The Violin Makers Journal

APRIL-MAY 1961

THE OFFICIAL MONTHLY PUBLICATION OF THE VIOLIN MAKERS ASSOCIATION OF BRITISH COLUMBIA

A Group of Aristocrats

(see story page 1)

Issued as an Educational Feature to encourage and develop the art of violin making.

The Violin Makers Journal

A Non-Profit Magazine Published every six weeks
by The Violin Makers Association of British Columbia

MEETINGS HELD THE
SECOND SATURDAY
OF EACH MONTH AT
4360 MAIN STREET.

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FRONT COVER STORY

Our cover photograph shows a group of Prize-winning Violas taken at The International Viola Exhibition held at Ascoli Piceno, Italy, September, 1959.

Second viola from the left is a Grand Silver Medal winner made by PEDER SVINDSAY, 240 E. 5th Avenue, Vancouver, B. C. Another, not identified, was exhibited by CLIFFORD HOING of High Wycombe, England, and won the Gold Medal for most distinct viola.

Another photograph of the Viola Show on page 9.

Lithographed by Apex Printing, Vancouver, B. C., Canada.

EDITORIAL PAGE OF *The Violin Makers Journal*

DON WHITE, EDITOR-MANAGER

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GUEST EDITORIAL

by Norman Miller

Many and varied have been the presumptions given for the ability of makers Stradavarius and Guarnerius, and for the quality of their instruments.

Many suppositions have been made as to their possession of secret formulae for construction and varnishes, and much ink has been spilt by makers over the years who have made claims to having discovered the working of these secrets and their application.

Little, if any, attention has been drawn to the possibility that these two makers in particular, evidently had one thing in common: sincerity of purpose coupled with humility.

This sincerity and humility is shown by the fact that both makers incorporated on their labels a symbol of the Supreme Maker of all things.

This would suggest that both Strad and Guarnerius were humble enough and devout enough to dedicate the results of their gifts and skill.

If one humbly and sincerely returns the gifts bestowed by the complete dedication of the work undertaken, and offers the results of that work to be accepted, and if the purpose of dedication be kept uppermost in the thoughts and actions of the maker, that the work should be of the finest possible the individual concerned is capable of producing, it will be found that the finished work will be finer in all ways than if it is produced only with a mercenrary, or other motive of self in view.

We cannot presuppose that because their work was dedicated, that some miracle was performed and that their work is so good because of this miracle, the thought that should be uppermost is, that grateful for their skill, they humbly acknowledged their gifts, and in their work endeavoured that each instrument would be of a standard acceptable for dedication. A standard kept in their own hearts that excluded falseness and any semblance of faking. It would be to their everlasting shame to lower their standards of endeavour. Such can be the purpose of dedication. Those of us with lesser ability and talent, can still make such a dedication, and the work, sincerely, humbly and honestly conceived, will automatically be of a finer standard. It becomes part of the admonition "To thine ownself be true."

Placing a symbol on your labels in itself will do nothing, but if the reason for placing the symbol is carried out sincerely in heart and mind, this sincerity of purpose will be evident in your handiwork, and you will be a good step closer to truthfully utilising any knowledge and skill that you may obtain.

Looking at such a dedication with a more mundane approach, it could be said that with such a high purpose to aim for, terms of 'concentration' and 'care in execution' become more meaningful to the maker. It is generally understood that possession of concentration is more than halfway to success when any project is undertaken. Should not such concentration be easier to attain if one keeps such a high purpose uppermost? . . .

Johann Sebastian Bach wrote on the margins of many of his Mss. "To God Alone The Glory".

TAKE COURAGE

There is one fact which is so very often overlooked by those who stand in awe of the great Italians, and that is: were it not for the ingenuity of the modern master, there would not be any great masterpieces left for the world to enjoy.

Charles D. Smith, Florance, S.C., U. S. A.
(Violin Maker)

LOCAL NEWS

by GEORGE FRIESS

Owing to the resignation of Mr. Floyd Holly this column has become my responsibility. I expect to find it difficult to achieve the standard set by my predecessor, having had little experience in the fine art of reporting and writing. One can only do one's best. May the day never come when my readers will say, "His pen is mightier than his gouge."

The April meeting was not too well attended. President Heyworth in the Chair. As this was not a business meeting the time was taken up with aspects of violin making.

Receiving major attention were various methods of thicknessing, fillers, such as tempera, propolis and oils.

Some discussion was had on the "World's Fair" which will be held next year in Seattle, Washington. It was suggested by Mr. Helin that we should give consideration to the advisability of putting in an exhibit, either as a group or as individuals. However, it was felt that until our Secretary receives a reply to his request for information, that this discussion was premature.

Playing some new instruments wound up the evening.

Vancouver has a New String Quartet, consisting of Joseph Pach, Violin; Johannes Chlumeky, violin; Rodney McLeod, viola; and James Hunter, cello, all prominent local musicians.

They played their first concert on Sunday in the Arts Club and were well received. Our best wishes.

The B.C. Music Festival got underway last Saturday and Instrumental Music filled the air, morning, afternoon and evening at the Pacific National Exhibition Gardens. Seventeen Junior and High School Bands comprising eight hundred students in all took part and made the "Welkin ring". What a day that must have been for the Adjucators!

The consensus of opinion in the Violin Makers Association of British Columbia is that our spruce is equal to spruce from Europe. We have huge forests of it.

Engelmann spruce, which grows in the higher altitudes of the mountains, is a soft spruce. Our Sitka spruce, which grows on the coast here, mostly in the Queen Charlotte Islands, is a harder wood and takes on a reddish hue. When seasoned, is much in demand for piano sounding boards.

McMillan, Bloedel and Powell River Co., the largest forest products firm here, has signified its willingness to cooperate with us and make this wood available if there is sufficient demand for it.

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TERMINOLOGY AND THINGS IN GENERAL

by George X. M. Collier

Regarding standardization on the terms we use in the Journal, I am quite convinced we should go metric. Far the greater part of the world uses the metric system and conversion to inches is no trick, since latest legislation established the inch as 25.40 milimetres. Actually it is a little more than this, but there are so many zeros between the 4 and the next significant figure that 25.40 is more than adequate for all conversions. Actually we have three schools of thought on this measurement business, metric, fractional inches and decimal inches. I use decimal inches as all of my measuring tools are calibrated in .001" increments and I find it handier. Conversion to metric will be somewhat inconvenient to me, but the metric system is utilized throughout the scientific world and its use in the English measurement countries is becoming more and more common. Further, the relation between linear, volumetric and gravemitric values is much more logical in the metric system, and once schooled in working with it, a person has no more trouble than with any other. So, Ho for the metric system in fiddle making and let us all convert.

Regarding other terminology, I believe we would have quite a time in standardization as each set of users develop somewhat warped meanings for various terms. For instance, tone. We use the word tone to indicate the quality of sound generated by an instrument. Actually the dictionary definition of tone is a sound having a regularity of vibration, as to impress the ear with its individual character, especially pitch, and to enter into the harmonic relations. There is a lot more to this definition, which includes tone as we use it. Now, if we standardize, each word should mean one thing, and one thing only. So, if we were to use "tone" to indicate a regularly vibrating sound, it would be O.K. as "pitch" will give us the word for the number of vibrations, and "timbre" will suffice to indicate we are talking about the quality of the "tone". But, we now encounter social inertia, wherein tone has been used to indicate timbre for so long that we automatically say tone when timbre would be more accurate. I'll be darned if I can stop using tone in fiddle talk when I mean timbre, though in the electronics business tone to me automatically means a pure sine-wave vibration, unless it is qualified as being a complex wave or a wave containing certain percentages of certain harmonics or random frequencies. If we used these terms, we would then be technically correct in stating "the timbre of the tone generated by a Strad makes the instrument superior to most others". This could become cumbersome as the statement "Strad tone" covers the ground in good shape, and correctly per the dictionary. To do a good job on this sort of thing will require the work of a committee and, while I have never investigated the situation, I believe the Acoustical Society of America must have standards we could adopt, if we can educate contributors to use them. Such a standardization will necessitate a lot of editing to bring contributions into line, or the Journal will have to so tighten up on the preciseness of the language it will accept for publication that a lot of contributors will not contribute because they feel they cannot meet the language standards required. Numerous technical societies utilize the strictest control over terminology used in articles, and it becomes very hard to meet their publication standards. I know, I've done it. Therefore, and inasmuch as we don't want the Journal to develop into a dry scientific publication, my thoughts would be to accept well written articles, with a mistake here and there with regard to terminology, and let the interested readers ask questions when they are not exactly sure what the author means. Most of the time we get the meaning well enough, and most of us can read between the lines a bit. I'll be happy to do a bit of investigating relative ASA standards if you wish, but Dr. Saunders contributes to the journal of this society more or less regularly and I believe he could tell either you or me exactly where to go for copies of said standards.

One thing more comes to mind before I close and that is this. We have all read about linseed oil going through a solidification phase as it is exposed to the air, then, after several years, this solid again becomes viscous and runny, with greatly changed chemical characteristics. Now, since air contains a relatively small percentage of oxygen, I'm wondering how much acceleration of the tests on linseed oil could be produced by conducting them in an atmosphere of pure oxygen and at somewhat elevated temperatures. I wonder if anyone has ever tried it, and did they make out or did their oil catch fire from spontaneous combustion. T'would be tragic to submit a fiddle to such a test and return to it after a few hours and find it a cinder. Mr. Michaelman's comments on this procedure would be interesting.

Something else is the catalytic and epoxy glues now on the market. Both of these substances stick like the very devil. The catalytic items are true glues, some of which require quite high temperatures for curing with others doing a good bond at room temp. The epoxy materials, at least those I have tried, appear to be more of a cement, with the substance itself being very hard. I mixed a little on a piece of glass and let it dry there. When it had cured out, the stuff was so hard I could hardly scratch it with a knife and it stuck to the glass so hard that I could break the glass and it would still hang together via the resin thereon. Both of these glues are far simpler to use than the conventional boiled glue. Further, they are waterproof and give a bond equal to that of boiled glue or better. T'would seem we could use them to good advantage in fiddle-making, especially in gluing the center joints on bellies and backs. One

thing I do know and that is that a fiddle put together with them will never come unglued, if the joints were good and close. Readers' comments on this will be interesting.

* * * * * * *

LETTER FROM MRS. FREEDA MICHELMAN

Dear Mr. White:

This letter is written by Mrs. Joseph Michelman. The November 1960 copy of THE VIOLIN MAKERS JOURNAL arrived this morning and was read with great interest. It is important that violin makers and violin varnishers exchange ideas so that the younger generation may learn from the older one, their successes as well as their failures, and thereby go on to improve their instruments, or at least avoid the same mistakes.

