--that many readers will be sorry they have not taken the work seriously for--The best is yet to come.
Sound and Structure

The earliest successful attempt to measure the velocity of sound was in 1640 by Mersenne. He timed echoes, and Zahm quotes his result as 1038 feet per second. Assuming that this time Mersenne used the unit of land measurement (King's Foot = 32.8 cm) and the day was cool 58 1/2° F. (14 3/4° C.), let us convert both his value and our modern value (331.46 M/sec at 0° C) to the customary working-temperature:

Velocity (c) of Sound in air

<table>
<thead>
<tr>
<th>Velocity (c) of Sound</th>
<th>at 20°C = 68° F*</th>
</tr>
</thead>
<tbody>
<tr>
<td>344 M/sec</td>
<td>Mersenne 1640</td>
</tr>
<tr>
<td>344 M/sec</td>
<td>Modern 1960</td>
</tr>
</tbody>
</table>

It would appear that modern measurement and methods have not improved much on the original work by Mersenne. His works have been virtually inaccessible and this has been unfortunate.

Mersenne, in writing on the construction of the Mandore, also Lutes and Pandoras, said that the braces (resemble our bassbar) of the belly were "one or two lines" (1.9-3.9 mm) in thickness and can be up to 1/2 (pendulum) inch (11.18 mm). He said that it must be observed that the manufacturers add still other strips according to the weakness of the boards, or "depending on experiments that they make to give a better harmony to the lutes". He gave lute belly-thickness = 1/12 (pendulum) inch (1.97 mm). A lute belly has far greater area and more strings than a violin.

By now you might surmise that he could not grace the work of the luthiers with the term experiment unless the work had met his criteria for accurate scientific experiments. Perhaps buried elsewhere in his voluminous works (unavailable here) there may be much more on these important aspects of instrument construction and experiments of the makers.

If you suspect that this information and the above box are not intended solely as decorative erudition, your Sherlocking is quite correct. As with all preceding material, it has very practical application for the violinmaker. You can use all this information even if you do not understand the principles behind it. In preparation, let us calculate the wavelength (λ) of a 3080 cps tone:

\[ \lambda = \frac{344}{3080} = 11.17 \text{ cm} \]

Half this length is Strad's cavity height. See page S13.

Cavity Resonance - New York

The Problem. Many theories have been postulated regarding the Cavity Resonance of the violin.

The underlying QUESTIONS are "How does the internal air of the violin cavity affect the sound-output of the instrument? What are the physical laws--i.e., the formulae--which describe the performance of the contained air?"

Indirect Approach. The classic mechanical analogy postulated was the BALL shape (Helmholtz Resonator) in which the cavity CUBATURE was thought to dictate the "pitch".

A newer mechanical analogy postulated is an eccentric flattened DUMBELL shape in which the SHAPE (and cubature ?) is thought to dictate the "pitch".

Mechanical analogs have acoustical formulae which have been translated into electrical analogs. If the mechanical analog chosen is correct, mathematical analysis of its electrical analog should be able to predict the frequencies at which one should find more air peaks than the single Cr listed in the table on page S6, chart page S7, graphs p S9.

That is one approach to finding the answer to the questions. If the mathematically predicted air peaks are not found by experiment, then the analogy used is not the correct one (i.e., the BALL does not work out in practice) and the search for the correct analogy continues.

Direct Approach. There is another approach. One constructs a basic mechanical analog (a model) and makes it perform in the laboratory. If the contained air produces the same result in the models as in the violin, one can determine the physical laws--i.e., determine the formulae.

This is a simplified preliminary report of the work that has been done here. If Cr (see table page S6) is 280 cps, other peaks occur--the complete and representative list in the playing range is given in cps:

<table>
<thead>
<tr>
<th>Violin Gamma Set--Typical AIR resonances of the Violin</th>
<th>D'/14</th>
<th>D'/13</th>
<th>Cr</th>
<th>D'11</th>
<th>D'/8</th>
<th>D'1/1</th>
</tr>
</thead>
<tbody>
<tr>
<td>220</td>
<td>237</td>
<td>Cr</td>
<td>280</td>
<td>385</td>
<td>3080</td>
<td></td>
</tr>
<tr>
<td>dbl 440</td>
<td>---</td>
<td>dbl 560</td>
<td>770</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>dbl 880</td>
<td>---</td>
<td>dbl 1120</td>
<td>---</td>
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<td>---</td>
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</tr>
<tr>
<td>dbl 1760</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
</tbody>
</table>

The Family of Gamma Resonances is an interrupted Reverse Series with doublings.
If one presets the cavity-height (S19, S13) either in the model or the violin, one gets by experiment the Gamma set (or family) of frequencies listed.

