PIANO TECHNICIANS
Journal
SEPTEMBER 1989

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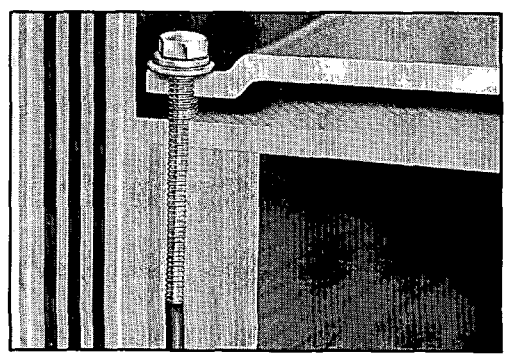

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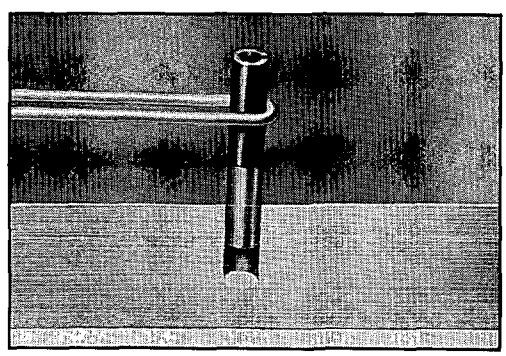

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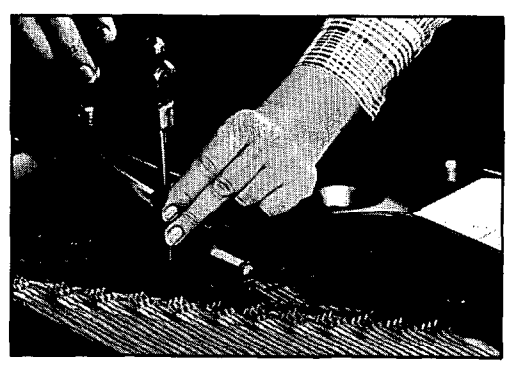

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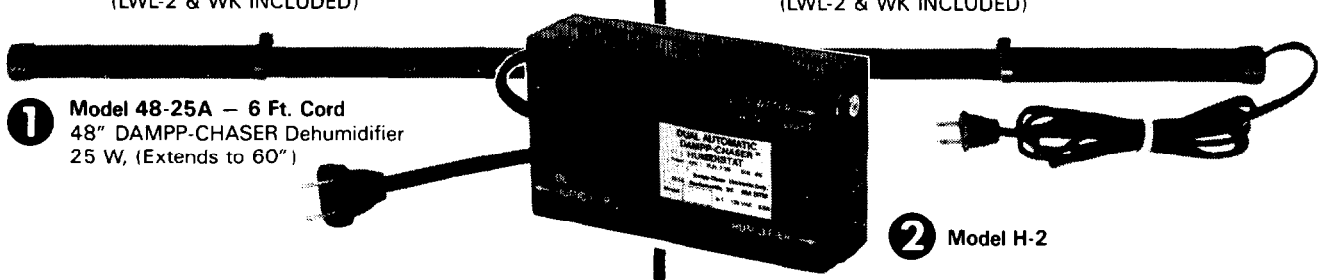

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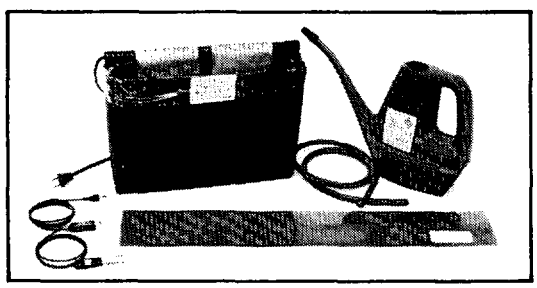
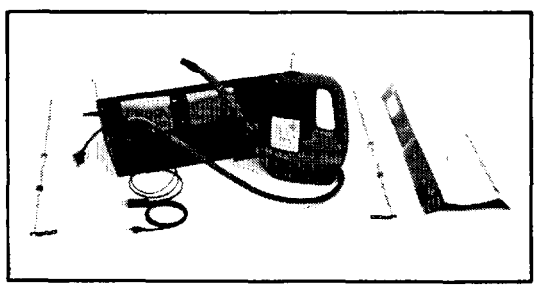


3 **Model HM-2**



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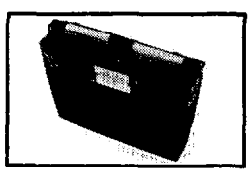

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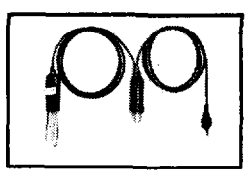

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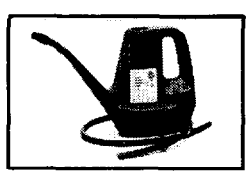

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PIANO TECHNICIANS
Journal

SEPTEMBER 1989 — VOLUME 32, NUMBER 9 OFFICIAL PUBLICATION OF THE PIANO TECHNICIANS GUILD, INC.

ABOUT THE COVER:

If knowledge is a tool, then attendance at the Guild's annual convention and institute is essential for any technician. Photograph by Susan Graham.

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PRESIDENT'S MESSAGE

How Important Are Aural Skills For The RTT?

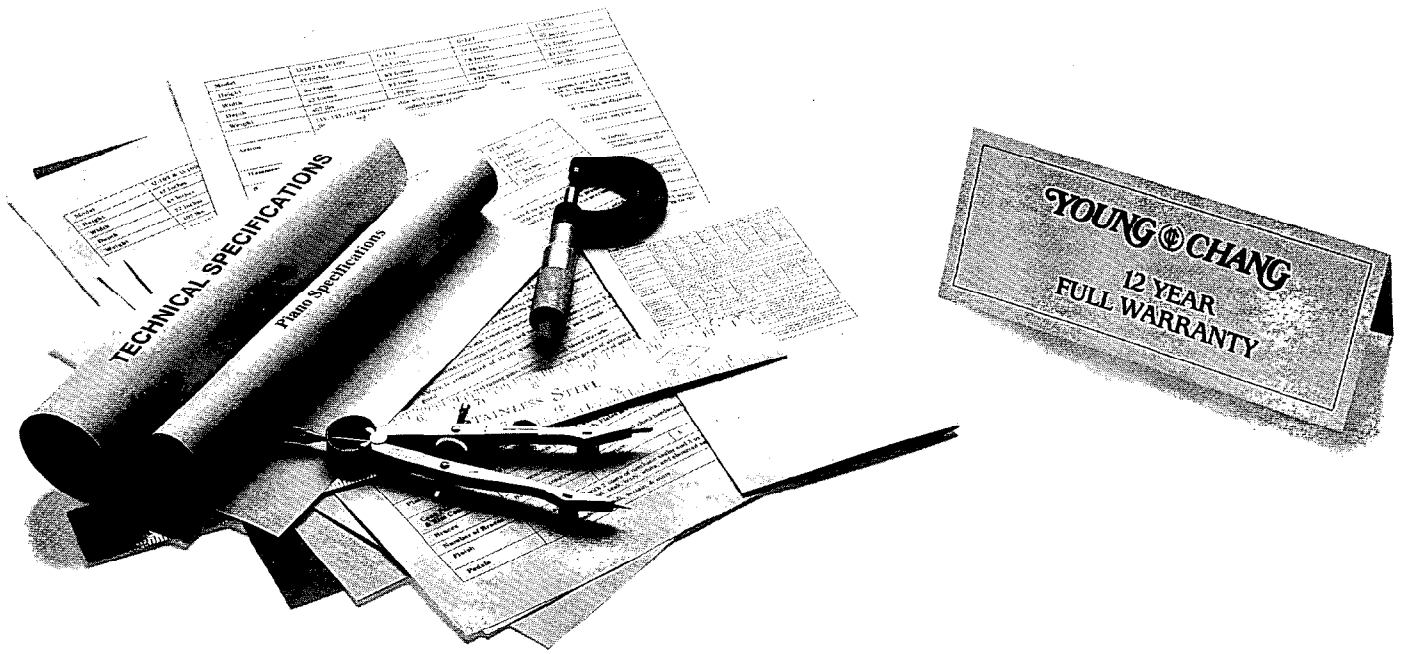
Ronald L. Berry, RTT
President

At this year's Council session in Portland, a change occurred in the tuning test that everyone needs to be aware of. Presently anyone taking the test for RTT status may use an electronic tuning device to tune the piano. Those who do are asked to repeat octaves three and four tuning aurally and must get at least 70 percent on pitch, temperament, and midrange. This was put in the test originally because it was felt that the tuner who is classified as RTT needed to have enough aural skills to know when the machine was not working or when it was not producing the best tuning. For this year's council there was a proposal to eliminate the aural retuning octaves of three and four. Not only was this not eliminated, but the passing score was raised to 80 percent. This will become effective January 1990. Despite the opposing views on this subject, there was agreement that whatever requirements there are should be the same for those who tune with or without electronic instruments. The ETS committee has been studying and will continue to study the idea of making the aural verification part of the test a graded section. With some systematic way to check and grade examinees on their aural abilities during aural verification, the aural retest would not be necessary. If you have feelings on this subject, please notify the ETS committee with your input. Coming up with a standard objective way to test aural verification is certainly a challenge.

The tuning exam has gone through changes since its inception in 1981. These changes have meant an upgrade in standards of what is a minimum acceptable tuning for an RTT. As more and more people are using electronic tuning aids, the question comes up "How important are aural skills for the RTT?" The Council's reaction to this was obviously that they are vitally important even to the point of raising the aural standards for those using electronic tuning devices. Those who are waiting to be tested and are concerned about their aural skills have until January to be tested at the 70 percent level, but upgrading aural skills is hardly wasted effort whether it be to pass a test or not.