I want to take issue with you on the article "The Pre-Varnishing Treatment of Violin Plates." Why do you insist on calling it the "Sangster method"? Mr. Sangster now uses raw linseed oil as recommended by my husband in his book "VIOLIN VARNISHES". At that time Mr. Sangster was still using his "water method". Mr. Sangster suns his violins just as my husband suggested in this same book on page 100. What then, is the Sangster method? The only difference I could see was that my husband puts the violin in a box, in the sun, in a horizontal position while Mr. Sangster "hangs" his in the sun in a vertical position. Will this difference affect the tone? The essential part is that the violin dries in the sun regardless of its position, vertical or horizontal. In fact, it is preferable that the violin be in a horizontal position in order that more surface be exposed to the sun.

Also, you mentioned that Mr. Michelman has stated that the linseed oil passes into a liquid state after a number of years and that it also migrates, and it is your opinion that this migration may ruin the instrument. On the other hand, Mr. Sangster's linseed oil oxidizes and improves the instrument, according to your statement. Isn't linseed oil the same whether it is vertical or horizontal? And if it changes back to the liquid state and migrates in one instrument, isn't it likely to do so in both? Isn't it logical to suppose that Mr. Michelman, a graduate chemist, should know more about this subject than a layman? Personally, I can't see any difference in the linseed oil in either Mr. Michelman's application or the so-called Sangster method. Both will oxidize and both will migrate after they have turned to the liquid state after a prolonged time, whether it has been noticed before or not. Mr. Michelman has used a scientific approach to this subject and his many experiments bear out his testimony. Therefore, let us call it what it really is, the Michelman method.

Otherwise, I enjoy your magazine and look forward to every issue. Wishing you every success for the year 1961.

Yours very truly,

Freeda Michelman

Note by Don White

I feel that my good friends Joseph and Mrs. Michelman slightly misunderstood some of the phrasing in my article. I did not say "Sangster's method" but "a method used by Earle Sangster," and only used his (Sangster's) name because I wished to describe the results of a recognized successful maker. I cannot see that the linseed oil treatment can be called "Sangster's Method" or "Michelman's method." Linseed oil was used long before these two gentlemen were born.

Let me repeat a remark from my article - We, the makers owe much to the tireless work and investigations of Mr. Joseph Michelman.

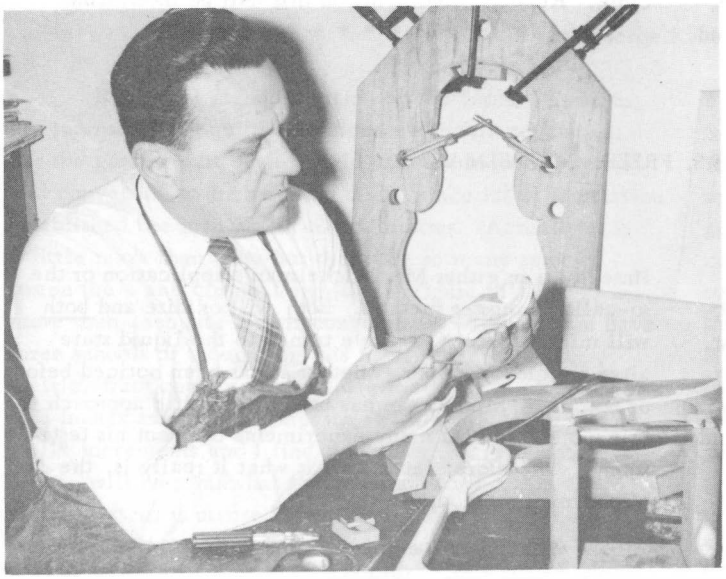
D. W.

* * * * * * *

LIFE

One man gets nothing but discord out of a piano; another gets harmony. No one claims the piano is at fault.

Life is about the same. The discord is there, and the harmony is there. Study to play it correctly, and it will give forth the beauty; play it falsely, and it will give forth the ugliness. Life is not at fault. -- Indiana Teacher.

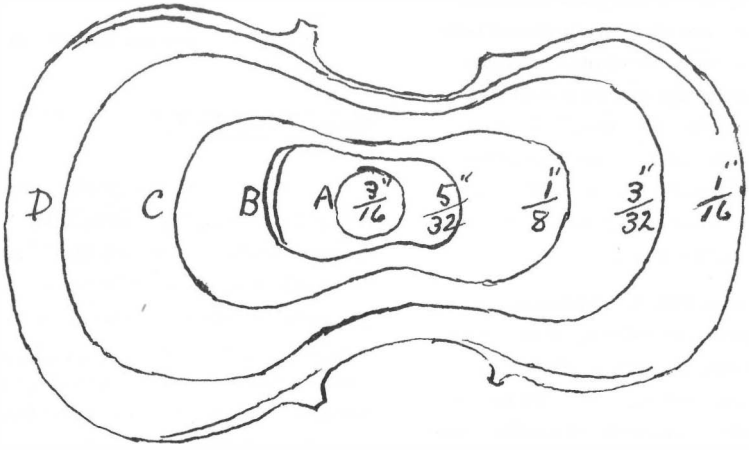


Norman Miller

Random Thoughts While Sanding Plates

By NORMAN MILLER

I have given a good deal of thought and consideration to the system of microtoning and will certainly make some experiments with it, and adopt it if I can master its principle effectively enough. However, a thought keeps popping into my mind that perhaps my system of arranging the thickness areas of my plates is in itself a system of microtoning. In case I have not sent drawings of my plans I present them herewith.



Each contour line is the exact thickness; back from it toward the centre it becomes progressively thicker; as it progresses to the other contour nearer the edge it tapers to the next contour thickness. viz., line C is exactly 1/8th thick. Line D is exactly 3/32" thick between them the wood tapers from 1/8th to 3/32".

Should I get wood that is less dense than one previously worked, I make contour C extend further down into the lower bout area. The dots give an idea. The plate is 1/16" only at the linings !!! From D to the linings it tapers from 3/32 to 1/16.

This type of thicknessing is difficult to produce and requires much care. I adopt this method to make sure that the contours are correctly thicknessed. I leave the plate approx. 3/16 all over and then draw the contours on in pencil. I then proceed to gouge out the depths of each thickness, leaving all a trifle fat. The surplus wood is then taken out and each contour blended into its neighbour. The light test is then undertaken (as per my letter).

Remember the area between B and C is not 1/8. It tapers from 5/32 at B to 1/8 at C.

C to D; and D to linings in the same manner.

You will notice that especially in the centre areas in and about the f holes that the perimeter of the thicknessing contours, apart from the circle under the bridge approximate the outline of the fiddle shape. This principle of thicknessing gives a completely different result than if all the variations of thicknessing followed some even design of, say a circular one, or perhaps ovate but with the perimeter even, instead of undulating.

In the execution of my thicknessing, considerable care is taken with the calipering to be certain that the contouring is infinitely correct. This is assisted by a further means, a visual one by placing the plate over a source of strong light (the light arranged so that it presents an even distribution). By this means, it can be seen if the contouring and thicknessing are evenly distributed, and steps can be taken to even them out, so that the thicknessing out-

lines match. It also serves to show up certain parts of the plate that may tend to be denser or harder than other parts and can be brought to the same density by scraping until the image has the same translucency. Here then may be a reason for the need of micro-thinning. The wood in a certain area of the plate may be denser than the rest, and so requires to be a little thinner. Working over the light source will show any difference. If your wood is too thin to start with, of course look out, or you will have a paper thin area easily enough. All the scraping is done before the assembly of the plates to the ribs, and because of this may be deemed hit or miss by some, but so, I feel, is scraping after assembly as how does one know exactly where to scrape to assist a certain string or note?

I took this from an old magazine on violin making: "... The object in making a stringed instrument is to produce a structure that shall respond freely as a whole, and equally to every varying rate of vibration that the strings produce. The one object is to prevent any portion of the structure, whether it be the solids or the contained air from vibrating on its own. Where then, is the sense of trying to make any element respond to a particular note?

There is a distinct tendency in any contained mass or air to respond to particular notes. This tendency in stringed instruments must be controlled by just sufficient resistance to felxion in the solids (the back and belly principally) to control this tendency with the minimum of weight, because any fractional increase of weight increases the work the bow has to do to set up the required vibrations of the whole.

The action of the back and belly in this respect is analogous to that of the reed in the reed pipe of an organ. The reed controls the vibrations of the pipe, not the air."

I was interested in the argument and answers by Dr. Saunders and K. Skou. With your experiment with the bottle, try this.

Get a bottle about two to three inches in diameter, and about six inches high. (That is the measurement of the one that I used.)

The bottle is completely open mouthed and is fitted with a screw top (tin).

Take the screw cap off, and hold the bottle horizontally with the open end near your ear. When the bottom is tapped, you hear a certain note. Screw the top on lightly so that the top rattles when the bottom of the bottle is tapped. Now, very gently, screw the cap to the tightening position by turning the cap about 1/8 inch at a time. Each time you screw it up hold it to your ear (not touching, of course) and tap the bottom of the bottle. As the cap is tightened the original note of the empty bottle ascends the scale until it reaches its maximum with the cap absolutely tight. The cap is metal and does not have any cork or other lining in it. Obviously it acts as a diaphraghm. Now is the blow conducted via the bottle or through the contained air? Both perhaps. But it does show that no matter what the original air note is, or the bottle note, the diaphragm transcends the scale as it is tensioned. The bottle I tried was of course empty. I have not tried it with liquid in it.

- End of Random Thoughts -

QUEER BASSBAR IDEA

By Clifford Hoing

When some of the queer ideas published in The Journal are considered, it is little wonder that I get many letters from amateur violin makers who are very much confused and are uncertain as to what method to adopt in making various parts of their instruments.

One such peculiar idea was described on page 12 of the October 1960 Journal.

This was a diagram of a bassbar, also described in the text of the article, that advocated the bar being made (quote) "according to the shape and height of arching (of the front) and thickness of plate, allows the maker to control the strengthening of the plate with the correct amount of wood necessary in a bassbar."

Now in the first place it is recommended that the shape of the bassbar should be made according to the shape of the long arching template.

Unless this maker places his bassbar along the centre joint of the front, there is no reason whatever why the long arching should be used as the shape for the bar !!! The shape of the front over the position of a correctly placed bassbar is very much different from the shape of the centre arching. Therefore the centre arch template cannot be any guide to the correct shape of the bassbar.

This maker also states that his method for thicknessing makes allowance for the variation in the strength of the wood. He suggests that by certain methods he is able to make his fronts of uniform strength even when using woods of different character.

Yet he makes his bassbars vary according to the actual THICKNESS of the front.

Now if he is successful in making all his fronts of the SAME STRENGTH irrespective of their thickness, why make the bassbar of different depths? If the fronts are the same in strength, surely they only require the same support!