R-C type pure sine wave audio generator was used to run the electromagnetic driver. Ports were close-miked Cr and its Gamma Set were always distinguished from Brs by making an "air run" immediately followed by a "carbon dioxide run" in which all "air" peaks shift to the left while Brs remain fixed and unaltered. The ear alone is often inadequate to 'pick up' all--except the most intense--members of the set. (See note on S-22.)

It should be pointed out that the BALL shaped Helmholtz Resonator is a sound collector with a maximum air resonance, while the model and violin are sound emitters with a set of air resonance frequencies of which Cr only is listed on the S6 table.

The work here indicates air cubature, and air shape, seem to have no influence on Cr location. Cavity height dictates the pitch-locations for the entire set. Note--port sizes used were the same area as on Strad Violins (S13).

Although the maker may not be able to detect the entire set with the mechanical equipment outlined in this series, he should be able to preset his Cr where he wants it. The other resonances will occur at locations calculated from the Gamma Numbers on the table headings--with due attention to the doublings. In some respects the Gamma Set resembles the 'privileged frequencies' (of Bouasse) in horns.

This is not the first time that the idea of the violin as something-like a 'short pipe' has been considered--Felix Savart was said to have entertained the thought. Perhaps a quotation will give some idea of the complexity of the problem:

"It may be added here that when the cross-sectional size of a pipe becomes comparable with its length, the formulas connecting pitch and length break down. Mersenne was able to lower the pitch of a pipe seven whole tones by holding the length constant and increasing the diameter from one-fourth inch to four inches." (Culver, Charles A., Musical Acoustics, Blakiston, Phila., and Toronto, Page 121, 2d ed 1947)

The Mersenne sentence was included, not because it is of help to us with violins--for he did not drive the organ pipe--but rather to indicate that the behavior of all air-bodies has never been completely formulated.

An organ pipe is air driven by a pressure of about 1/2 pound per square inch ( = 27 mm Hg.). It takes about 75 mm to drive an oboe, 3mm to sound c' fundamental of 2-foot tenor recorder--and 6mm to sound c" the octave above.

Sound emitted from organ pipe ports is greater than from the pipe body--a port emitter. Sound emission from the violin body is greater than from its ports--body emitter. It is normally driven below the Gamma/1 Resonance (3080 cps fundamental. Different Gamma/1 can be selected in order to get any desired Cr--ie. Gamma/11.

The cross-sectional size of the violin cavity is considerably greater than its cavity height; it is short, fat, bi-ported, and has 2 large driven emitting areas--diaphragms. The relatively mute ports were not designed to 'speak'. The air content is not air-driven--unless you blow into the f-holes.

Baroque Calipers

Photographs of Baroque Calipers have, until now, appeared in the violin literature without comment--perhaps to provide a quaint decorative touch to the text.

I asked these questions, 'Is their simplicity deceptive? How were they used? How useful? How accurate?'

The resulting calipers proved to be so versatile that it occurred to me that others might wish to try them. It is convenient to have (make!) all 3 gauge blocks.

More expensive modern calipers take longer to construct, but can they do as much--or better? The old masters were rather clever.

In 1951 David Eugene Smith wrote "The pupil who studies geometry in secondary school today is not getting as good mathematics as the one who studied in the 17th century, simply because it was the selected boy who took the work at that time." (History of Mathematics, Vol. I, p. 445, Dover.)

Stradivarius was such a selected boy for he could read, write, and cipher. He was also selected to work for the science-music minded Medici--as were Galileo Galilei, Andreas Amati, Vincenzo Viviani (Strad's contemporary) etc.

A rubber band on the caliper notches is convenient. Also, it is very simple to make paste-on scales for the gauge block which would enable one to make measurements in thousands of an inch--or in hundredths of a millimeter.

Such accuracy is unnecessary for our work, of course, but we could easily stretch the measurements even farther if we desire--all we have to do is lengthen the gauges.

Today our equipment has become more complicated, but that does not necessarily mean that we can look at a "simple-looking" old tool and assume it couldn't do much. What the tool could do depended on the head that operated the tool.
Baroque Calipers

<table>
<thead>
<tr>
<th>Gauge-Type</th>
<th>Length of each SIDE</th>
<th>Length of BASE</th>
<th>Scale factor times</th>
<th>Scale reading</th>
<th>Actual Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eng. Decimal</td>
<td>5 inches</td>
<td>1/2 inch</td>
<td>1 x 10ths</td>
<td>hundredths</td>
<td></td>
</tr>
<tr>
<td>Eng. Fractional</td>
<td>4 inches</td>
<td>1 inch</td>
<td>4 x 8ths</td>
<td>1/2 inch</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 x 14ths</td>
<td>1 inch</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 x 32nds</td>
<td>1/2 inch</td>
<td></td>
</tr>
<tr>
<td>Metric (mm)</td>
<td>10 cm</td>
<td>1 cm</td>
<td>1 x mm</td>
<td>tenths mm*</td>
<td></td>
</tr>
</tbody>
</table>

Note: Try Sears-Dunlap steel rules @ 50¢

*Note: these are nearly equal

For violin and viola — each rod is 1 4/4" stock. Bend 2 simultaneously. Make \( l_1 = l_2 \) by reversing pivoted arms. Make larger for Gamba and cello and bass.