Our tests are set up to establish a minimum level of competence for the classification of RTT. The technical level required is high enough to have some meaning, but it is not the ultimate achievement in a person's career. The tests represent a marking point to judge one's technical skills against others. Learning and upgrading one's skills is a continuing process that will last throughout one's whole career. There has been a great deal of discussion in the "Soundboard" section of the *Journal* regarding the necessity of an aural portion of the tuning exam. In spite of rather strong feelings on each side of the issue, it is clear how the Council feels about it. Aural skills in tuning are considered not only valuable, but necessary, even though modern electronic tuning aids have amazing capabilities. Using the strengths of your ears as well as the strengths of electronic tuning aids, you can produce top quality tunings. The move made by Council was a very strong one and the vote was so overwhelming that it shows that most technicians still believe in the ear as the final measuring device for a tuning.

While most manufacturers offer proof of performance in feet and inches, we offer our proof in years.



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From The Home Office

Convention '89 — Teamwork Pays Off!

You'll read all about it elsewhere in this issue, but the Guild's 32nd annual convention and technical institute in Portland would have to be considered a success by any yardstick.

If it wasn't the largest in our history, it at least came close, with more than 950 registered for the institute and spouse program. But if educational offerings, camaraderie, cooperation and downright fun were the qualities measured, then this convention stacks up against any other in our 32 years of history.

Consider these sights, sounds and experiences:

Grownups giggling on a merry-go-round (when adults ride, it's called a "carousel") during the Portland Chapter's Tuesday night carnival, an event that took countless hours of organization by Portland Chapter members. And that was only one of their activities.

An audience of more than 700 people fretting on the edges of their seats as Dean Petrich, a member of the Seattle Chapter, balanced precariously on upside-down stepladders, chairs and a unicycle during the convention opening session. Petrich, a professional clown, also entertained during the carnival.

For every name you'll read on the following pages, remember that several others made their own contribution.

Larry Goldsmith
Executive Director

Countless intense technical conversations taking place throughout the hotel during breaks, after class, and into the night.

Pianist Paul Smith enthralling an audience with his virtuoso playing and funny stories during the banquet.

Instructors and exhibitors giving time and often money to ensure a successful and profitable convention for everyone who attended.

The reverence with which Emil Fries accepted his Golden Hammer Award.

A one-day Council meeting.

An emotional rendition of "Auld Lang Syne," the traditional ending to the convention closing luncheon.

There's more, of course. That's only the surface of the story. For every name you'll read and every face you'll see on the following pages, remember that several others made their own contribution. Countless people worked behind the scenes to pull off a successful and enjoyable convention. For an organization of individuals and individualists, a lot of teamwork and cooperation went into this gathering.

Convention Classes...And More!

Susan Graham
Technical Editor

As is the tradition, this month's Technical Forum mainly consists of convention coverage: class reviews and general commentary from our most recent international gathering. Once again, I have enlisted a corp of volunteer writers (enlisted being the more operant word than volunteer), which gives us a diversity of interests and styles. They are: Paul Rice of Bath, ME; Greg Hudak of Baltimore, MD; Ken Sloane from Oberlin, OH; Mitch Kiel of Tacoma, WA (an encore performance), and the *Journal's* own indefatiguable Nick Gravagne. I should note that in one instance, Ken and Mitch chose to review the same class (poor organization on the part of the editor, I'm afraid), so I have taken the liberty of combining the two in hopes that the result is doubly informative and not too offensive to either gentleman.

There's a lot of good technical information in these reviews, but just to round out the Forum I've included a few tips, comments and responses generated by previous topics. Finally, this *Journal* includes one of Jack Greenfield's fine articles on acoustics and the development of equal temperament.

Convention Highlights:

(Clockwise from above) Among the special guests at the Portland Convention was Bo Jung Lee, above, president of the Korean Association of Piano Technicians and vice president of IAPBT. Leading the Portland Chapter's host efforts were President John Cooke, at microphone, and chairman Taylor Mackinnon. Institute Director Ben McKlveen received a plaque during the closing luncheon for his outstanding efforts in organizing a successful convention. Banquet entertainment featured jazz pianist Paul Smith. Member and professional clown Dean Petrich entertained during the opening session. A popular feature of Guild conventions is the Barbershop Chorus, directed by Larry Crabb.

Impressions From Portland

Nick Gravagne
New Mexico Chapter

For a brief but furious five days, the piano technicians of the world set up shop in Portland, OR. They came from many places: most of the 50 states, Panama, Canada, Belgium, Australia, France. The Red Lion Inn, site of this small invasion, was more than subtly changed from its "Inn-like" character into something resembling a military beach-head, complete with commanding officers, troops, walkie-talkies, machinery, and materiel. The object of this campaign, however, although carried out with Ike-like determination, had nothing to do with destruction. It had everything to do with building—building pianos, building relationships, and perhaps most importantly, building confidence. Not only confidence in one's ability to perform in such an esoteric (and oftentimes misunderstood) profession, but more tangibly, confidence in the continuing existence of that one item which is at the center of all the attention—the piano.

Will the piano always be with us? In this age of the arrogant electron the question is often asked. The answer is often complicated. But in looking around at what really goes on at a Guild Convention, in keeping an open ear and an open mind, something becomes very clear: if all the manufacturers of pianos in the world were to suddenly close their doors tomorrow, the piano could not possibly disappear from the face of the earth. Piano technicians everywhere simply wouldn't stand for it. Corporately, there is enough talent, knowledge and sheer skill in the Guild alone for designing and building pianos to supply the world over. But Portland was about more than pianos; it was about people, too.

FOLLOW THE OREGON TRAIL...

...TO EXCELLENCE!

If there is such a thing as a sterotyptical piano tuner, where was the species at the convention? Although stubbornness is apparently the requisite personality trait to stay in piano tuning, there exist, beyond that, innumerable and often opposing character quirks as a group. Where you might find at a gathering of CPAs the definitive accountant, "public" in every way and most carefully dressed and coiffed, you will not find two piano technicians quite the same. The range of personalities is as broad as it seems incongruent: CEO types; hippies; bearded

Classes And Instructors:

The 1989 Technical Institute included almost 200 hours of classroom instructors, taught by a faculty of more than 60 leading independent and company-sponsored instructors

and clean-cut; skirted or slacked; slick, cool, casual. And as they relate to the craft: artists, artisans, mechanics, real intellectuals, would-be intellectuals and an assortment of legitimate and quasi-engineers and mathematicians. And the taste for life, whether refined or uncomplicated, manifested itself in a wide variety of personal and social pursuits in the "off-duty" hours.

Take the Carnival, for instance. In the nighttime it was a magical place. Under a blue, moonlit sky, the scene looked like something out of a Steven Speilberg movie. A large concrete slab, which during the day bristled like the chunk of aggregate that it was, became a dance floor surrounded by the greenest grass and punctuated with lawn furniture and beach umbrellas. The Bouncing Baby Boomers Band "do-wopped" through a classic list of oldies rock tunes as the illumination, both natural and man-made, ricocheted off their instruments like rainbow laser snaps. Who there will ever forget the sight when the band announced that their next tune would be Little Eva's *Locomotion*. A train-line of dancers was called for. The song began with six machine-gun-like raps on the drums—and the train was off. The line of people seemed to hiss into motion, slow motion at first. Holding on to each other's hips they chugged along in solid rhythm, always on track, feet kicking, bodies bouncing until they were full steam ahead at mid-song looking like a giant millipede. The crowd cheered. And to think that many of these same individuals were going to be in class the next morning focusing their concentration to hear the relationship between an inside third and the outside sixth. Say "ram-a-lam-a-ding-dong-man." Now say it fast. It's how the F-A M3rd beats.

At the other end of the world there was Paul Smith's laughingly entertaining piano performance at the Awards Banquet. A virtuoso at the keyboard, but never taking himself too seriously, he represented what was to many the culmination of what piano technology is all about: the piano embued with life—seduced, and pushed to its emotional limit under the hands of an artist. This was no ordinary audience. They listened at once to both tune and tuning, to harmony and hammer. And you could have heard a tuning pin drop in the place; no indifferent or disrespectful chattering here. Many closed their eyes and simply listened. Others bobbed and swayed. All were moved.

If the technicians at Portland, in their single-mindedness to purpose, seemed oblivious to the other guests at the Inn, the converse was certainly not the case. With a horde of about 970 Convention-related people in virtually every nook and cranny of the building, the other guests couldn't help but take notice. "What in the world is going on here?" asked a man at the check counter. Girl behind the counter: "Oh, we have a bunch of piano tuners staying with us."

"Who?!"

Several minutes later at the entrance to the restaurant a man and a woman were waiting to be met by another couple. Upon meeting they all smiled and shook hands after which one of the women inquired of the group as to who was singing all this wonderful choral music in the lobby. "Oh, that's the piano tuner's barbershop singers," one of them answered. "They're having a reunion or something here." Another commented that it seemed quite fitting (if you thought about it) that piano tuners should make excellent singers and then wished that his church choir sounded as good. His wife concurred after which they all agreed that they were in good company.

Earlier that day a non-convention woman gasped as a grand piano standing on its side rolled past on a dolly: "Is *that* how they move pianos nowadays?"

Add to these images a mosaic of mood and introspection as folks settled into armchairs and talked into the night. Others in restaurants, or standing in halls, or tucked away in remote corners were philosophizing, teaching and learning, confessing and being forgiven, affirming and re-affirming, touching and laughing. All together, a huge dynamic at work unfolds. This is no ordinary group. Its richness in diversity demonstrates to itself and anyone who cares to notice that, in the end, what we are about is life and independence—a freedom of self expression often sought, but seldom found in this world.

Portland Chapter Carnival: *A perfect evening with plenty of activities for everyone: carousel rides, museum tours, games for the kids, prize drawings or dancing to your choice of Big Band or fifties music. In addition to hosting the carnival, chapter members also staffed an information desk in the hotel.*

Awards — Honoring Our Own

If the mark of a worthwhile organization is the individuals it chooses to honor, then the Piano Technicians Guild is indeed fortunate. Many of our present members owe their current success to the individuals honored during this year's convention.

Golden Hammer

Emil Fries

In 1986, Emil Fries was inducted into the Guild's Hall of Fame. His career in servicing pianos and serving his fellow tuners and technicians dates back to 1924, when he began work in rural northeastern Washington State. This work financed a college education.