Another point that makes this method even more confusing is that the method makes a deeper bassbar indicated for a high arching (which is stronger than a medium arch) and indicates a very shallow bassbar for a shallow arching

(which is much weaker than the high arch!!!

I have used the method of making the bassbar of a shape balanced on the centre of its length as mentioned by Mr. Stuekerjoergen but found no particular advantage. I now make the deepest part of the bar directly under the bridge.

Contrary to some makers, I make the bar a perfect fit to the underside of the front, with only about 1/32" "spring" in fitting. I find that I can get the results I require by this method. Which is after all the best reason for any type of construction. The size, i.e., weight, is balanced at the bridge point.

I do not wish to say that ANY maker is using an incorrect method because it is up to everyone to please himself. What would satisfy one maker may not satisfy another. But I hate to see dogmatic statements and perhaps diagrams that purport to be 'scientific' and which can only mislead the beginner.

* * * * * * *

WAS STRAD A SCIENTIST

by H. W. Hardwick

The word science has a kind of aura about it - it is a very popular word today and is very often loosely used in consequence.

In Stradivarius's time science was confined to persons of the standing of Michaelangelo. There was no Public Library. Strad learned in the Amati workshop, boiled the varnish, stacked the timber and absorbed the whole atmosphere of the place. He learned that the peculiar character of sound depended on the sounding body. He also learned to listen to sounds given off by wood and which best to choose. (There are 66 kinds of pine though I don't suppose more than 4 kinds found their way into the Amati workshop.) I have read that men would actually go up on the mountainside during tree felling operations and select trunks by the note given off when they fell.

Poor old Stainer was considered mad when he went through the forest tapping trees--but he was saner than most. He also used to select trees that were dying off at the top; showing that he preferred wood of full mature growth.

Mr. George Hart gives one a fair picture of the "Trial and Error" processes in his notes on J. Guarneri page 147, who made thin - flat - medium and high models and left many in a rough and unfinished state. One could assume that these instruments had served their purpose and a new idea had been tested, and that being so, the interest in that effort just disappeared (but something was learned). When this Trial and Error period came to an end J. G. made his best violins.

Strad's progress was very similar. When he started on his own he proceeded to make Amati models after the manner in which he had been taught, later he began thinking for himself and varied his models with a view to improvement and finally (in 1700) he put the best of all the knowledge gained into his grand pattern and was satisfied with the result. This means the experience gained by Trial and Error over about 30 years of concentrated application of a highly capable brain and ability as a craftsman was expressed in the production of the Grand Pattern Violin.

I cannot concede that this progress was scientific but I will readily agree that science, as we know it today, would and could prove that Stradivarius by a long process of elimination progressed toward scientific perfection and practically attained it.

These old makers tried everything and wrote off the failures. One proof we have is the fact that Da Salo and Maggini tried top table grain from left to right - but did they persist in this method? No, of course not - it was one of their experiments of negative value.

It is said that the worst form of athletics is "jumping at conclusions" so the opposite to this is scientific progress because scientific progress in any sphere is amassed by the gradual addition of proven facts and such assured progress must provide the beacon for further endeavour.

One must remember that the whole of the period from 1550 to 1700 was a period of experiment (by trial and error) at the highest possible level and in that period the Magginis, Amatis and Strad exhausted the investigation into the realm of thicknessing of plates as to whether they should be:

1. Thick in the middle and thin at the edges.
2. Thin in the middle and thick at the edges.
3. The same thickness throughout.

This kind of advancement cannot be called strictly scientific because some errors would be carried along in the process whereas in pure scientific progress all the factors would have been taken into account and errors in each department eliminated before any progress would be claimed.

After the 150 years referred to Stradivarius decided on his Grand Pattern which the world has accepted

as the best ever!

No one that I have ever heard of has ever been able to devote 75 years to violin making as did Strad. So, without any shadow of doubt, if the modern maker is to improve the violin he must start where Strad left off.

Joseph Guaneri died at the age of 51. His violins are superb and highly valued, but he was not permitted to carry on to a Grand period. We do know, however, that his work incorporated some of the Strad principles and was leaning toward the early successful practices of Bertolini and Maggini. Someone is yet to incorporate the best of them all (i.e., eliminate the errors carried along to the end of Strad's life).

The "thick centres" claim sadly suggests that modern makers are plowing through the 1550-1700 experiments again and few will have 75 years to apply themselves to the task.

The best definition of Science that has ever come my way is "Science is the knowledge of the order of things." Now in violin making we start with earth conditions where suitable trees are grown and end with the temperature of the room where the violin is played. Enough happens between to excite the keenest cabinet makers--, luthiers, string makers and musicians and finally we have a creation capable of stirring up every emotion known to man.

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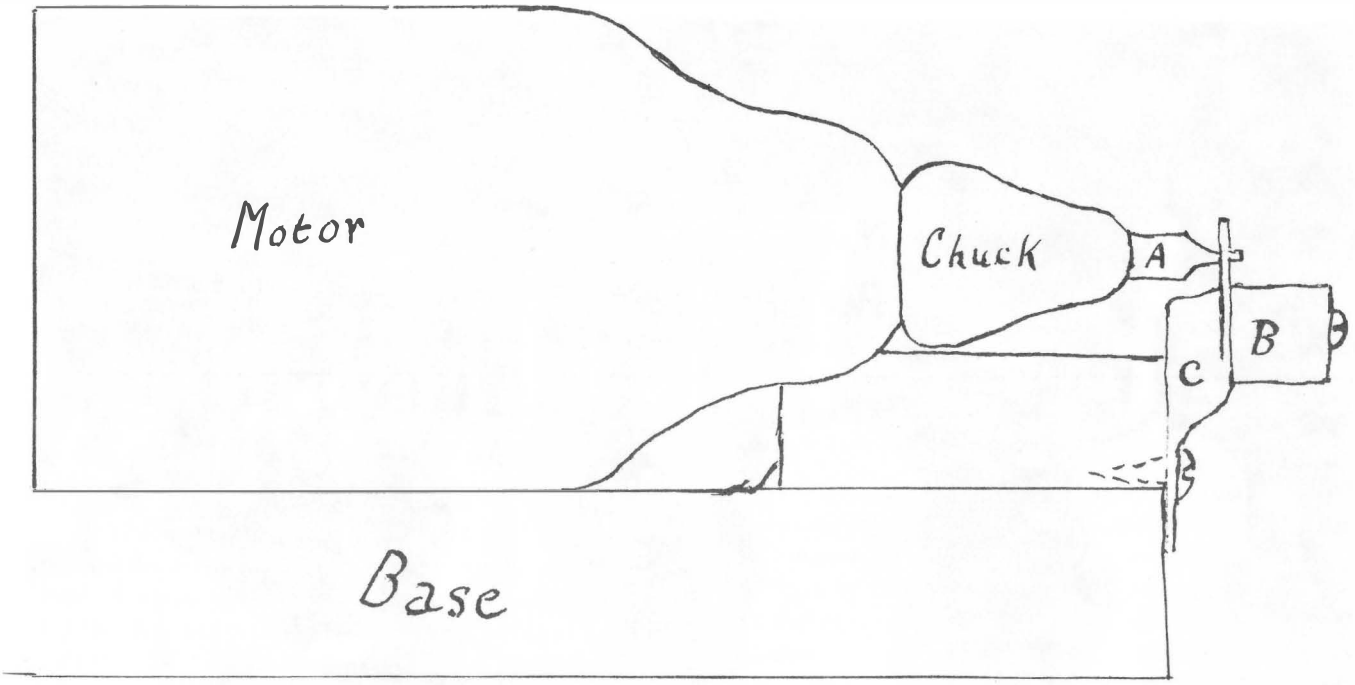
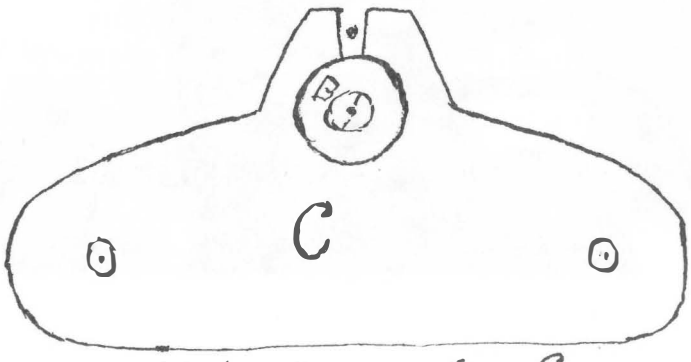
Another view of the violas at the Ascoli Piceno Show. The exhibition was held in the Great Hall. Note old Master Paintings on walls--altogether a very lavish display.

ROUTER FOR PURFLING

by Edward Stuekerjuergen

Here is the description of a little router that I made several years ago and thought it would interest some of the readers of the Journal. The drawing is clear enough so it does not need much explaining. A is a 1/16" router bit, C is the depth guide, B is the rest or guide 1/2" diameter. For the motor I used a Craftsman high speed hand grinder. In use I have found it best to clamp the machine to table or bench with the working end overhanging the bench somewhat with motor to the left, rest edge of violin on rest B, then pushing work into cutter A and start routing cut feeding away from operator. For the beginner it is best to practise on some scrap wood until you get the knack. For those who believe in using machinery and want to save time and work will be surprised how easy it is to cut the purfling grooves on your violin. I have grooved a number of violins in about 8 to 10 minutes for each instrument. In using it is best to feed somewhat slowly but not too slow otherwise the bit will head and get dull. Another thing, don't try to go too near the end of the corners, leave these to be finished by hand.





End view of C

Top View of C

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AN INVESTIGATION INTO THE GRADUATIONS OF STRADIVARIUS AND GUARNERIUS VIOLINS

by Don White

Conclusion

As I draw this series to a close I feel a certain reluctance for I feel that those of us who have taken part in the various discussions have thoroughly enjoyed ourselves.

Those of you who, since February 1960, have carefully followed this series of articles should be completely satisfied that the best violins, certainly the Old Masters, were not made according to graduations given in most "text-books". Several lists of Old Master graduations obtained from orthodox sources, have shown that no hard-and-fast rules were followed. The old "boys" graduated each violin slightly different. How could it be otherwise seeing that no two pieces of wood are exactly alike? Nearly all Strad's later violin tops were thinner in some central portion of the plate than at the edge. Guarnerius' tops more so.

Mr. Gordon Rooke in the April instalment gave a very valuable contribution which showed that several old master violins examined by Mr. Rembert Wurlitzer of New York, were found to be "thinner in the central area than in the region around the sound holes and at the edge."

The several arguments between Mr. Kristian Skou, Dr. Saunders, and myself have helped to liven the proceedings and have assisted us to decide just where the sound from a violin comes from.