Uses
1. Inside-outside calipers.
2. Delineate contour lines.
3. Measure all bout widths.
4. Measure overall violin-thickness.
5. Plate graduation.
6. Plate thickness of assembled violin.
Re Name Changes

For at least 100 years certain peaks among the resonances have been variously named—for our cavity theory was growing in data, but not complete. A tentative and partial summary follows:

<table>
<thead>
<tr>
<th>VIOLIN</th>
<th>CELLO</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
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<td>x</td>
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<td>x</td>
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<tr>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

**NOMENCLATURE Reference Chart**

<table>
<thead>
<tr>
<th>PEAK</th>
<th>Called by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1</td>
<td>Proper tone</td>
</tr>
<tr>
<td>1/1</td>
<td>Main Air-body Res.</td>
</tr>
<tr>
<td>1/1</td>
<td>Overtone Peak (old)</td>
</tr>
<tr>
<td>1/1</td>
<td>A Subharmonic (new)</td>
</tr>
<tr>
<td>1/1</td>
<td>Airtone</td>
</tr>
<tr>
<td>1/1</td>
<td>Blown tone, etc.</td>
</tr>
<tr>
<td>5/1</td>
<td>Airtone</td>
</tr>
<tr>
<td>5/1</td>
<td>WOLF occurred here</td>
</tr>
<tr>
<td>5/1</td>
<td>Wolf occurs here</td>
</tr>
<tr>
<td>9/1</td>
<td>Principal tone</td>
</tr>
<tr>
<td>9/1</td>
<td>Wolf may occur here</td>
</tr>
<tr>
<td>9/1</td>
<td>Overtone Peak</td>
</tr>
<tr>
<td>9/1</td>
<td>Subharmonic (new)</td>
</tr>
</tbody>
</table>

H = Hermann Helmholtz (opus cit.)
S = F. A. Saunders, et al (various)
O = Others

Note—technical: The oscilloscope trace shows a characteristic shape for all members of the Gamma Family. The ear can learn to detect all the faint high members of the set, however trace-checks and carbon-dioxide-confirmations should always be made.

Also, some of the listings in the above table previously had been attributed to Brs rather than to air-resonances. The descriptions of those experiments indicate the instruments were usually harmonic-driven rather than pure-tone-driven, without routine followup with Carbon-Dioxide-Separations, nor was close-mike technic employed in early work. A re-evaluation of that work may be indicated.

Re the Rowland Table

Pages S3 and S4 recorded the birth of an important computing table.

The NUMERICAL ACCURACY to be expected of all such tables (cf. log10 tables) is quite properly indicated by the number of digits to the right of the decimal. The more digits, the more valuable the table—for its use is not limited solely to violinmakers.

Suggestions as to our EXPERIMENTAL ACCURACY was given in the preceding text (S2) and again appears on page S15. From such a suggestion the number of places to the right of the decimal that we can use should be clear to all familiar with the use of numerical tables. Others will receive directions when we have immediate need to use the table. The interim gives volunteers ample opportunity to check the table for errors,... The illusory problems of temperature and humidity have probably been banished (S15–S18), and bow-pressure we have not—for we PLUCK the RM/chord string (S7).

Letters containing suggestions, corrections, and questions are helpful and much appreciated. Your patience with the slow development of many fine points will be expected and appreciated.

Archive Section

Probably many makers own 'Bow Instruments, Their Form and Construction' by J. W. Giltay, translated from the Dutch about 1923 (Wm. Reeves, Pub.).

Almost lost in the text is the description by Giltay of an air-cubature experiment which he performed that is related to the material presented on the preceding pages. He said, 'The resonance-tone of a soundbox, however, does not depend on the capacity [cubature] alone, but also on the model [...]. This well-known fact can be demonstrated by a simple experiment':

Koenig's accurate forks and strongly-reinforcing resonance boxes were used by many physics laboratories at the turn of the century.

Should not one be able to predict how to build such a simple BOX to attain maximum resonance. For any fork?

Puzzle: Suppose you are a resonance-box manufacturer and you receive an order for 105 forks with maximum reinforcing boxes. You do not want to waste precious materials so you are going to have to do better than "rule of thumb" work or you will be wasting costly time as well as much wood. The 105 forks will differ in frequency from each other by 4 cps and you will be given a list of the fork frequencies—for fortunately you do not have to make the forks, just the boxes. Can you do the job?


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