In 1949, he founded the Emil Fries Piano Hospital and Training Center in Vancouver, WA, which has trained countless visually impaired technicians. Emil joined NAPT in 1936 and ASPT in the mid-40s.

Hall of Fame

George Morgan

George was a member of the National Association of Piano Tuners prior to its merger with the American Society of Piano Technicians in 1957 to form the Piano Technicians Guild. He served as president of the Seattle chapter, regional vice president, and vice president of the Guild. George was elected president of the Guild for the 1972-1973 terms.

George attended many conventions and seminars, including the 1988 Convention and Institute in St. Louis, MO, where he received a standing ovation in recognition of his many years of service.

George Morgan died on September 7, 1988, after a long illness.

Norman Neblett

Norman Neblett has been active in the Guild and the earlier American Society of Piano Technicians since joining in 1952.

Norm has served the Southern California music industry as a technician for several colleges, universities, concert venues and recording studios.

He served eight terms on the Los Angeles chapter's board, and has taught in many local, regional and international conventions. In 1985, he was chairman of a committee that created the "Los Angeles" version of the PTG technical exam.

Member of Note

William Smith

For the past 19 years, Bill has crafted the Golden Hammer Award. These exquisitely crafted presentation pieces each take more than 150 hours of painstaking work, and often are made with the individual recipient in mind. Bill is a longtime member of the Seattle Chapter.

Kenneth Serviss

Ken, a member of the Portland Chapter, has served on many national committees, including a stint as chairman of the Visually Impaired Committee. A Guild member since 1961, he has worked tirelessly with the visually impaired at conventions and has taught at annual conventions, state conferences and local seminars.

Ellen Sewell

Ellen, a longtime member of the Cincinnati Chapter, chaired a committee that recently finished its three-year project, a PTG film known as "The Unseen Artist." Ellen invested countless hours in writing, editing, auditioning, learning the film business, and overseeing shooting, editing and production.

Clancy Stout

Clancy, a Craftsman member since 1962, served for many years on the Guild's Newsletter Committee as well as other committees. His work took him throughout the midwest, and he was responsible for the starting of the Nebraska chapter, in the process helping many younger technicians start their careers.

Presidential Citations

Presidential Citations were presented to: Bill Spurlock, for his work in revising the Guild Technical Examinations; the late Raye McCall, for organizing the convention tutoring sessions; Past President Ernie Preuitt, for his assistance during the Guild's recent move to new offices; and to Secretary-Treasurer Bob Smit, for his work on the Guild's contract negotiation committee and in the establishment of a captive office.

Emil Fries (l.), and Ken Serviss

Smith

Preuitt

Spurlock

Smit (r.)

President Berry (l.) and Neblett

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Piano Parity

Mitch Kiel
Ken Sloane

"For a new idea to be successful, it must at first seem to be crazy."
— Albert Einstein

Somewhere, high in the sky, there might still be one or two ash particles left from smoking rubble of 1,000 square grand pianos incinerated by some flamboyant sales types in 1904 in Atlantic City. That funeral pyre, ringed with dancing piano salesmen singing late into the night, symbolized a new era in the search for the perfect piano that would fit into the common folk's modest home and budget. The vertical piano, virtually identical to the present design, was taking over the marketplace. Uniform length of key and shorter overall width were some of its advantages, but relief for the tuner's sore back surely was most appreciated by our predecessors. Piano salesmen everywhere fervently implored the musically minded to banish forever the square grand and buy the new and improved upright. Remarkably enough, they were telling the truth. And the history of the keyboard instrument changed.

Today, the past is repeated. This century's double dots are Darrell Fandrich and Chris Trivelas, two softspoken Seattle technicians who are quietly instigating a revolution. Neither is voluble, but both are articulate.

Darrell and Chris are designers, not manufacturers. Their action appears in only one piano, a 1909 Steinway K that they have been working on for a very long time. It was on display in the Portland Convention's exhibit hall and at their class called "Improved Vertical Action," where they expanded on their two articles in last winter's *Journal*.

Many instructors made mention of the phenomenon of inertia in piano actions during their presentations, but none looked at it quite so thoroughly as Fandrich and Trivelas.

They analyzed the various perceptions pianists have when comparing the touch of a grand action to an upright and related these perceptions to physical differences between the two action systems: lost motion (static and dynamic) in the upright, and the spring loaded repetition lever in the grand were two major differences they isolated. Although these features of each action are familiar to us all, Chris and Darrell's description and comparison of them were fresh and informative.

A third major difference they described is certainly more obscure than the previous two and possibly more important. This is the higher degree of inertia in the grand action. This phenomenon exists for reasons far too numerous to discuss within this class summary. Suffice to say that Chris and Darrell's analysis of it was eye-opening and extremely interesting, and that one of their main objectives in redesigning a vertical action is to duplicate that phenomenon in the vertical piano.

To emulate the touch of a grand piano, the balance rail is moved slightly rearward, and leads are added to the front of the key, in a ratio similar to a Steinway B. A small butterfly spring between the side of the jacktop and the hammer butt replaces the familiar coil spring under the jack heel. A very heavy hammer return spring, adjustable with a screw, is the counterbalance, simulat-

Continued on next page

Nickel and Dime Quality Tools

Paul Rice

Thanks to his legendary wit and humor, Jim Harvey's classes are always as entertaining as they are informative. This year's class on inexpensive, homemade tools was no exception. Jim packs an amazing amount of useful information into a single class period using a "shotgun" delivery. Some of the many tips that prompted this writer to take note are listed below in similar shotgun fashion:

1. a through-the-strings voicing tool made by epoxying a needle to the end of a chopstick;
2. a slide hammer-type coil lifter retrofitted with a pair of Vise Grips;
3. numerous uses for the ubiquitous plastic film can;
4. thick action cloth for durable temperament strips;
5. a chamois for the tool kit;
6. a knocker stick made of two hammer heads;
7. numerous uses for braising rod of various diameters;
8. an inexpensive upright action support;
9. combination handle chuck for electric screwdriver.

This very incomplete list ought to whet the appetite of any tool buff and encourage the true aficionado to "get thee to a Harvey class" as soon as possible for more.

ing gravity on a grand action. The strength of that spring regulates the hammer blow distance, which means there is no need for a hammer rest rail.

The most striking practical effect is that the jack top never loses contact with the hammer butt. Therefore, no slapping of action parts and consequent loss of control occurs. This allows the butt felt to be made of dense hammer felt, which adds to the player's feeling of direct control. Soft pedal function is achieved solely by a rod pushing up the backs of the keys, which decreases keyheight, keydip, and blow.

Most people who play the piano fall in love with it immediately. It feels like a well regulated grand action. What fascinated so many technicians at the Portland Convention, is that the design works so well and yet is so simple. Its elegance is an inspired synthesis of old and new ideas that seems obvious in retrospect. Clearly, it could be the first significant change for the vertical piano action in a century that has seen close to 200 patented attempts.

Chris and Darrell have been working on this project for more than seven years, but only within the last year and a half have they been able to publicly discuss it. Patents needed to be researched, written and filed, a very time consuming and costly process. Some people have since wondered if they were crazy to try to take on the Corporate Musical Powers That Be. If it were really possible, wouldn't it have been invented by now? Won't it get stolen by The Bigs immediately?

Well, their design works, and is original, and they now have the protection of the U.S. Patent Office, which granted their patent two days before the Portland Convention. Foreign patents are pending.

Before the Portland Convention, Darrell and Chris had been anxious about the reactions of piano technicians. They needn't have worried. More than 20 technicians mentioned that the primary reason they came to Portland was to see the Fandrich action, and six technicians said that they have cautioned customers to defer purchasing a new piano until the new design became available on the American marketplace.

Business people listen to that kind of talk. Up to now, the manufacturers have been biding their time, wondering if any demand might exist to warrant the risk. Corporate lawyers cautiously waited to see whether the patents would be granted. But since the Patent Office decision and the exposure at the Portland Convention, the winds have already started to change.

Even though the acoustic upright piano commands the vast majority of piano sales, that is rapidly shrinking. Chris and Darrell hope that their Fandrich Vertical Piano Action will rejuvenate the piano of the bourgeoisie, and allow it to survive the evertightening market pinch between the high quality grand and the electronic keyboard.

If these two softspoken men can actually get a major piano company to sign on the dotted line, it will be a small victory of talent over cynicism, and a classic American success story that the cold modern era was supposed to have outpaced. It might also re-ignite interest in piano playing in middle class families, where many tunings can be sold.

Their appearance at our Portland Convention was, in Darrell's words, "the peak of the mountain we need to climb" for acceptance by the piano community. That implies that it's all downhill from here. If an agreement is reached with a piano builder, and the Fandrich Vertical Action appears in today's competitive marketplace, hang on for the ride.

Grand Piano Remanufacturing

Nick Gravagne

Willis Snyder is by any criteria an institution in our organization. The meticulous and thorough work that he and his son Dave are known for is actually a benchmark for many technicians who judge their own processes and workmanship according to "what the Snyders do." In many fields such a position of influence creates demigods. Not so here: "Take these ideas and practices to your own shop," says Willis, "and see if they'll work for you. If not, try something else." Never sanctioned, however, is careless and sloppy work.

Their class on piano re-manufacturing is a serious, but always engaging experience. There are few jokes. Although Willis and Dave are quick to laugh they are not comedians. They mean to teach and if you attend their class, be prepared to learn something. As instructors they floor incoming questions like a crack basketball team handles a down-court drive. As quick on their feet as they are in their minds, they work in tandem, passing a class question back and forth until father or son finally hoops it. Dave will then ask, "Are you with me?" Everyone was.

Continued on next page

Humidity And The Complete Technician

Paul Rice

Those attending this year's Dampp-Chaser class quickly learned that the company has come a long way since the days of the uncontrolled, shiny-metal rod. The current products form a complete humidity control system which has an attractive, high-tech appearance, is easy to install, and is very effective in stabilizing the tuning of virtually any piano in any environment.