In these "encounters" the writer of this series often came off second best!

Mr. Kristian Skou very early introduced us to the Micro-tone System. The system that both he and Mr. Sanborn of Sweden have been experimenting on for some time. Realization that the old masters must have followed the Micro-tone System, either consciously or unconsciously (through expert knowledge of graduating wood) was forceably brought to Skou's attention on the examination of an outstanding violin made by Thomas Balestrieri in 1752.

The outline for this violin, together with its graduations, was given in the July-Aug. 1960 issue of this series. This outline, by the way, is a splendid one for makers to follow. Since that time Kristian Skou has elaborated on the system and in this issue he contributes an article in which he presents in full detail the actual procedure to follow in building a violin, from start to finish, on the micro-tone system.

I should remind you that Mr. Skou did not recommend this system until he had proved it to be absolutely correct. He has made a number of micro-toned violins, all of which have been quickly seized upon by professional artists. He tells me that he has not one left to play on himself. He restored one for a violinist and upon hearing it he was deluged with requests to regraduate other violins. At present two of his violins are being played in The Royal Opera Orchestra, the largest orchestra in Denmark.

Let me remind you that both Sanborn and Skou could have kept the secret of this system to themselves but the really great makers are not built that way. It is only those of lesser stature that harbour some "secret" method, they that are made of poorer material.

Mr. Skou's detailed description of the building of a micro-toned violin immediately follows this "Review." Being lengthy it will be divided into two parts, the second part being presented in our next issue.

I consider this the most valuable contribution ever presented to the violin maker. Let us give honour and praise where it is due, not only to Mr. Skou, but to all scientifically-minded individuals who seek to add their share to the most fascinating of all the arts, that of violin building. This includes all those who have so kindly contributed to this investigation. To them I say "Thank you".

Not only a violin maker, but a real Family man, Mr. Kristian Skou is shown here with his wife and children.

HOW TO REBUILD A VIOLIN FROM THE MICROTONE SYSTEM

by Kristian Skou

I have written several articles about the microtone system, but as yet not given a detailed description of the course of proceeding when building a violin from the system. The editor has asked me to write an article on "How to microtone your plate--from start to finish?", I can promise to write something about that, but for two reasons I would rather start with an article with the above title.

1. It would take me some time to write a detailed article on the building of a new violin, and I understand that some of the readers are eager to try the system in practice.
2. The building of a new violin from the microtone system is a long process--not that our working time will be longer by this system than by other systems, but because the hardening process of the wood, the glue, and the varnish, takes time, and we cannot tune the plates finally until their elastic properties are constant--or as nearly constant as they can be for such materials. But I fear that many makers will hesitate to try the system, if they have to wait a year or more until they can hear the result of their efforts. An already existing violin has the advantage that the varnish and--to some extent--the wood has been hardened, and we can perform a rebuilding of such a violin in a moderate amount of time.

First a warning: do not take a valuable violin for your rebuilding work. Many fine old violins have been spoiled by makers who thought they would make them better.

No--take a nice factory violin of a good form, acceptable varnish, wood of a good quality, and--not least--one with plenty of wood in the plates, in this way you have only to remove wood, and not to add wood, by veneering, which is troublesome work that requires great skill.

Before you open the violin it may be useful to test the plates concerning their microtones, partly in order to plan your work, and partly to decide if the violin is suitable at all for rebuilding.

Perhaps I have here to sum up something about the character of the microtones. They are called microtones because they are small in nearly every respect. They are produced by a very light tap from a little object with a very small contacting surface. The tapping with a finger tip, or knocking with a knuckle cannot produce them. A light tap with the edge of a nail can, but better still, a light tap with a bit of a thin electric wire with soft metal inside, and covered with rubber, as this wire has no frequencies of its own to disturb the sound production. They originate from a very small area (a square centimetre or less). The loudness of the sound is so weak that we cannot hear it without silence in the room and with the ear not too far away from the oscillating area. Furthermore the sound is very short in duration--nearly no "after ring" at all. For that reason some people--musical people--cannot perceive them as a musical sound, a note, but only as a short noise. The psychical course of proceeding by determining the note is that we in thought continue the frequencies started, but soon interrupted--a procedure that may require some training.

And now we can test the plates of our violin. Commonly there is no accordance--no system at all--for the microtones in such a violin. Some areas of the top may have higher microtones than the corresponding areas (vertically below) of the back, and for some other areas the reverse may be the case. If so, the violin cannot play with a tone of any value. If we have several violins to our disposal perhaps we can make some observations regarding

the microtones in relation to the tone quality. If the microtones of the top everywhere are a little higher than the microtones for corresponding areas in the back, the tone of the violin may be very good. The violin speaks less easily and distinct perhaps for a weak stroke, but for a more vigorous stroke the violin sounds very well. If the microtones of the top everywhere are lower than those of the back the violin sounds very poorly, with wolf notes, etc., the top being too weak to master the back, or to correspond with the back, and the "endeavour" of the top in this direction resulting in areas with uncontrolled vibrations--and worse, the more vigorous the stroke. To find a factory violin with all over corresponding top and back is rather improbable, but now and then we can find a factory violin with the central areas corresponding, and we will notice that such a violin sounds remarkably well, even if some other areas do not correspond.

This was a side-leap, and now returning to our violin we have to find the lowest microtone in the plates. If this is not below g^1, and if the microtones in top and back just behind the front block are somewhat above g^1--say about c^2--the violin is usable for rebuilding.

Check the stops. The body stop (the distance from the front edge of the top to the connecting line between the two inner notches of the f-holes) has to be 195 mm. And the neck stop (the distance from the upper saddle (the nut) to the front edge of the top)? Well, most text books say 130 mm. (the ratio being 3 to 2), but tell us at the same time that the string length has to be 325 mm. This is impossible if the bridge shall not lean forwards, and that the bridge must not. The string length from the notch in the bridge to a point vertically above the front edge of the top will be about 3 mm. more than 195 mm., and in order to compensate this (if the ratio of the string lengths shall be 3 to 2) we have to make the neck stop about 132 mm. which is done by many makers of today.

Check also the neck angle. If the bridge is placed correctly, and the height of the bridge (from the centre joint of the top to the upper edge of the bridge) is 33 or 34 mm., and then the string heighth above the finger board (the free end) is not more than 4 mm. and not less than 3 mm. for the E-string, and not more than 6 mm. and not less than 5 mm. for the G-string, the neck angle is acceptable. Also check that the lengthwise direction of the neck is correct (not sloping to one or other side).

All this we have to check before opening the violin, because if the faults are too great we have to remove the neck and place it correctly. But let us say the faults are not greater than to be tolerated--or to be corrected without removing the neck (or the fingerboard), and now we can dismantle the violin.

Before opening the violin a little operation may be useful. Drill a little hole (say 2 mm. in diameter) through the top plate into the lower end block just in front of the lower saddle and near the middle joint (that is if it has not already been done). The hole is for a little plug of hardwood. This plug can be useful for the exact placing of the top later on.

Now we can remove the top, and take care not to split it! I can give a little trick, known by most makers, but perhaps not by all. Wet the steel blade you are using by the opening process in spirit, but take care that no drops of spirit injure the varnish. The spirit will not dissolve the glue, of course, it just lowers the friction, but that is enough.

Should--in spite of all care--the top suffer from small cracks, etc., you have first to glue all this carefully. Now we can start our rebuilding work. Remove the bass bar (I think it will pay you to do so!).

As the top is the more complicated of the two plates --and also because the hardening process of the surface of spruce is not so long as for maple--we will start to tune the top, and later on we will tune the back and the ribs to correspond with the top. But before we start the tuning we have to decide what sort of tone we want from the violin. If we want an Amati-like tone (with its charm, and its faults), we can tune the top to the same microtone all over, which is rather simple. This microtone can be about b^1 or c^2, and the top will commonly (it depends somewhat on the arching) be thickest in the centre with its thicknesses tapering towards the edge. We have only to hold the areas in top and back just behind the front block somewhat thicker (never less than 3 mm. for the back--commonly about 3.5 mm.) and no area along the middle joint of the back between the front block and the centre should be much less than 3 mm.). The reason is that much vibration energy is transferred to the violin body through the vibrating neck, and if there is too little wood to transfer the vibrations the intensity of the tone will suffer, especially on the high notes. Also, for another reason, there must not be too little wood in these areas. The tension of the strings produces a permanent pull in the neck, trying to draw the neck upwards (and the end of fingerboard downwards). The neck acts as a sort of lever with a long arm acting on a short one, and this short one is that which is fastened to the violin body. If there is too little wood in the extension of the neck the violin body cannot stand the pull, but will be deformed in time, and the violin becomes unplayable. It does not help to have plenty of wood in the centre as it is not there the deforming pull is strongest. I have seen too many violins suffering from that ailment!

The areas around the lower roundings of the f-holes must not be too thin. When playing the violin these areas are vibrating very intensively, and if these areas are too thin the tone will be somewhat fluttering (lack of firmness). But with these reservations you can tune the top--and later on the back and the ribs to the same microtone all over, and get a lovely sounding instrument.

Personally, however, I prefer a Strad- or Guar-like tone which is more powerful and much more even, and with the purpose in mind of producing such a tone I shall describe the tuning of the violin body.

The lowest microtone we will place in the central area of the top (and later on in the corresponding area of the back), and from this area we will let the pitch of the microtones raise somewhat towards the edge. Such a raise in pitch does not necessarily stand for greater thickness in the plates towards the edge. Among other things it depends on the form of the archings (the more acute arching the higher pitch for the same thickness). But now and then it may be the case.

And what microtone, and what thickness do we have to start with in the central area of the top?

Well, I said that the lowest microtone should not be lower than g^1, and I think g^1 will be all right, but I should think g^1 sharp or a^1 will be the best, and that we have to let the microtones raise to about b^1 or c^2 near the edge. (Note: The sign ^{1} indicates the octave from "middle" C up. C^2 is the next octave higher.)

Now it may be difficult for someone to determine the exact pitch of a microtone, even if he can hear if two microtones have the same pitch, or the one is higher than the other, and it may be guiding and useful also to measure the thickness of the wood in the central area. But the best thickness depends--apart from the form of the arching--on the quality of wood. But to discuss wood qualities without anything for the eye will mean but little. I shall take a pair of wood qualities I think many of the readers will know. Bob Wallace has been so kind as to send me a piece of his pink topwood. This wood is extremely well sounding when tapped, and with a specific weight of 0, 375--I will make it about 2. 6mm in the central area. Also the Editor has been so kind as to send me a piece of his Redwood (Sequoia sempervirens), specific weight about 0. 34. This wood is also well sounding, but not so firm in its structure, and I will make a top from it about 3 mm. or perhaps 3. 2 mm in the central area. If a piece of top wood requires more than 3. 5 mm in the central area I will not use it for a violin.