Two recent additions to the product line were shown by Steve Smith, owner and CEO of Dampp-Chaser. The first, a narrow grand humidity tank, is designed to fit pianos with limited space between the beams (Steinway model "B" comes to mind). The other, a beeping low water warning light, ought to be useful in institutional situations where the blinking light alone is too often ignored. Blind piano owners will also appreciate this new, audible signal.

Randy Potter did an excellent job swaying the unconvinced by tracing his own evolutionary process from tentative skeptic to enthusiastic convert. He claims that about one service call in five now results in a Dampp-Chaser installation. He has revived countless pianos with untunably loose pins and has completely abandoned the use of chemical pin tighteners.

The class subject primarily centers on belly work—soundboards in particular. Small but truly amazing props on hand include a small, two-foot grand piano complete with bent rim, solid spruce soundboard, vertically laminated bridges, pinblock, and gold plate (made of wood). A miniature go-bar deck stood close by which was built with so much scaled-down detail that a class attendee could quickly get ideas on how to build a real one. These items, as well as being teaching aids, speak mute testimony to the marvelous woodworking skills of these talented piano men.

During the class a multitude of slide photos were projected onto a huge screen. Whether at wide angle or in close-up, these color shots of the many aspects of piano tear-down and rebuild were central to the progress and cohesion of the ever-present discussion.

Willis and Dave philosophize about piano rebuilding right up front. Quality is the key word in their shop vocabulary—and quality takes time. They don't re-manufacture many instruments in a year's time according to Big Time rebuilding reckoning, but the six or so they do, in addition to maybe four action overhauls, are done with pride and fastidious attention to detail. In dealing with their customers they stress quality, not price.

Although the importance of soundboard installation is emphasized, Willis states that they are not "soundboard crazy." The original will be reused if it has good crown and only a few cracks, and if it demonstrates good ring time (10 to 12 seconds of discernable peak and fade at note #60 or thereabouts). They also consider resilience in the unloaded soundboard as another criterion.

Soundboard removal is done by routing. First the plate support dowels are trimmed flush. Next, a typical router with straight bit is kept in close contact with the inner rim and guided along until it must stop due to bridge obstruction. After a few passes, the bit has cut through the board and ribs. The unrouted areas can be sawn through by hand. Before doing so, however, a line needs to be scribed on the soundboard which follows the contour of the inner rim. To do this, a small wooden disk with a perfectly centered pencil point just protruding through one face is necessary. Place the disk on the soundboard horizontally with pencil point down and press the "tread" against the inner rim. Now when the disk is pushed and rolled along, the contour of the inner rim will be marked on the soundboard. Remember, the saw cut needs to be made *between* the scribed line and the inner rim. When all routing and sawing is finished, the soundboard is then lifted from the rear to break the bellyrail/soundboard glue joint. The stuff still attached to the rim is broken and chisled off.

To trace a new soundboard from the old, another wooden circular disk which has the same radius as the router base plus the radius of the cutter bit is necessary. A pencil point protruding through the dead center of the "wheel" will mark the original outline of the soundboard onto a fresh panel as the wheel's "tread" is kept in close contact with the cut out soundboard edge and horizontally pushed and rolled around the perimeter. The un-routed areas (those that were sawn through) need to be neatly trimmed back to the scribed line which was made with the small disk-marker. This same disk-marker is then used in the identical fashion as the larger one to transfer a line to the new panel. Of course, the new panel being marked must be dry and shrunken to its smallest size (for a given EMC) or all this careful work will be in vain.

Soundboard panels are no longer glued up in shop. Posey panels are now being used with satisfaction. Incidentally, these commercial panels are specifically glued up so as to allow planing in one direction across the surface. This is important not only to the panel makers but to the rebuilders as well. If one of the boards which make up the panel is reversed as to grain rise the plane will chew up that particular board while planing the others smooth—a very frustrating experience. Power sanding, whether in large commercial machines or by hand-held tools, is very kind to a reversing grain rise; spinning knives or sliding planes, however, can be brutal. The fact that Posey builds their panels with this in mind is a critical piece of information to those soundboard makers who prefer to plane a taper into the board rather than sand or rout one in. For more particulars on either Posey or North Hudson soundboard and related products, the Snyders suggest you call the companies with questions.

On the subject of annual grains per inch, father and son have some definite ideas. It has long been known that a close-grained soundboard panel demonstrates the ability to propagate mechanical impulses most advantageously. But it is easy to get hung up here. What do we mean by close grain and how critical is it, anyway, to quality tone? Willis cited a realistic and workable range of 12 to 25 grains per inch (averaging 18 per inch). But he was quick to comment that evenness of grain spacing within a single panel is perhaps more important than the number of grains per inch since the soundboard reactions to both string vibrations and ambient conditions would be more uniform in a "homogeneous" board.

When the soundboard panel arrives from the Northwest it is not immediately thrown into the piano—hardly. Panels are ordered several months or even a year in advance of when they will be needed; they are then stored in the average shop environment to acclimate. Prior to pressing, the soundboard panel is dried (and kept dry) in a small room for 60 days at 95 degrees Farenheit (F). Dave mentioned that the humidity level in the room is the primary factor for panel drying. The temperature, on the other hand, is not a targeted number but rather a means to lower the Relative Humidity (RH). In the summer months, when there is generally more moisture in the air, the temperature needs to be set higher than in the winter in order to achieve the same RH in the drying room. The maximum, safe temperature was stated as 140 degrees F above which they say the wood could be damaged. It is usually possible to adequately dry spruce at temperatures closer to 100 degrees F. The equilibrium moisture content (EMC) they look to obtain in their spruce panels is four to five percent. In order to accomplish this the temperature is increased to 125 degrees F average and held there for four days directly prior to rib pressing. These parameters translate to about a 20 percent RH in the drying room. At every stage of the bellying process the soundboard is stored in the drying room and maintained in a relatively shrunken condition right up to the day that it is installed in the piano.

Continued on next page

While on the subject of monitoring ambient conditions, the Snyders' motto "the right tool for the job" holds as true as ever. A certified hygrometer is seriously recommended over the usual consumer types. They cost about $125. Although these units are very accurate, they should be calibrated to be most reliable in the 42% range for general shop monitoring and 25% for a drying room or hotbox. Use a sling psychrometer to calibrate. R. Bruce Hoadley's book *Understanding Wood* was cited as an excellent text covering not only a good deal about wood moisture considerations and measuring devices but also as a valuable reference in general.

Ribs, of course, are critical soundboard assembly components. They are chosen according to vertical grain requirements and general soundness. Since perfectly vertical, quartersawn material is not always available, even from the best suppliers, a variance between 52 and 90 degrees is considered acceptable. A 45 degree piece is "leaning" too much. Again, stock having reasonable grains per inch is selected; wood showing either extreme grain spacing or closeness is not used. Ribs are radiused (crowned) by routing in a special jig. After the ribs are glued to the soundboard the rib ends are tapered (feathered, pared) with a router which is riding in another specially designed jig.

A traditional go-bar deck is used for soundboard crowning (although they are toying with the idea of going to an air system someday). The deck, which is made of wood, is capable of sustaining an incredible load. The dished-out bottom is reversible so it can be used for bridge gluing—a multi-use advantage which pneumatic presses cannot so easily accommodate. The hickory go-bars are rated at 200 pounds per, i.e., pushed fully into place they are capable of a 200 pound thrust. In the crowning process the go-bars are pressed directly onto the ribs (no protection), but marks and depressions made as a result are of no concern since the ribs are deeper at this stage of the work than the final called-for dimension. Go-bar spacing is about 3 to 4 inches apart but the evenness and amount of glue squeeze is the criterion as to go-bar spacing and applied pressure. This requires the careful eye and experience of a craftsman. Choice of glue is a urea resin (Wellwood Plastic Resin Glue) which is a water/powder mix allowing plenty of set-up time (45 minutes). This glue is also used at the soundboard/rim joint and for gluing bridges. Glue squeeze at each rib is cleaned up as they go using rags and sticks with angled tips. Rib depth and "corner rounding" are accomplished after the glue has dried and the soundboard is removed from the press.

After the soundboard has been crowned the spruce panel is tapered. Again, the choice of tool is a router (the Snyders are motorized) which rides in a tapered jig. The conventional belief in tapering is based on the traditional approach that soundboards cut thinner at the perimeter than in the center areas will vibrate more fully. The actual thinning pattern is a sort of standardized cut running around the perimeter of the board (but not across the front) and varies according to the size of the instrument.

Whether you are already knee deep in soundboard installation or just thinking about getting your toes wet, you really should consider catching this class. There are brand new ideas for neophytes or a different slant on something for the veteran. Willis commented that, although the essential piano hasn't changed much over the years, his shop practices certainly have in the continuing search to come up with that perfect and most efficient rebuild. No doubt, next time we see Willis and Dave something will have changed—a new tool, approach, or glue will be part of their shop repetoire.

I first met Willis in Philadelphia in 1975. He was teaching a class and I was in attendance. Of course, I couldn't know at the time that it would be fourteen years before I would sit in on another of his classes. But upon seeing him in Portland I was reminded that the piano isn't the only thing which has remained essentially unchanged: Willis is as dedicated to both the beauty of the art and the purposes of the Guild as ever—and he still wears a bowtie.

College and University Technicians Seminar

Greg Hudak

On Thursday morning a hardy group of university technicians ventured beyond the confines of the Red Lion Inn and boarded the MAX (Metropolitan Area Express) light rail train for downtown Portland and the Portland State University Campus. The day-long meeting commenced at 9:00 a.m. with a presentation by Don Person, the PSU concert technician. He discussed the school maintenance program's pros and cons, and then led a tour through the music facilities including a peek at Lincoln Auditorium and the Hamburg Steinway which Don keeps in top form.

FOLLOW THE OREGON TRAIL...

...TO EXCELLENCE!

The College and University Technicians Forum has been a visible part of every national convention for many years now, but it formerly consisted of only one class-period meeting in which the attending university technicians would attempt to accomplish a myriad of things in a very short amount of time. Because of this limitation the Forum never really got off the ground. But at the Toronto Convention in 1987, through the inspiration of Marshall Hawkins and the determination of the attending university technicians, the Forum emerged as a strong and cohesive organization within PTG. At that meeting the present committee was elected, with Tom McNeil of Fredonia State University (NY) as Chairman. Since then the Forum has had a significant presence at several regional seminars, with day-long on-campus sessions at the Ohio State Conference and last fall's New York State Conference in Syracuse. Today the Forum consists of technicians affiliated with universities and colleges in various situations, from part-time contracted to full-time salaried, and produces a quarterly newsletter with a mailing of over 400.

Under the leadership of Lou Tasciotti, a major part of the committee's work the past year has been formulating a comprehensive document which would serve as an effective set of guide-

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lines covering all aspects of institutional piano maintenance—climate control, tuning frequency, budgeting, assistants per number of pianos, etc. Final revisions of this document were discussed in the morning session and the document was approved for eventual publication and distribution to our members.

A delightful buffet lunch gave us the opportunity to toss around more thoughts and ideas, and to compare notes of our own situation with others. I'm always amazed to learn just how much variety there is among various university situations.

The meeting resumed with a presentation by Dr. Dean Shank, of Rice University on "A University Technology Program for Enlightening Pianists," which is also the subject of his recently submitted doctoral dissertation. Dean described in detail the two-semester course which he teaches, which runs the gamut from the history of keyboard instruments and historical temperaments to field trips to various local piano stores to evaluate the current market products. Dean is an accomplished pianist and teacher as well as an RTT, and he also possesses a wry sense of humor. He kept us entertained (starting off with a brief but hilarious skit portraying the sometimes strained relations between technician and artist) as well as informed, even providing an excellent bibliography of relevant books and articles used in his class. I was quite impressed to hear that his course was a *requirement* for the DMA degree, and I'm sure that his influence had a lot to do with that.

Any young organization experiences some growing pains, and the final period was dominated by a lively discussion of how to best set up our own meeting at future PTG conventions. Some evinced some regret at being physically removed from the main institute site, while others felt that spending the day exclusively with other university technicians presented a unique opportunity for valuable discourse. Some wanted to trim the meeting to a half-day session, possibly on the final half-day of the convention. It was remarked that a full day took too much time away from attending other classes, that after all we are primarily piano technicians and the nuts and bolts of our daily work is still tuning, regulating, and voicing, subjects covered so well in the institute. It was concluded that while we want to make our meeting unique and vital, we also want to work within the framework of the PTG convention, and not set ourselves too far apart. I'm sure our untiring committee will work out the details and come up with the best solution for next year's convention in Dallas. In any event, everyone went away with the feeling that much had been accomplished that day, and in the past two years.

Pianos: A Moving Experience

Paul Rice

The secret to piano moving is to let gravity work for you. It also helps to wear the right clothes, to have the right equipment, and to know when and how to use it. All this and more was skillfully imparted by Jim Geiger in his piano moving class. Jim showed that most pianos can be moved quite safely and easily by two people. A small upright can usually be moved solo if no stairs are involved.

Jim starts by explaining the importance of dressing for the job—no three piece suit, but no dirty jeans and tee shirt, either. Jim sported a beltless, buttonless jump suit and athletic shoes with good traction. The grand piano was also well dressed in a custom-made Kevlar cover from JM FABRICations.

Noteworthy equipment included a non-swiveling, large wheel (6" dia.) dolly made from discarded grand shipping pallets. All lifting is done with webbed straps, not ropes, cables or those backbreaking handles on the sides of the skid board. Skid boards are useful for upright moving as well as for grands, especially when stairs are involved.

Jim stresses the importance of staying focused on the job at hand. Don't rush, and think every move through in your head before lifting anything. The most important muscle is the one between your ears.

Spielart

Mitch Kiel

There was no doubt who was the most respected technician in the room, as the legendary Franz Mohr, chief tuner-technician for Steinway's Concert and Artist department, shared with us the benefits of his immense talent and charm.

Franz describes himself as "the happiest tuner in the world." He certainly has the most well known clientele in the world. He travels with Horowitz, and calls a certain Serkin "Rudy." He tells stories of "Van" playing at the White House, and he received the wrath of von Karajian. He sits backstage at the best concert halls in the world, and is indispensible to the world's most talented musicians. This is certainly enough to make any tuner happy.

But his happiness also stems from recovering from the trauma of World War II in Germany, and finding Jesus to quench the fires of hatred that burned in his heart from the violent loss of his dreams to bombs and death. His life changed as he became preacher and tuner both.

There is a German word "spielart," which is used around Steinway Hall to describe their instruments. It can be roughly defined as the sum total of the way a piano sounds, the way it plays, the way it feels, what the artist gets back from the piano and what the piano will receive from the artist. The dictionary says "spielart" translates as "style of play; variety, sport." It is the living link that passionate genius creates between Play and Art.

It was spielart Franz Mohr really tried to teach. he told us a few technical tips, but that was not his focus. He spoke about using a plastic keytop dissolved in a pint of acetone for voicing juice, what is good hammer shape, how important strong test blows are. But what he really wanted us to learn was never to give up, know when not to show doubt,

Continued on next page

to use our allotted time wisely and well, and to have faith in our clever and sensitive gifts. What spielart is for a piano technician, he seemed to say, is the creative ability to work with both piano and artist to produce a confident player on a responsive instrument. He would not define what grit of sandpaper he used to file hammers; he didn't know or care. He was wise enough to not tell Rudolph Serkin that a string had just been replaced on a concert piano; there was no need to introduce doubt in the artist's concentration. Franz Mohr knew enough to never directly disagree with Horowitz even when the Maestro was wrong (!), but he was also able to create solutions to those complaints without causing offense or loss of face.

Franz Mohr's skills as a technician are first rate. The most famous pianists in the world believe this is true. He probably knows the Steinway piano as well as anyone ever has. But he has much more in his little box of tools than custom-made titanium widgets. He has emotion and artistry in there, too. He contends that a tuner staring at an electronic tuning device can neither properly feel the pin nor understand good tone. Where is the instinct?

Confidence and discovery are what really define Franz Mohr. His skill and sympathy have helped him to achieve the pinnacle of our profession. Love of music and musicians, strength of faith and thankfulness, and gobs of joy make this man as inspiring a teacher as the community of piano technicians has ever seen. ≡

***Special Exhibit:** One of the highlights of the 1989 convention was an exhibit of past and present Golden Hammer Awards crafted by William Smith.*

INDUSTRY NEWS

Piano Foundation Observes National Piano Month

The month of September has been declared National Piano Month in recognition of the nation's most popular instrument and its 20 million amateur players, according to the National Piano Foundation.

"Celebrate by throwing a piano party, studying the history of the piano with students, staging a piano sing-a-long at a local nursing home, *having your piano tuned*, taking your piano teacher to lunch, or signing up for lessons," the Foundation's publicity suggested. The Foundation's materials also suggested that National Piano Month also presented an excellent opportunity for local public relations activities.

The National Piano Foundation was formed in 1962 as the educational arm of the Piano Manufacturers Association International, one of the oldest professional associations in the United States. On the recommendation of a study by the Harvard School of Business, NPF was created to develop programs, activities, and materials that inform the general public about the value, benefit and enjoyment of playing the piano.

NPF recently updated its catalog of materials and membership information. For a free copy, contact Madeleine Crouch, National Piano Foundation, 4020 McEwen, Suite 105, Dallas, TX 75244. (214) 233-9107.

Baldwin Names Webb

Kent Webb has joined Baldwin Piano & Organ Co. as Piano Technical Service Manager. He will be based at the company's piano manufacturing facility in Trumann, AR.

Webb has been involved with piano service for 13 years. He has been working with the Baldwin organization for the past five years as a technician for Maus Piano & Organ Co. in the Raleigh-Durham, NC, area.

Webb

He also co-owned and was technical director and vice president of a large piano restoration facility in Raleigh. His experience there included employee training, overseeing production quality and concert preparation.

As Piano Technical Service Manager, Webb will be available to consult with dealers, technicians and individuals about their technical concerns. He also will teach seminars and classes to aid in the understanding of Baldwin products. ≡

Saturday The 15th

Nick Gravagne

I returned to the Inn on Saturday. The red airport shuttles were arriving and departing as usual. The front desk people, looking more like airline ticket agents now, were busy about their work—the piano technicians were gone. But they've seen conventions come and go and after a while they all look the same. The whole place, which was a swarm of PTG activity only the day before, seemed to be exhaling after a deep breath.

FOLLOW THE OREGON TRAIL...

...TO EXCELLENCE!

But for me the images of the past week were still strong. The large lobby in which I stood had been for the past week a crossroads, not only in the obvious sense as a vertex where hallways, restaurants and shops come together, but in subtler ways. People's lives crossed here, perhaps never to cross again. Conversations, both serious and hilarious, on every possible aspect of "being in the piano business" filled this place from the first moment it all began until that last technician had left for home. I could hear the PTG Barber Shop Chorus who had assembled here on Thursday night and delighted everyone. The three large and lighted see-through tubular elevators, which during the week alternately lifted off and touched down with exhausting regularity, were parked at the bottom. The scene was like Coney Island after Labor Day. Life goes on. But there are pianos to tune and rebuild along the way. There will be other seminars and, of course, it will all happen again next year in Dallas. ≡

Meanwhile...
On The Road To Dallas!

No convention would be complete without a taste of the next one. In this case, 1990 Institute Director Dick Bittinger talked about next year's classes, accompanied by Dallas Chapter President Tom Tomko's a cappella tribute to next year's headquarters hotel, the Hyatt Regency Reunion. Hawaii member Ben Kuraya is on his way after winning four free nights' lodging in a drawing conducted by James Smit and Home Office staff member Mary Kinman.

Dallas!

July 7-11, 1990
Hyatt Regency Dallas At Reunion

Is There A Better Way?

Plastic Elbows, Keylead Removal And Reaming Action Centers

I'm writing in response to the reader's question about plastic elbows in the April '89 issue. My method is fairly fast and easy on the wippens.

I punch out the centerpin with centerpin pliers (Schaff 5500), leaving it hanging out one side of the wippen. Remove the old elbow. Push the centerpin back in with the centerpin pliers: line up the pliers punch on the end of the hanging-out centerpin and just push it straight in! Sounds crazy, but the punch rarely slips, and the holes are rarely damaged. Then install a snap-on elbow.