On the other hand the Pearyland wood (5780 years old Larch, specific weight 0. 66) was so strong and heavy that I have made the top from it 2. 2 mm in the central area, but less wood in the centre I will not give a violin. Well, I have also given a top of light spruce the same thickness (2. 2 mm) in the centre because there was not more wood, but I have given this top a sound post veneering of strong and heavy wood (but still 2. 2 mm) to increase the strength of the wood in the area where the high-frequent sound waves especially are formed and controlled. The violin sounded perfectly.

Now you have to compare the quality of the wood in your violin with one or other of the wood qualities mentioned, and decide for yourself what thickness you will give the centre--it is not too important if only the thickness is reasonable.

When talking about the central area this shall not be meant as a little spot in the centre of the top, but as most of the area between the f-holes (not the border areas along the f-holes, and especially not those at the lower end of the f-holes). Lengthwise I have tried to expand this area (the area with the same microtone) to nearly half the length of the whole plate. From this central area, moderate in size, or somewhat extended if we wish, we will now work out with the same microtone all over (and that does not mean that the thickness necessarily should be the same all over) we will work out the top in the way that the microtones are evenly increasing in pitch towards the edge. The microtones do not need to be the same all along the edge, but if there is wood enough it is practical to make them alike, and it is also practical to make the microtones in the two sides (the two halves) of the plate symmetrically alike. We will notice why when we start to tune the back. Regarding the area behind the front block we have to "ask" the back which in that area requires a thickness of not less than 3 mm. and we have to make sure that the microtones in the top at that place should not be too low to correspond with the back.

When finding the microtones do not be too quick to decide the pitch. If the microtones in two areas have the same pitch this is very easy to decide, of course, but if they are not alike we can be mislead in deciding which has the highest pitch--strange sounding perhaps, but you will notice it. For that reason test the microtones as well from the inside as from the outside of the plate, and use different methods: use your little bit of electric wire (usually the most precise method), but use also a very light tap with the edge of a nail, or use a very light stroke with your finger tip. If all methods give you the same impression of the pitch you should be sure. The ear can get tired, and then you have to put your plate away for some time. Do not in eagerness tap too violently--in that case it is not the microtone you will hear, and when tapping near the edge of the plate it might be necessary to place the plate on a soft support to avoid irrelevant notes.

And now the bass bar has to be worked out and glued in. The finished bass bar has in every spot of its lengthwise extent the same microtone (or rather an octave above) as the spot of the top to which it is fastened, that is, the depth of the bass bar is determined by the microtones of the top, and if we should like to alter the supporting strength of the bass bar (this strength is very important for the balance between the "low" and the "high" strings, and a thin top or a flat arched top) we have to do this by altering the horizontal thickness of the bass bar. For a top of normal Strad-arching and normal thickness (normal to the microtone system) I will make the bar 6 mm. thick (horizontal thickness) in the centre, 4 mm. thick at the upper end, and 5 mm. thick at the lower end. The length of the bar I will make 270 mm. or a little less according to the length of the top. And the placing of the bar? Under the bridge I will place the outer edge of the bar 19 or 20 mm. from the middle joint, and the upper end I will place about 5 mm nearer to the middle joint than the lower end. Lengthwise I will place the bar about 5 mm.

nearer to the lower edge of the top than to the upper edge. Work out the contacting surface of the bar to suit exactly to the top where it should be placed. Commonly I give the bar no "spring" whatever. We can do it, of course, and for a time obtain an incorporated, latent tension, but we may just as well give it up, for after some years the forced form will be the normal form, and the latent tension will disappear. (Wood is to some extent plastic to protracted pressure.) Only if the top is lopsided will I use "spring" in the bar.

Glue in the bar exactly, and take care by clamping it not to use more pressure than necessary, and if you are using a water soluble glue, not to use more glue than necessary, or the water will soften the wood, and the pressure deform it in the way that after the hardening of the glue you can see the bar as outlined on the outer surface of the top, and this is not beautiful.

And now the bar is glued in successfully, and you have to form its curved line, to give it the right depth in every spot, and as said before, this depth is determined by the microtones of the top, and as you have worked out the microtones symmetrically to the middle joint, you may as well tune the bar to the points symmetrically to the bar--this is the most convenient. Many makers used to make the cross section of the bar wedge shape. Do not do this. It will weaken the supporting strength of the bar. Just round the edges slightly. Perhaps you should strengthen the middle joint (I think it is not glued with "Araldit"), not with small pieces of wood glued across the joint as usual (this will disturb--raise--the micro tones), but with small pieces of wood slightly fit in across the joint (only about 0.5 mm in depth), then levelled after the glue is dry--and tuned after.

And now your top is finished, that is, perhaps some small corrections are to be performed, but you can put the top away for some days, and let the surface of the wood harden, and then you may control the top as to its microtones, and perform small corrections, if any.

(continued in our next issue)

NOTE RE CONVERSION OF MILLIMETERS TO INCHES

Owing to the fact that Mr. Skou gives all his measurements in millimeters, we herewith present a conversion table compiled by Mr. Carl Farseth, of Minneapolis. For another conversion table and "Ready-Reckoned" see the article on page 18 of the January 1961 issue where very comprehensive details are presented by Robert Atkinson of Hornsea, England.

Mr. Farseth's Table from MM's to Inches

mm	64"th	mm	64"th
2.0	5	3.6	9
2.2	5 1/2	3.8	9 1/2
2.4	6	4.0	10
2.5	6 1/4	4.2	10 1/2
2.6	6 1/2	4.4	11
2.8	7	4.6	11 1/2
3.0	7 1/2	4.8	12
3.2	8	5.0	12 1/2
3.4	8 1/2		

NOTES FROM MY DIARY

by J.E. Bushnell

A few weeks ago ran across a notebook of mine with various items on instrument making--had misplaced it for several years.

From an article in the now defunct "Etude" (was published by Theo Presser in Philadelphia) by George P. Orr, March 1951, pp. 19.

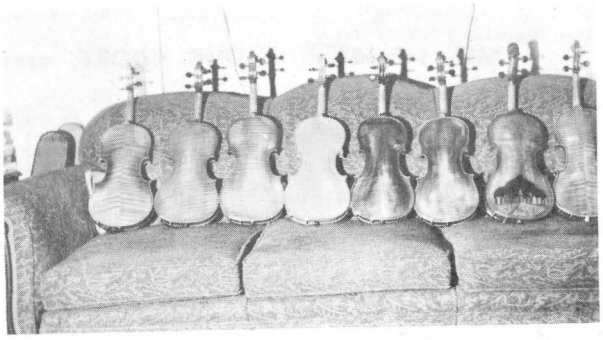
For accoustic properties:

Maple: Take a strip 7 3/16" long, 3/8" thick, 1/2" wide grain at right angles to 1/2" side--scrape smooth with safety razor blade. Drill small hole 1/2" from one end just large enough to pass a violin A string. Suspend strip by the string and strike with a small mallet. Tone must be clear and bell-like, but tone $A^{\#}$.

Spruce: Strip 11" long x 5/8" x 1/4" grain perpendicular to 5/8" side--Tone $C^{\#}$ with lower tones preferred to higher. Use straight grained spruce with 18 reeds per inch at "f" holes, slightly narrower at center and wider at flanks.

For 1/8" divide $\frac{25.4}{8}$ = 3.175 mm. Have spent a fairly long life as an engineer, I use my slide rule and read any conversion at a glance. Anyone interested can make any desired table by a little dividing and multiplying. Some instrument dimensions are more conveniently used as millimeters, viz. the normal width between upper lobes of "F" holes for the violin is 42 mm., a most convenient dimension to use. Lupot used 41. The outside width of bridge feet is the same 42 mm. normally. The dial type thickness calipers I bought from Mr. Laubi about a dozen years ago reads in mm.'s and is so graduated that one can easily read to the equivalent of 1/1000". Setting the calipers to read 0.175 mm., the difference between 1/8" and the 3 mm.'s which Carmen White says equal 1/8", one readily becomes aware of the difference and it will take some sanding or scraping to remove that much from a maple back.

I don't like Carmen White's paragraph 4 on page 11



Some of Mr. Bushnell's violins

Middle bouts not over 4 3/8" for bow clearance.
Grain in back and belly should be similar.
Use three applications of a strong saltpeter solution to cure the wood--dry under ultraviolet lamp at not over 100°F.
Filler - 2 coats of clear fish glue makes instrument more sonorous. Make "F" holes narrow and widen if tone is muffled. When looking at "F" holes from side they should be parallel to top of bout - not rise toward tail piece end, arching must give this.

There is nothing strange or mysterious about the conversion. 1"=25.4 mm. and that relation is almost exact - sufficiently so to serve for any dimensions for any of the string instruments.

(December) at all. Am quite certain that "thousands of fiddles have been spoiled by bad varnish" by varnish I mean the combined effect of any pretreatment plus subsequent finish. Without going into the effect on the tone caused by the way any one person plays and the bow he may be using. Some violins are not for some people. As Kreisler says of a fine Strad he once owned, "it was not for him". It takes a little trying for any given player to find a bow which will let him get the beat from a given violin. I have been told by one maker that he has seen recording artists change bows while recording to get the best results in different kinds of passages. Of the benefit of this I need to know more of the facts than I do to remove my scepticism--a bow needs to warm to its playing just as the violin does--any really sensitive player knows this.

Always do right. This will gratify some people and astonish the rest. -- Mark Twain

The String Section

Conducted by
CARMEN WHITE

TWO LETTERS FROM ENGLAND

It is a pleasant surprise to know that our readers find this new section of the JOURNAL interesting; we hope to make it more so, and, of course, contributions such as these two letters from England received this week are always welcome. The first letter comes from Mr. H. L. Apps, 21 Westbourne Road, Luton, Bedfordshire, Eng. Mr. Apps writes as follows:

"Dear Mr. White:

"I was pleased to learn from the February Journal that Don White has invited you to edit the String Section, which I am sure will become popular with readers because it is difficult to imagine a violin maker who is not also a player--however modest his attainments may be. It is unthinkable that a maker should have to appeal to another in order to find out what his productions sound like when played!

"It was most appropriate that you should open a discussion on strings, but although the editor of the JOURNAL invites support for metal strings, I must confess that I come down on the side of gut strings. When I began playing the violin as a boy, metal strings were almost unknown. Acribelle was used for the E string, while even gut was still used for the first string. I suppose it would be difficult to obtain a gut E nowadays. I naturally use a steel E and sometimes a metal A, but I prefer gut for A and D. A gut string yields more easily to the pressure of the bow. Moreover, in time, it begins to wear slightly flat, which in my opinion, is an aid to tone production. A metal string is very hard, as you say, and needs careful handling in the higher positions if one wishes to avoid a disagreeable whistling sound, although the same thing must be said to a certain extent of gut strings. I wonder what Paganini, who played to the very end of the fingerboard, would have said of metal strings.