The job takes about four or five hours. I do it lying on my back on the floor, with the action in. I suppose you could take the action out and do it in the shop, too.

William A. Magnusson, RTT
President, Boulder Chapter

In your article on key unleading from the July issue, you mention that you didn't know the clever way to evaluate which keyleads were to be removed.

The way I use is quite simple and clever, indeed: I just take my weights, set them on the keytop as if I were measuring, and then I add a lead on top of the key on the other side of the balance rail. I move the lead back and forth until I get the up or downweight that I want, then measure the distance from the balance rail, report that distance on the other side of the balance rail and remove the weight that is at that distance. It is quite simple and fast, and I get results that were quite accurate with this system. I hope others can benefit from it.

Marcel Carey
Sherbrooke, QC

Here's a quick method for reaming action centers:

Tools:

1. Modified *repinning tool (Apsco 16404)*
2. *Straight reamers for teflon bushings*
3. *Pin vise*
4. *(Flange bushing cloth)*
5. *(Center pins)*
6. *(Glue)*

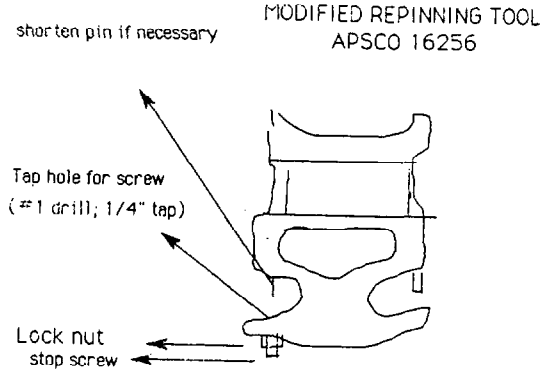
Time: 20 seconds per flange

Procedure:

1. *Set stop screw on repinning tool so that center pin can be pressed out of one bushing at a time. (Center pin should not lose contact with the bushing cloth). Tighten locking nut.*
2. *Ream bushing using appropriate size reamer in pin vise.*
3. *Press center pin back in place.*
4. *Repeat process on other side.*
5. *Test flange for appropriate friction.*

Hazards: If set screw allows pin to leave bushing cloth, bushing may be pushed out when pin is pressed back into place. Be prepared to rebush!

Ken Eschete
Algiers, LA



TUNING UP

Convention Review

Rick Baldassin
Tuning Editor

This month we will review the tuning classes which were offered at the 32nd Annual Convention and Technical Institute, in Portland, OR, July 10-14, 1989. Three of the tuning classes were also offered at last year's convention. These included: "Basic Piano Tuning" by George Defebaugh, "Aural Fine Tuning for Electronic Tuners" by Al Sanderson, and "A Master Class in Temperament Tuning" by Bill Garlick. The fourth tuning class was entitled "Tuning the Historical Temperaments by Ear" by Owen Jorgensen, and was not offered last year. The three classes offered last year were reviewed in the *Journal* in the September 1988 and October 1988 issues. Rather than simply refer you back to those issues, I have chosen to reprint the reviews, adding new material where possible. In addition, I have asked Kathy Teetsell, RTT, of the Los Angeles Chapter to review Owen Jorgensen's class.

Basic Piano Tuning

The following is a reprint of the review of George Defebaugh's class entitled "Basic Piano Tuning" which appeared in the October, 1988, *Journal*.

When you want a good basic course given, it is always good to have a seasoned veteran give it. George began with the basics of hammer technique, what position to use, what movement techniques to use, and what type of hammer tips to use for various pianos. The class period was topped off with an actual demonstration of his famous Defebaugh Temperament, where he tunes by the faster beating intervals such as 3rds and 6ths, and checks with 4ths and 5ths to see that they are relatively smooth.

Having been a drummer, George has a beautiful sense of rhythm. Since his days in the service, he has developed a perfect memory for the standard marching speed of 120 beats per minute. This gives him a standard for the F3-D4 6th, and the G3-B3 3rd. He can accurately calibrate all other 3rds or 6ths as slightly faster or slower than the intervals he sets early in his system because of his built-in drummer's metronome.

For those of us without this "built-in" metronome, a standard metronome is quite helpful in establishing basic beat speeds as a basis for our temperament. If the metronome is set at 120 beats per minute, and the pulse sub-divided into sixteenth notes, the result would be eight beats per second. The same technique with the metronome set at 105 beats per minute would result in seven beats per second, and a setting of 136 beats per minute would yield nine beats per second. Beat rates of approximately seven, eight and nine form the basis for George's temperament.

George strongly advocated the exclusive use of the "A" fork, and recommended that the fork be checked frequently for accuracy. It was stated that direct pitch transfer from the fork is unreliable, and note F2 was used as a test note. The object was to tune A4 such that the beat rate from F2-A4 was the same as F2-A fork. The same test would be used if an audible pitch source other than a fork was used. The next step is to tune A3 to A4 as a wide 4:2 octave (M3 < M10).

The next step is to tune F3 to A3 at ≈ seven bps. This is followed by tuning D4 to F3 at ≈ eight bps. Test to see that the A3-D4 4th is not more than one bps. The next step is to tune A#3 to D4 at ≈ nine bps. Test to see that the F3-A#3 4th is not more than one bps. These notes form the foundation for George's temperament.

It was stated that the actual beats in the piano are slower than the theoretical rates due to inharmonicity. In addition, it was mentioned that the fast-beating intervals were favored in this system to give a more musical sound. The object was to create a nice progression of M3rds and M6ths, with no objectionable 4ths and 5ths. The opinion was expressed that a musical octave could not be achieved using the slow beating intervals.

Continuing with the temperament, C#4 was tuned to A3, slightly slower than the A#3-D4 M3rd. G#3 was then tuned to C#4 at less than one bps. C4 was then tuned to G#3, slightly slower than the A3-C#4 M3rd. The F3-C4 5th was also tested. F#3 was then tuned to A#3, slightly faster than the F3-A3 M3rd. The F#3-C#4 5th was also tested. D#4 was then tuned to F#3, slightly faster than the F3-D4 M6th. B3 was then tuned to D#4, slightly faster than the A#3-D4 M3rd. The F#3-B3 4th was also tested. G3 was then tuned to B3, to fit in the chromatic progression between F#3-A#3 and G#3-C4 M3rds. The G3-C4 4th and G3-D4 5th were also tested. E4 was then tuned to G3, slightly faster than the F#3-D#4 M6th. The C4-E4 M3rd, B3-E4 4th, and A3-E4 5th were also tested. Finally, F4 was tuned to G#3, slightly faster than the G3-E4 M6th. The C#4-F4 M3rd, C4-F4 4th, A#3-F4 5th, and F3-F4 octave were also tested. Parallel M3rds, M6ths, 4ths, and 5ths were then played.

Finally, the inside 3rd-outside 6th test was used. It was stated that the inside 3rd should beat at about the same speed as the outside sixth. To test, first play the G3-B3 M3rd, followed by the F3-D4 M6th. Move up a semi-tone and repeat, etc. Complete the test by playing all four notes at once, F3-G3-B3-D4, and listen for sonority. Move up a semi-tone and repeat, etc. It was stated that this creates the piano vibrato, and that if this sonority is present, the tone will carry better.

Time was given to answer ques-

tions even from beginners. His well chosen anecdotes kept the class alive at all times.

My thanks to Jim Coleman for his help in the review of this class.

You may recall that Ross Anderson of Monroe, CT, wrote a letter which appeared in the March 1989 issue with regard to this class review titled "Where's the beats?" In his letter, Ross stated that information regarding where to listen for the beats is important basic knowledge which is necessary to tune the temperament which George sets forth. Ross found that using the "Conn Beat Locator" made the job of knowing where to listen for the beats much easier. Though it was not mentioned in this review, George demonstrates the use of the "Coleman Beat Locator" (previously marketed as the "Conn Beat Locator") in his class. For those of you who wish to acquire one of these, they are available from Superior Imports, 2152 Washington Blvd., Los Angeles, CA 90018, (213) 735-4595. When I last saw these displayed the cost was under $5.00.

Aural Fine Tuning
For Electronic Tuners

The following is a reprint of the review of Al Sanderson's class entitled "Aural Fine Tuning for Electronic Tuners" by Peter Briant, RTT, of the Montana Chapter, which appeared in the September, 1988 *Journal*.

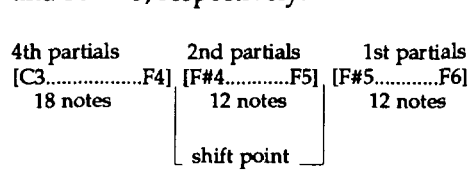
Sanderson's Ph.D. in Applied Physics was granted by Harvard University in 1969. Subsequently, he taught Electronics at Harvard from 1969 to 1977. He has received eight patents, five of which are presently used in the Accu-Tuner.

Dr. Sanderson has been teaching institute classes for several years now, and as many of you are aware, he played an important role in developing the present tuning test. His earliest classes covered temperament and introduced the features and use of his inventions: the Sight-O-Tuner and the Sanderson Accu-Tuner. Later classes shared information on the pitch raising process, scale design, and more efficient aural checks. Recently, he has emphasized aural techniques that permit refinement of electronic tuning operations.

Sanderson began our class by discussing the Accu-Tuner's Stretch Mode of operation. This method (assuming the piano is at pitch) requires measuring the inharmonicity between the 2nd and 4th partials of F4 (key F-45). The result is called the "Stretch Number" and is entered into the Accu-Tuner's microprocessor, or Stretch Calculator. It computes a 42 note sequence of values from C3 (key C-28) to F6 (key F-69) which the operator then transfers to the piano. The Stretch Calculator gives the operator values for 18 fourth partials from C3 to F4, 12 second partials from F#4 to F5, and 12 first partials from F#5 to F6.