"At the same time, we must remember that metal strings have advantages in certain circumstances. For those who wear gut strings to shreds, they must indeed be a boon, particularly in hot or humid conditions. Gut E strings were most unreliable and would break unexpectedly. There is no doubt that in the old days, a concerto might have to be interrupted while a new E was fitted. Audiences were used to such mishaps which nowadays are almost unknown.

"It would be interesting to know whether modern violin makers are taking into account the increased use of metal strings when determining such things as thickness of belly and strength of bass-bar. It is certain that many old thin-bellied instruments are unequal to the strain of high bridges and all-metal 'strings'.

Yours faithfully,

H. L. Apps "

(Editor's comment: The steel E string is so universally accepted and used by artists everywhere that there appears to be no controversy about it. Gut strings of the waterproofed variety are available for those who wear strings to shreds and for hot and humid conditions--these strings sound fine and give a surprising amount of wear and resistance to heat and humidity. Sometimes, the wearing of gut strings to shreds is the result of allowing the nails to grow too long so that the fibers of the gut are cut by the sharp fingernail. A good nail clipper produces surprising results here! Only yesterday, the editor played on a new violin with four metal strings of a rather expensive type. So long as the violin was played hard and loud, the tone was ample--but tinny in nature. When a pianissimo scale was attempted, nothing came out of the new fiddle at all! It refused to articulate in rapid soft passages. I handed it to the second

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Address all communications for the String Section to: Mr. Carmen White, 1022 Caddo Street, San Angelo, Texas, U.S.A.

violinist in a string quartet and stood back to listen--and the second violin part simply disappeared! Nothing could be heard at all! Upon handing the player another violin strung with fine gut and gut wound strings, her part in the Beethoven quartet was restored to its proper balance and beauty. Even the softest nuances could be heard and the tone was more penetrating and beautiful--also there was not that "tinny" metallic quality so repulsive to many musicians.)

Continuing the discussion of strings and related matters, here is a fine letter from Mr. Clifford A. Hoing, 137 West Wycombe Road, High Wycombe, Bucks, England. Mr. Hoing, a noted professional violin maker who has had phenomenal success with his violas, writes as follows:

"Dear Mr. White:

"It was with great appreciation that I read your article on Tertis Model violas and also the item on metal strings in the February issue of the JOURNAL. I may have criticized some of your views at times but on the above topics I am in complete agreement with you.

"I am very much in favor of medium sized violas, but regarding your suggestions of the Maggini pattern, I think the size quoted is too big, but I like it better than the Tertis Model. May I point out that Tertis recommends the metal strings for his violas, so that here we have a combination of two undesirable features, cumbersome size and metal strings.

"The practice of teachers recommending poor instruments is, I agree, a thing to be condemned. The fact is, of course, that the Tertis Model was made as large as possible on the idea of "the bigger the better". I feel that now, Tertis is trying to associate himself with medium sized violas because they are becoming popular. Players are recognizing that facility in playing, together with a fine free tone, is much more appreciated than a dreary laboured performance..... best wishes for the String Section.

Yours faithfully,
C.A. Hoing "

We are indeed glad to have these constructive comments from Mr. Hoing; the editor grants him the privilege of disagreeing with me at any time he chooses, as Mr. Hoing is a fine professional maker of unquestioned status, and he has earned the right to disagree with any of us. Of course, it is a pleasure to have him agree with us, too! Not long ago, I listened to a noted artist-teacher giving a violin lesson to a young man who wishes to become a professional violinist. The young student had worked hard, probably too much so, and was plainly discouraged. The teacher lectured him at length, telling him that he must change his whole conception of sound on the violin, that he must hold the violin high, bow lightly, keep the violin ringing, and similar comments. The student looked puzzled and doubtful. My reaction was that the student's entire problem centered on the inferior violin he was playin on--it was a commercial German violin valued at about $150.00. It was completely dead, unresponsive, badly adjusted, and about as useless for the purpose of learning a Prokofief Sonata as any cheap violin could be! Yet, this poor boy was working his heart out on that poor fiddle, and neither he nor his teacher appeared to be aware of his real trouble. The student left the studio full of discouragement and resentment. The teacher was disappointed in the showing of his student. All because of a poor fiddle! The student had "inherited" the poor violin from an aunt and is laboring under the delusion that it is a priceless old violin--in fact, he stated that he once tried out a Stradivarius in New York, and that he did not like the Strad at all, as it was too shrill, and he stated that in his opinion, all of the Strads were "highly overrated"! I leave this question with our readers: "How much longer do you suppose this young talented student will continue to play violin seriously?" My prediction is that he will soon grow discontented, sullen, bitter toward music, and toward his well-meaning teacher, and that he will quit within the next few months! I have seen it happen too many times to be accidental. It is most unfortunate that so many fine teachers do not know tone, and that they do not know how to judge the quality of a violin, new or old. It cannot be repeated too often that the ear is a most deceptive organ--it grows used to the shallow, harsh, and shrill tone of a poor fiddle, and then, when it is exposed to the fine, reedy concert tone of a great violin, that ear may be offended and give a negative response to the fine violin!

"Leopold Auer's students report that he used to say "listen--listen to your violin, and sing on it"--and I believe that the most satisfying and rewarding efforts and accomplishments in string playing are all bound up in that one word: "LISTEN"--and learn what fine tone IS and what it IS NOT.

"Caution: Warm weather is coming--if you put up your violin for a week or two, BE SURE TO LOOSEN THE BOW. A bow put in the case during a damp spell of weather will have the hair loose, but when the weather changes to warm and dry weather, that hair will draw up considerably and it must be further loosened, or your favorite bow will suffer incurable damage! When warm, dry weather comes, be sure to check all your bows and loosen them further to prevent damage.

Carmen White

* * * * * * * *

The greatest pleasure I know is to do a good action by stealth, and to have it found out by accident.

Chas. Lamb

SOME THRILLING EXPERIENCES

by William E. Slaby

I have had some experiences lately that I presume would make me the envy of anyone interested in violins.

First, I had an opportunity to examine a Strad for an entire hour and even was permitted to draw a bow across it. It had a sweet reedy tone but seemed a little thin. Perhaps this was due to the fact it had not been played on for some time. I can't give any more details regarding this incident because the person that had the instrument was not the owner and I am not sure how the owner would have felt had he known a stranger was allowed to handle his priceless possession. I should also state that I scrutinized the remaining varnish very carefully and it resembles Michelman's more closely than any other varnish I've ever seen on modern instruments.

Next, I became acquainted with a man whose avocation is dealing in fiddles. He has about forty-five instruments all old Italian and German except for two or three modern Italians and a Slaby. Yes! he bought my first fiddle. This gentleman has a tremendous collection of old instruments and no junk--except possibly the Slaby. His collection includes an Amati, a Montagnana, a Gagliano, two Vuillames and a Lupot; all with certificates.

My most recent experience which may be of interest to your readers was a demonstration-exhibit of some of the old Italian instruments in the Henry Ford Collection at the Ford Museum. These are the same instruments that were illustrated and discussed in Violins and Violinists in the articles by Victor Angelescue. Included were the J.B. Guadagnini of 1775, two Strads dated 1703 and 1709, a Carlo Bergonzi dated 1740, and a Guarnerius del Gesu dated 1741. There is also a Nicolo Amati in the collection but it was away for repairs. The instruments were demonstrated and discussed by Gordon Staples who is assistant concert master of the Detroit Symphony Orchestra. He played short passages on each instrument several times to show the differences in their tone qualities. He pointed out that the Guarnerius had the most robust tone and played best with a heavier bow. He showed how the Guarnerius worked best in passages requiring a bold approach but admitted that the same effects could be accomplished with the other instruments but required more effort on the part of the player. He then played a melodic number of Kreisler--I have forgotten which one.

Finally, he concluded with Bach's magnificent Chaconne which he played on his own Guadagnini dated, as I recall, 1769. He remarked that at one time the wood for his violin and that in the Ford collection might possibly have rested side by side in Guadagnini's loft.

When asked which of the violins he preferred he replied, "My own, because it's mind, and I have it paid for."

Asked if modern makers were turning out fiddles as good as the old ones, he diplomatically replied, "That's part of my $10.00 lecture."

Incidentally, Staples came to Detroit from Los Angeles, I believe, and at one time studied in Vancouver.

All in all it was a wonderful evening. Only about fifty people in the audience and we all had an opportunity to look at the violins at close range. A most memorable occasion.

* * * * * *

WHAT IS MUSIC?

God gave sound, voice, words, ***words, the fundament of script, scripture.

Sound, the fundament of music.

Words became a divinity in the theology of the church.

Music became the outpouring of eternal harmony of the medium of created sounds.

Music is pure, totally pure, virgin absolute, unable to express hate, corruption, crime immorality.

Music is a moral guide of civic and social life.

Adam Szymanski

Wolf Notes

by The Editor

The "New" Journal

As I write this on April 24th I realize it is too early to analyze the reaction of our Readers to the new set-up. However, several have already written me in most glowing terms. There will be some small changes in this issue but on the whole we have few alterations to make. For myself I am well satisfied and feel that we now have a Journal that will hold its own against any other professional publication. We expect to add four more pages to this issue and then hold it to that size.

The photograph on the front cover will be changed for each issue, for the time being, eventually we will settle down to a standard illustration.

We need more readers and more advertisers as our printing is costing somewhat more than we had anticipated. This is your Journal so please see if you can help in this regard. Many of you must be acquainted with large Music Establishments that would advertise, both for their own good and the Journal's. I should not have to worry over finances!

The Shape of Things to Come

Many of our new readers, who are beginners in the violin making art have asked me to publish articles on the technique of violin building. They seek information about glue and glueing, outlines, graduating, etc. and what tools are required. I feel the only way to satisfy this demand in a manner that will cover the ground completely is to publish a series of articles describing the building of a violin from start to finish.

This series will start in our next issue with an introduction describing the overall picture of the construction of a violin together with an outline of the whole course. After that different prominent makers will be asked to contribute their methods, as the building of the violin progresses.

The next issue will see the completion of Kristian Skou's Micro-tone article and also some valuable information on F holes by this same writer.

"Smiley's" supplement is going over in a big way. This is something to take very seriously.

Local Notes

Owing to personal obligation Floyd Holly feels that he can no longer attend to this column. George Friess, our first President, will "carry on". George is an excellent fellow and a first class violin maker. He will have much to tell you. We thank Floyd for the many words of wisdom he has given us through Local Notes.

The Double Bass

Sometime ago I promised to produce some articles on the double bass. It has taken me a long time to find data on this subject but I feel I now have enough to at least describe the building of the instrument. Mr. H. Apps of Luton, England, has been a great help in this search for information and has even sent me the outline and graduations of a fine Guarneri Bass. This and his informative letter I will hold over for future use.

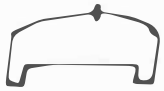
Novel use for "Smiley's" Mono-chord

The following is part of a letter from Bill Hall of Listowel, Ontario:

"Here is a further use I found for the Monochord in my teaching work. It really is marvellous as a help in getting young students to play in tune... when drilling them in scales, I have one play each note of the scale to a slow count of 4 with the warning to keep each finger down, that is to be tested for pitch, another student bows the instrument, while I adjust the bridge to the pitch of note that is off pitch. It really is remarkable the interest the youngsters take in being tested, as they can see how far they are off the pitch; not only that, they enjoy the tests, and now ask for them. Also the advanced pupils take a great interest in it, and I get quite a kick out of them, by having a test in working out C/P. S. in algebraic form.

"In making the bridge for the monochord, I made an inset in it, that allows it to remain straight, also to slide easily from one interval to another, thus making it easy to bow the string, and move the bridge at the same time.

(See sketch.) In testing this instrument to find the pitch



of tap-tones of plates I find it accurate and reliable, as with a tested chromatic pitch-pipe that has a chromatic scale, one can keep the monochord to standard pitch, with the use of a piano tuning key, or other tool that allows easy turning of the wise pins, which are easily obtained from a piano-tuner. Also the wire, --I found gauge #12 suitable."

Australian Trees

Perhaps few of us are acquainted with the fact that the "Flora" of New Zealand and Australia is completely different from that which grows in our Northern Hemisphere. It is quite possible that some of the southern wood might be superior to maple and spruce for violin making. Here is a large field for those who wish to experiment. One of our new readers from New South Wales writes:

"I have been employed by the N. S. W. Forestry Commission for twenty years, the last ten as botanical Assistant and Curator of the Forestry Herbarium.

"The following particulars on Australian trees would be of interest. Our timbers are different to anywhere else in the world. There are over 500 species of Eucalypts or hardwoods as they are called, varying in weight from about 40 lbs. to over 73 lbs. per cubic ft. Over 100 spp of Acacias (Wattles) some of which have harder and heavier wood than any of the Eucalypts.

"Our tropical and sub-tropical rain-forest (scrub) comprise another 400 or so species. It is in this group that most of our finest cabinet woods are found, an inviting and almost virgin field for the violin maker.

"We have no true pines here but one species of the family callitris commonly called Cypress Pine has been used with some success by a Czechoslovachian friend who had a lot of experience in violin making before coming to Australia." Harold C. Hayes, New South Wales, Australia.

Letters to the Editor

There are two letters which I have selected to insert in Wolf Notes; both contain useful information.

"Dear Mr. White:

Here in England it's very difficult to obtain "quality" wood also if it were possible one would get no price for the instrument unless it passed the so-called principles of the Society of Violin and Bow Makers. This also applies to sale of all Old Violins, etc. Also the purchase tax on all material is killing everything.

"A point in view, if you buy Bow hair by 1 lb. weight (price 9£) no tax is required, but if it is packed in hanks ready for working, extra tax of 25% is required.

"During my 50 years of work which I may add is only a hobby, I have repaired Pianos, Violins, Cellos, Bas V, Clarinets, Saxophones, and Brass instruments, also made Violin Bows.

"Regarding the "Bass Bar" I think the most important part is the position the Bar is put into the instrument.

"Having inserted a large number, I find, when it is made with a "Belly Convex" it must be placed so that the "G" String comes direct along the centre of its full length, and what I do is to put the belly in position without "Bar" "String" it temporarily and mark the "Front" along the "G" String with a piece of chalk. (Note: the front is not glued for this, also the strings not tuned properly.)

"Whilst on this subject, I would like to tell you once I had an old "Perry" of Dublin which had been sat on; this pushed the sound post through the front, which put paid to the instrument. I repaired this and am pleased to say the friend I gave it to is still playing it, but when I opened it I noticed the "Bass Bar" was only about 5" long, placed on an angle which brought the "G" along the centre. In addition it was carved out of the "Front", being the belly itself (not glued). Perhaps you have seen the type, now tell me does a "Bar" have to be 10 1/2".

"The tone of this and all "Perry" Violins is as good as anything it's possible to get. Very sweet and reasonable volume."

A.W. Louch,
Walsall, England.

* * * * *

"Dear Don:

I have been reading my last copy of the "Journal" and as usual enjoyed it very much. In it there are several articles which mention the use of raw linseed oil for treating violin plates prior to varnishing, and each article mentions the fact that the linseed oil can only be used when the instrument can be put out in the hot sun for several weeks or months, so that it can only be used successfully in a warm, dry, sunny climate. Now I am presently making a violin, and as nearly as I know how I am following the instructions given by Mr. Earle Sangster, and I do not see why I should have to wait for warm, dry, sunny weather for I believe these conditions can all be duplicated artificially. It is a wonder to me that I have seen no mention in any articles in the "Journal" on the use of infrared heat lamps for doing the work of the sun. These lamps are used extensively for brooding chicks, and supplying warmth for little pigs, calves, etc. and seem to give as good results when so used as real sunshine would do and they are recommended for drying varnish. They are made in 250 watt size--115 to 125 volts and fit a standard light

socket, and like the rays of the sun, they heat the object which they strike without heating the air through which they pass. They are about like the shape of the little drawing. The upper part is silvered to act like a reflector to send all the rays downward and the lower part is plain glass. They are made in two types--one a clear glass and the others are made of specially hardened glass that will stand considerable splashing with water when hot, and are made of dark red glass to tell them apart. These red ones are necessary for use with chicks etc. but they are much more expensive and are no more efficient than the plan glass as long as the plain ones are kept dry. Now, if you are in a hurry you could use two of these lamps--one on each side of a violin--and if they are kept going for 24 hours a day it should do the job in a quarter of the time the sun would take. You can regulate the heat of your violin by adjusting the distance of the lamps and I know they will give you all the heat necessary to blister varnish if you get them too close. You should be able to get these from your local hardware or department store, but if not, try the places that handle poultry and livestock supplies.

H. Briggs,

White Rock, B. C.

(one of our local members)

I have placed the following article next to the "Smiley" Supplement for quick reference.

SUBDIVIDING THE MONOCHORD INTO TENTHS--THE EASY WAY

by Harry S. Wake
4592 Osprey Street, San Diego 7, Califomia.

In the March issue of our Journal, in "Science for the maker", is described how to make an instrument for frequency determination, the "Monochord": The article is followed by a table or chart by D. R. Rowland giving the frequencies for each tenth of a semitone from A220 cps to A440 cps. At first glance this looks like it would be a formidable task after having made the monochord as shown in Mr. Smiley's article, to break it down into tenths, however, I found it not too difficult to do a precision job, so I'm passing along my method for what it is worth.

The only tools required are a two inch pair of toolmakers dividers, a rule divided into 64ths and a table of decimal equivalents of fractions of an inch.

It will be seen by the table in Mr. Smiley's article that the first half tone measured from B' on the Monochord is A220 cps. to A# 233.08 cps and the distance given is 2 26/32.

Now this distance is to be subdivided into ten equal spaces, so 2 26/32 is easier to figure as 2 13/16, this fraction must be converted into a decimal and by referring to the table of decimal equivalents we find that 13/16 = .8125 so now we have our distance for the first step as 2.8125 and we require this to be subdivided into ten equal parts; this is done by moving the decimal point over one space to the left, giving us .28125, the last two figures may be discarded and we have .281" or two hundred and eighty-one thousandths of an inch. This must be changed back to a fraction in order to set the dividers, so again referring to the table of decimal equivalents we find that .2812 equals 9/32 so we now set the dividers very carefully and exactly to 9/32" and this will be found to exactly subdivide the first step of the Monochord into ten equal spaces: Mark off the ten spaces with the dividers and then with a sharp knife, cut short lines into the wood and number them from 1 to 10.

We will need to find the exact measurement of the next step on the Monochord in order to be able to subdivide it in a similar manner; it will be seen that the distance from B' to scale step 2 is 5 15/32" so again we convert to a decimal which gives us 5.4687; by subtracting the previous distance of 2.8125 from this amount we get the required dimension 5.4687
2.8125
2.6562, again moving the decimal point one space to the left to divide by ten, we have .26562 and discarding the last two figures we find by the tables that .265 equals 17/64" which is the setting for the dividers and transfer to the Monochord scale step 2.

Each of the remaining scale steps should be followed through in the same way: from note b to c' the dimension 5.468 is subtracted from 8.000; from c' to c#', the 8.000 is subtracted from 10 12/32 which in decimals would be 8.000 from 10.375.

It will be noted that the scale steps get progressively smaller, so care must be taken in setting the dividers; the little extra work involved in subdividing the Monochord should prove to be well worth while by giving us an instrument of greater efficiency and capacity.

#2 - SCIENCE FOR THE MAKER (continued)

Smiley Chart #2B

Resonance type	Sound Quality	Sensory Eardrum-Effect	Range of Influence	Intensity (loudness)	Approx. Pitch of Maxima of Huggins 1708 Strad
Cr	Flute-like	Noticeable PRESSURE at Cr	BROAD ± 3 1/2 semitones	Greatest	c'
Br (several)	Reedy		NARROW ± 1 semitone	Less than Cr	b, g'#, c" c"#

The forks of Ellis and the electronic generator (and driver) of Saunders are pure-tone generators.

The fact that RM is a harmonic generator (as is the playing violin) may be more satisfying to makers who question or lack electronic techniques.

Place and Space Maxima in Bass

Resonance Maxima are unavoidable in violins, so makers must place Cr and Br where they will do the most good--and the least harm.

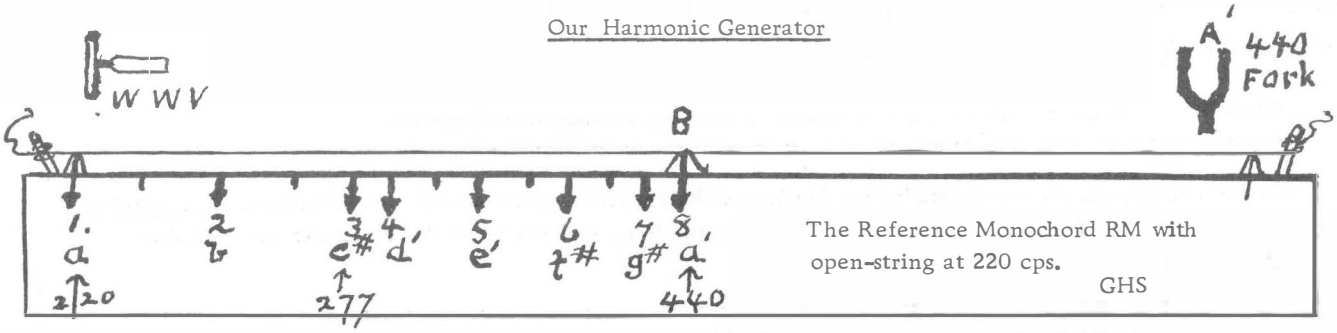
Since man's hearing is more sensitive to high frequencies than to low frequencies, it is logical to place the resonances where they can enhance the bass (g-g") of violins.