It is interesting that Sanderson himself criticizes the calculated values of the Stretch Mode as being "too perfect." He says the Stretch Mode concept looks at the whole piano from "too narrow of a window." The computed stretch temperament values derive from a measurement of inharmonicity that is characteristic of just one string in the middle of the piano. Due to many factors, a scale's characteristic inharmonicity varies throughout the piano, so the success of a particular stretch temperament depends on how well suited it is for a specific scale. By analogy, if we buy ready-made clothes, we should expect a perfect fit only if our physique is average; otherwise, an item may need some alterations.

To determine if the temperament conforms well to the piano, Dr. Sanderson suggests that the operator check aurally at certain locations in order to detect irregularities in the beat patterns. These points are where the Accu-Tuner "downshifts" from reading 4th partials to 2nd partials, and from 2nd partials to 1st partials, which is between F4-F#4, and F5-F#5, respectively:



He recommends aurally checking the C4-F4 Fourth against the C#4-F#4 Fourth to detect a sudden increase or decrease of beat rates. "The Fourth is our friend," he says, "Look for them all to beat about the same." He suggests that if we detect a sudden increase in the beat rate, the Stretch Number is too low, and if the beat rate suddenly decreases, the Stretch Number is too high.

At this point in the process, he also recommended use of Seventeenths and Contiguous Interval tests. He says adjacent or parallel Seventeenths will beat all the way to the top of the piano because the relationship between the 5th partial of the lower note and the 1st partial of the upper note stays expanded. The operator should check with Seventeenths across the shift points described above.

The operator should also use chains of contiguous Major Thirds and Fourths to detect irregularity. The reader who is not familiar with the term "contiguous" intervals may understand them as like intervals that are stacked on top of each other sharing a common note. For example: an Augmented Triad (C-E-G#) consists of two contiguous Major Thirds (C-E, E-G#). These tests very quickly identify an irregularity.

These tests have been described in previous *Journals* (Baldassin, Sept.'87, p.28.; Sanderson, Nov.'84, p.19). The Sanderson article also appears in the Accu-Tuner Operating Manual (p. A14). It is useful to quote a brief part:

Tests that use contiguous intervals are easy to learn and use, and tell the tuner explicitly which notes are at fault and what to do to correct them. Contiguous major thirds will beat in the ratio of four to five because the major third itself consists of two notes whose frequencies are in the ratio of four to five. Displacing any interval up the keyboard will speed it up theoretically in the ratio of the frequencies of the two root notes involved. Therefore two contiguous major thirds should beat in the ratio of four to five, two contiguous minor thirds in the ratio of five to six. Similarly, two contiguous fourths should beat in the ratio of three to four, and two contiguous fifths in the ratio of two to three. However, on the piano this theoretical relationship holds well only for the major and minor thirds. The fourths and fifths are so strongly affected by inharmonicity that these contiguous intervals beat at almost the same speeds.

If the aural tests indicate a problem, Dr. Sanderson advocates a simple method to adjust the temperament values to compensate. This simply involves trying a slightly higher or lower Stretch Number as indicated above. If, for example, we have selected 6.0 cents for the Stretch Number, and at the shift point, the beat rate suddenly increases, select

6.5 cents as the stretch number, re-tune, and test again. Repeat as necessary until the beat pattern is satisfactory. A little practice will speed up this technique. He advises that only four notes need tuning in order to test for the adequacy of the Stretch Number: C4, C#4, F4, F#4.

Another method to modify the stretch temperament was considered, as well. As the Stretch Calculator creates octaves that are one-half beat wide, and as this may be too wide for some tastes, adjustment can be made by chosing a lower Stretch Number, and "offsetting" the lowest 18 and highest 12 values of the stretch temperament, keeping the middle 12 the same, thus retaining A4 at 440 Hz. In other words, the Stretch Number affects the size of the temperament octave, and the outer two sections of the temperament can be skewed up or down to alter octave size.

The example suggested in class required the operator to determine a Stretch Number (6.0 cents), then enter a slightly lower Stretch Number (5.5 cents). Notes F#4 to F5 would be tuned to the 5.5 Stretch Number. The Accu-Tuner would next be recalibrated (or reset) to plus 0.5 cents (retaining the previously determined 5.5 stretch values) to tune notes C3 to F4. Then the Accu-Tuner would be reset to minus 0.5 cents to tune notes F#5 to F6. This would appear as follows for a piano which measured a 6.0 Stretch Number:

(55-cent stretch #, offset + 0.5 cents)	55-cent stretch #)	(55-cent stretch #, offset - 0.5 cents)
(C3.....F4)	(F#4.....F5)	(F#5.....F6)

If the Stretch Number is lowered, then notes C3 to F4 must be offset positively by the amount the Stretch Number was lowered, and notes F#5 to F6 must be offset negatively by the same amount. If the Stretch Number is raised, the opposite would be true. Be sure in all cases to check the shift points between F4-F#4 and F5-F#5 as described above. The above are examples of how modification of the stretch temperament might be attempted.

Sanderson provided a six-page handout of tables and graphs. Several of these showed the effect of using wrong Stretch Numbers on partial frequencies and beat rates in comparison to a correct tuning. The remaining charts graphed beat rates of correctly tuned contiguous Thirds, Fourths, and Fifths. My only recommendation would be for the inclusion of a page of explanatory notes either to aid review, or to help someone in the local chapter with whom the handout might be shared.

Whether we use Dr. Sanderson's technology or not, we in the field of piano work must sooner or later recognize his contribution to the Piano Technicians Guild's understanding of the piano tuning process and the physical forces upon which it is based. It is instructors such as Sanderson who make ours a dynamic, progressive technology. I believe it would be in the best long-term interests of the art of music, our customers, and our profession if we all shared a little more of his vision. My thanks to Peter Briant for his time and effort in writing this review.

Dr. Sanderson has graciously allowed me to publish the tables and graphs which Peter mentioned in his review, and which were distributed this year as well. During the class session which I attended, some of the particiants inquired about a set of Stretch Tables which Jim Coleman had passed out the previous year during a Mini-Technical he taught. These tables were printed in the October 1988 issue. Because of the interest shown, I am reprinting these tables as part of this class review.

These figures and graphs illustrate the "jumps" which occur when the wrong Stretch Number is used to tune the piano. One cause for measuring a wrong Stretch Number could be that the string being measured has false beats. Since there are three strings in the unison for F4, if one has false beats present, simply measure another. Another reason could be that the inharmonicity for Note F4 is not in line with the notes around it due to poor scaling. In this case, notes E4 and F#4 could be measured, and the results averaged. This could be done if all three strings of F4 were false, as well. As was mentioned in the class review, aural testing at the

1. CORRECTLY TUNED TO A STRETCH NUMBER OF 6.0 CENTS

NOTE		INH CONST	FUNDA-MENTAL	SECOND PRTL	THIRD PRTL	FOURTH PRTL	FIFTH PRTL	SIXTH PRTL	SEVNTH PRTL	EIGHTH PRTL	
28	C3	0.151	-5.8	-5.3	-4.6	-3.5	-2.1	-0.5	1.5	3.8	cents
29	C#3	0.159	-5.5	-5.0	-4.2	-3.1	-1.7	0.1	2.2	4.6	
30	D3	0.169	-5.2	-4.7	-3.9	-2.7	-1.2	0.7	2.9	5.4	
31	D#3	0.179	-4.9	-4.3	-3.5	-2.2	-0.6	1.4	3.7	6.4	
32	E3	0.191	-4.6	-4.0	-3.0	-1.7	0.0	2.1	4.6	7.4	
33	F3	0.204	-4.2	-3.5	-2.5	-1.1	0.7	3.0	5.6	8.7	
34	F#3	0.218	-3.9	-3.2	-2.1	-0.6	1.4	3.8	6.6	9.9	
35	G3	0.234	-3.5	-2.8	-1.6	0.0	2.1	4.7	7.7	11.2	
36	G#3	0.251	-3.2	-2.4	-1.2	0.6	2.9	5.6	8.9	12.6	
37	A3	0.270	-3.1	-2.2	-0.9	1.0	3.4	6.4	9.9	14.0	
38	A#3	0.291	-2.8	-1.9	-0.4	1.6	4.2	7.4	11.2	15.6	
39	B3	0.314	-2.5	-1.6	0.0	2.2	5.0	8.5	12.6	17.3	
40	C4	0.339	-2.2	-1.2	0.5	2.9	5.9	9.7	14.1	19.2	
41	C#4	0.366	-2.1	-1.0	0.8	3.4	6.7	10.7	15.5	21.0	
42	D4	0.395	-1.8	-0.6	1.3	4.1	7.7	12.0	17.1	23.1	
43	D#4	0.427	-1.6	-0.3	1.8	4.8	8.6	13.3	18.9	25.3	
44	E4	0.462	-1.3	0.1	2.4	5.6	9.8	14.8	20.9	27.8	
45	F4	0.500	-1.1	0.4	2.9	6.4	10.9	16.4	22.9	30.4	
46	F#4	0.541	-0.8	0.8	3.5	7.3	12.2	18.1	25.2	33.3	
47	G4	0.586	-0.6	1.2	4.1	8.2	13.5	19.9	27.6	36.3	
48	G#4	0.634	-0.2	1.7	4.9	9.3	15.0	22.0	30.2	39.8	
49	A4	0.687	-0.1	2.0	5.4	10.2	16.4	24.0	32.9	43.2	
50	A#4	0.744	0.3	2.5	6.2	11.4	18.1	26.3	36.0	47.1	
51	B4	0.806	0.6	3.0	7.0	12.7	19.9	28.8	39.2	51.3	
52	C5	0.873	1.0	3.6	8.0	14.1	21.9	31.5	42.9	56.0	
53	C#5	0.945	1.3	4.1	8.8	15.4	23.9	34.3	46.6	60.8	
54	D5	1.024	1.6	4.7	9.8	17.0	26.2	37.5	50.8	66.1	
55	D#5	1.109	1.9	5.2	10.7	18.5	28.5	40.7	55.1	71.8	
56	E5	1.202	2.3	5.9	11.9	20.3	31.1	44.4	60.0	78.0	
57	F5	1.302	2.5	6.4	12.9	22.0	33.7	48.1	65.0	84.5	
58	F#5	1.411	2.6	6.8	13.9	23.8	36.5	52.0	70.3	91.5	
59	G5	1.529	2.9	7.5	15.1	25.8	39.6	56.4	76.3	99.2	
60	G#5	1.656	3.1	8.1	16.4	27.9	42.9	61.1	82.6	107.5	
61	A5	1.795	3.4	8.8	17.8	30.3	46.5	66.2	89.5	116.5	
62	A#5	1.945	3.7	9.5	19.3	32.9	50.4	71.8	97.0	126.2	
63	B5	2.107	4.0	10.3	20.9	35.6	54.6	77.8	105.1	136.8	
64	C6	2.283	4.4	11.2	22.7	38.6	59.2	84.3	114.0	148.2	
65	C#6	2.474	4.9	12.3	24.7	42.0	64.3	91.5	123.7	160.8	
66	D6	2.681	5.3	13.3	26.7	45.5	69.6	99.1	134.0	174.2	
67	D#6	2.905	5.8	14.5	29.0	49.4	75.5	107.5	145.2	188.8	
68	E6	3.148	6.3	15.7	31.5	53.5	81.8	116.5	157.4	204.6	
69	F6	3.411	6.9	17.1	34.2	58.1	88.8	126.3	170.6	221.8	

Fig. 1 contains the partial frequencies for a piano with a Stretch Number of 6.0, and correctly tuned to a 6.0 Stretch Number. The first column gives the note number, the second column gives the note and octave, the third column gives the inharmonicity constant for the note, and the remaining columns give the cent deviation for the fundamental through eighth partials.