It is crucial to space the resonances properly for if all resonances are piled near one pitch (or the octave), the violin will boom on these notes and speak too softly on others.

A poor violin has a WEAK BASS and BOOMERS. Among other things, it may also have shrill quality, but that is another topic.

A violin with a rich properly-balanced bass is a superb instrument.

Our Harmonic Generator



Pluck on right side of movable bridge B.

"NOTES" (continued from page 5)

It would be unwise to assume that all makers of the Cremonese school were ignorant of the fabulous acoustical research of their era. You have evidence that 5 Strad cavities have Cr277±2 cps. This is too close to be "rule of thumb". Cr. was part of the art.

Table II should help eliminate confusion regarding pitch of yore. (Study it after completing Science #2 experiments.) The Mersenne Table cited is not in equal temperament. Know also that Mersenne observed that the English played their pieces a wholetone lower (circa a' 432).

"The great violin school of Cremona in Italy lived in the time of MEAN PITCH with a HIGHER CHAMBER PITCH and the resonance of boxes of their violins seems to show traces of both pitches*, but their great object was to insure tolerable uniformity of reinforcement, and hence they are a treasure for all time." ... Ellis, p. 513 in Dover Helmholtz. (Reinforcement = amplification)

* This is a very interesting speculation! For:

Cr281 (Highest chamber 563÷2=281
Br252 (High chamber 504÷2=252
Br480 (MEAN PITCH 480

} Compare with Saunders 277±2

Smiley Table #2b on 1635 Pitch STANDARDS (Paris)		Mersenne table (cps)		Confirmations by others cps	Authority (a' 440)
Ton de chambre = Mersenne's text Highest Chamber = Highest Church =		c''	576	563	Ellis Speculation
Ton de chapelle = Mersenne's chapel-organ High Organ = High Chamber = Cornett-ton =		b'	496	504	Ellis experiment! An organ pitch varies-- Mersenne! (Schlick)
MEAN PITCH = Mersenne's text Mean Chamber = Kammerton		a'	480	480	Mersenne expt. 1635 Ellis expt. 1885 Praetorius 1609
		g'	432	440	Wencelskirche- Recorders (16th Cent.)
Low Chamber = Mersenne's spinet Low Church = Tief Kammerton =		f'#	400	403	Ellis speculation
Lowest Church = from model after Low Organ = Mersenne		f'	384	374	Ellis speculation. Schlick = 377!
Lowest vocal tone of Mersenne		G	108		Mersenne, baritone.

Notes and TERMINOLOGY:

Monteverdi was born in Cremona (1567 - 1643).
First Andreas Amati (c1505-1580. 1505 and First from Bonetti, Doring)

ORGANOGRAPHY = Description of musical instruments.

ORGANOLOGY = Science, history mechanics and technology of musical instruments.

No one can dispute science unless he has duplicated the experiments and found them erroneous. Speculations derived from science experiments should be challenged more often. --- Therefore did you make the pendulum? You will need a 100cm string later!

ERRATA (March 1961 Journal Supplement)

p. 1 Paragraph 3. Change chops to shops.
Chart #1. Change 329.23 to 329.63.

p. 2 Homework. Paragraph 1. After line 2 insert missing line: "written c'. The C above is called two-line C, and is'

p. 3 Draw a black line across the page under B3 7/10 and D4 5/10.
Under the black line: Last column (second number 30.5772177149) change to 30.7543527247.
Add the missing line of numbers below D4 7/10 as follows:
D4 8/10 307.55349958 35.94496847 F4 6/10 361.54371386 30.5772177149

p. 4 Supply the twelve missing square-root signs on the page:

$\sqrt[12]{2}$ $\sqrt[120]{2}$

Paragraph 2, second line: after is insert the following:
25.125 x $\sqrt[12]{2}$ x $\sqrt[12]{2}$; then the distance from B' to F#4 is

Paragraph 3. Change last word (length) to pitch.

p. 5 Change chart SC#2a to SC #2. Last line on page 5: place a period after 88. (The Pitch-Study is in the Appendix.)

Resonance Experiments--(continued)

SCIENCE FOR THE MAKER
Smiley. Copyr. 1961

Loudness vs Intensity

On Chart 2b a column was labelled "Intensity (loudness)". Intensity is not identical with loudness.

If the ear is the "measuring instrument" used in the resonance experiment, then

EAR "measures" LOUDNESS.

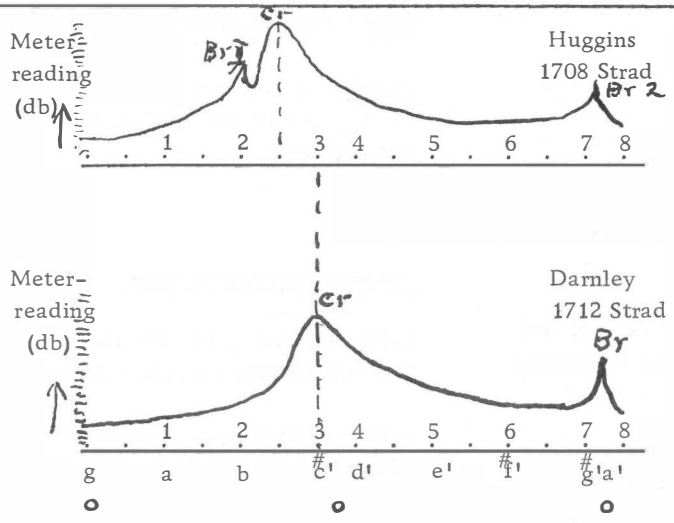
If a meter is the measuring instrument used in the resonance experiment, then

METER measures INTENSITY (sound-pressure) in decibels or other units.

Simple Electronic Test Equipment (OPTIONAL)

Those who own a microphone and a tape-recorder containing a meter are ready to measure and graph the INTENSITY of the Resonance-maxima (Cr and Br).

A little thought will enable one to use the overload-lights (instead of a meter) installed on some tape-recorders. A simple alternative method: inexpensive crystal-mike plus a sound-meter hookup to amplifier, T.V., or radio*.



Huggins 1708 Strad

Ellis experiment. Data from Table 2a. (1885)

Darnley 1712 Strad

Saunders Experiment. Data from Table 2a. (1946)

GRAPHS: Resonance-Intensity of Violins

Ordinary equal-spaced graph-paper may be used. Scale-steps are labelled as on RM/chord. Open strings are marked o.

Due to Hi-Fi influence, tape-recorders or amplifiers are no longer uncommon. Those who have such ready-made test equipment will enjoy experimenting with it and graphing their violin resonances. Use RM/chord driver as in the preceding section.

Graphs make quick-comparisons of musical instruments possible--even if the instruments have been sold or destroyed.

Note: measure violin-to-mike distance and locations so all measurements can be made under the same conditions (same room, etc.). Place RM/chord in contact with violin-body and proceed as before.

Why a meter?

Both sensitivity and discrimination of the ear vary from person to person, i.e., some are partially deaf.

Also, the normal human ear can easily confuse a pitch-increase with a loudness-increase--although with a little ear-practice most can learn to distinguish the difference within the limited range of RM/chord.

At the risk of an oversimplification--one cannot argue with the meter-reading. This is certainly not true of ears.

Eardrum-Effect

The eardrum can actually detect INTENSITY (sound-pressure) at Cr. (Chart 2a).

In this instance the ear acts like a sound-meter. The intensity of sound at Cr can cause a distinctly uncomfortable pressure on the eardrum--an effect not noticeable at Brs.

Can all ears get this effect? Usually, after it is pointed out that the effect exists. However, all people are not equally-sensitive to pressure-changes--one gets an earache during a quick mountain descent while another does not.

If you are unaccustomed to "feeling" with your eardrums it may take you a couple of months before you find yourself triggering to the effect.

Experiments and Homework

You do NOT need to go electronic to complete this assignment, but DO tune violins to a'440 on the nose--always.

Graph all the instruments in Table 2a. You will find your graphs more readable and more hearable than the table. Then graph your own and your colleagues' violins from your notebook data.

Ear-Fatigue. Since the ear fatigues rapidly, training and blindfold tests should be limited to 20 minutes in any one day. You will get your best results during the first 5 minutes--so save them for the tests and use the remaining 15 for the training.

Ear-training with Graphs. Have someone play your graphed violins so that you can listen for what you see on the graph. Have scale-passages played forte while you pay particular attention to the two lowest octaves. Ignoring the attack and decay, concentrate on the sustained part of each tone. (Also try portamenti.)

You can learn to hear and locate the resonances in each instrument while it is playing. Ultimately you should try to train yourself to draw and visualize schematic playing-graphs "by ear".

Those who go electronic should also watch the meter during the playing.

Resonance Games. After you have partially trained your ear, try some blindfold "recognition" tests.

Can you now identify the instruments played?

In your notebook keep score on the results of all resonance games and see how much you can educate your ear. (Watching a meter does speed the process.)

*Radio or TV Hookup

If you get stuck here, ask a Radio Ham. (It will be convenient to have permanent jacks installed so plugging in mike and meter will simultaneously disconnect speaker.)

Mike: connect mike-leads across volume-control leads.

Meter: connect a resistor (about 10 ohms, 2 watts) across disconnected leads to speaker. Connect meter across resistor.

Parts Source--Inexpensive

Lafayette Radio, 165-08 Liberty Avenue, Jamaica 33, New York, USA, ---1961 catalogue #610.

(#TE 10) Multitester, $9.95. Large dial (-20 to +63 db). Postage on 1/2 pound.

(#PA 9) Crystal Lapel Mike, $1.95 plus 20¢ postage.

Volunteers?? Thick vs Thin Edge. What are your present convictions on this subject? Would you explain--with diagrams, measurements, tests and/or experiments?

RM/chord Wire. My thanks to Mr. W. G. Hall for recommending a #12 gauge (0.029" diameter) piano-wire for the RM/chord! The sample he sent is an improvement on the fatter (approximate) figure given in #1.

G. Smiley, Organology Research, Sunnyslope, Ottumwa, Iowa, U.S.A.