2. STRETCH NUMBER = 6.0, BUT INCORRECTLY TUNED TO 4.0 CENTS

NOTE	FIRST	SECOND	THIRD	FOURTH	FIFTH	SIXTH	EIGHTH
C3	-5.3	-4.8	-4.1	-3.0	-1.6	0.0	4.3
C#3	-5.1	-4.6	-3.8	-2.7	-1.3	0.5	5.0
D3	-4.9	-4.4	-3.6	-2.4	-0.9	1.0	5.7
D#3	-4.7	-4.1	-3.3	-2.0	-0.4	1.6	6.6
E3	-4.5	-3.9	-2.9	-1.6	0.1	2.2	7.5
F3	-4.3	-3.6	-2.6	-1.2	0.6	2.9	8.6
F#3	-4.1	-3.4	-2.3	-0.8	1.2	3.6	9.7
G3	-3.9	-3.2	-2.0	-0.4	1.7	4.3	10.8
G#3	-3.8	-3.0	-1.8	0.0	2.3	5.0	12.0
A3	-3.8	-2.9	-1.6	0.3	2.7	5.7	13.3
A#3	-3.7	-2.8	-1.3	0.7	3.3	6.5	14.7
B3	-3.5	-2.6	-1.0	1.2	4.0	7.5	16.3
C4	-3.5	-2.5	-0.8	1.6	4.6	8.4	17.9
C#4	-3.4	-2.3	-0.5	2.1	5.4	9.4	19.7
D4	-3.4	-2.2	-0.3	2.5	6.1	10.4	21.5
D#4	-3.4	-2.1	0.0	3.0	6.8	11.5	23.5
E4	-3.3	-1.9	0.4	3.6	7.8	12.8	25.8
F4	-3.4	-1.9	0.6	4.1	8.6	14.1	28.1
F#4	-1.1	0.5	3.2	7.0	11.9	17.8	33.0
G4	-1.1	0.7	3.6	7.7	13.0	19.4	35.8
G#4	-0.8	1.1	4.3	8.7	14.4	21.4	39.2
A4	-0.8	1.3	4.7	9.5	15.7	23.3	42.5
A#4	-0.5	1.7	5.4	10.6	17.3	25.5	46.3
B4	-0.3	2.1	6.1	11.8	19.0	27.9	50.4
C5	-0.1	2.5	6.9	13.0	20.8	30.4	54.9
C#5	0.1	2.9	7.6	14.2	22.7	33.1	59.6
D5	0.2	3.3	8.4	15.6	24.8	36.1	64.7
D#5	0.3	3.6	9.1	16.9	26.9	39.1	70.2
E5	0.5	4.1	10.1	18.5	29.3	42.6	76.2
F5	0.6	4.5	11.0	20.1	31.8	46.2	82.6
F#5	2.0	6.2	13.3	23.2	35.9	51.4	90.9
G5	2.2	6.8	14.4	25.1	38.9	55.7	98.5
G#5	2.4	7.4	15.7	27.2	42.2	60.4	106.8
A5	2.6	8.0	17.0	29.5	45.7	65.4	115.7
A#5	2.8	8.6	18.4	32.0	49.5	70.9	125.3
B5	3.1	9.4	20.0	34.7	53.7	76.9	135.9
C6	3.3	10.1	21.6	37.5	58.1	83.2	147.1
C#6	3.7	11.1	23.5	40.8	63.1	90.3	159.6
D6	4.0	12.0	25.4	44.2	68.3	97.8	172.9
D#6	4.3	13.0	27.5	47.9	74.0	106.0	187.3
E6	4.7	14.1	29.9	51.9	80.2	114.9	203.0
F6	5.1	15.3	32.4	56.3	87.0	124.5	220.0

Fig. 2 contains the partial frequencies for a piano with a Stretch Number of 6.0, but incorrectly tuned to a 4.0 Stretch Number. The first column gives the note and octave, and the remaining columns give the cent deviation for the first, second, third, fourth, fifth, sixth, and eighth partials.

3. STRETCH NUMBER = 6.0, BUT INCORRECTLY TUNED TO 8.0 CENTS

NOTE	FIRST	SECOND	THIRD	FOURTH	FIFTH	SIXTH	EIGHTH
C3	-6.3	-5.8	-5.1	-4.0	-2.6	-1.0	3.3
C#3	-5.9	-5.4	-4.6	-3.5	-2.1	-0.3	4.2
D3	-5.5	-5.0	-4.2	-3.0	-1.5	0.4	5.1
D#3	-5.1	-4.5	-3.7	-2.4	-0.8	1.2	6.2
E3	-4.7	-4.1	-3.1	-1.8	-0.1	2.0	7.3
F3	-4.1	-3.4	-2.4	-1.0	0.8	3.1	8.8
F#3	-3.6	-2.9	-1.8	-0.3	1.7	4.1	10.2
G3	-3.1	-2.4	-1.2	0.4	2.5	5.1	11.6
G#3	-2.7	-1.9	-0.7	1.1	3.4	6.1	13.1
A3	-2.4	-1.5	-0.2	1.7	4.1	7.1	14.7
A#3	-2.0	-1.1	0.4	2.4	5.0	8.2	16.4
B3	-1.4	-0.5	1.1	3.3	6.1	9.6	18.4
C4	-1.1	-0.1	1.6	4.0	7.0	10.8	20.3
C#4	-0.7	0.4	2.2	4.8	8.1	12.1	22.4
D4	-0.3	0.9	2.8	5.6	9.2	13.5	24.6
D#4	0.2	1.5	3.6	6.6	10.4	15.1	27.1
E4	0.8	2.2	4.5	7.7	11.9	16.9	29.9
F4	1.1	2.6	5.1	8.6	13.1	18.6	32.6
F#4	-0.4	1.2	3.9	7.7	12.6	18.5	33.7
G4	-0.1	1.7	4.6	8.7	14.0	20.4	36.8
G#4	0.4	2.3	5.5	9.9	15.6	22.6	40.4
A4	0.6	2.7	6.1	10.9	17.1	24.7	43.9
A#4	1.1	3.3	7.0	12.2	18.9	27.1	47.9
B4	1.6	4.0	8.0	13.7	20.9	29.8	52.3
C5	2.1	4.7	9.1	15.2	23.0	32.6	57.1
C#5	2.6	5.4	10.1	16.7	25.2	35.6	62.1
D5	3.0	6.1	11.2	18.4	27.6	38.9	67.5
D#5	3.5	6.8	12.3	20.1	30.1	42.3	73.4
E5	4.1	7.7	13.7	22.1	32.9	46.2	79.8
F5	4.5	8.4	14.9	24.0	35.7	50.1	86.5
F#5	5.2	9.4	16.5	26.4	39.1	54.6	94.1
G5	5.6	10.2	17.8	28.5	42.3	59.1	102.0
G#5	6.1	11.1	19.4	31.0	46.0	64.3	111.0
A5	6.6	12.0	21.0	33.6	49.9	69.7	120.2
A#5	7.1	12.9	22.6	36.1	53.6	74.9	129.2
B5	7.6	13.8	24.1	38.6	57.3	80.0	138.0
C6	8.1	14.7	25.7	41.1	61.0	85.2	147.0
C#6	8.6	15.6	27.3	43.6	64.8	90.5	156.1
D6	9.1	16.5	28.9	46.2	68.6	95.8	165.3
D#6	9.6	17.4	30.5	48.8	72.4	101.1	174.5
E6	10.1	18.3	32.1	51.4	76.3	106.5	183.9
F6	10.6	19.2	33.7	54.0	80.2	111.9	193.3

Fig. 3 contains the partial frequencies for a piano with a Stretch Number of 6.0, but incorrectly tuned to a 8.0 Stretch Number. The first column gives the note and octave, and the remaining columns give the cent deviation for the first, second, third, fourth, fifth, sixth, and eighth partials.

CORRECTLY TUNED TO A STRETCH NUMBER OF 6.0 CENTS

NOTE		CENTS FOR 1 B.P.S.	OCTAVES 1-2	OCTAVES 2-4	OCTAVES 3-6	OCTAVES 4-8	FIFTHS 2-3	FIFTHS 4-6	FOURTHS 3-4	FOURTHS 6-8	3RDS 4-5	MINOR 3RDS 5-6	10THS 2-5	17THS 1-5	DOUBLE OCTAVE 1-4	TRIPLE OCTAVE 1-8	
28	C3	13.45	0.5	0.7	0.4	-0.5	0.0	-0.7	0.9	0.7	5.2	-7.0	5.9	6.7	1.3	0.4	beats/second
29	C#3	12.70	0.5	0.7	0.4	-0.7	0.0	-0.7	0.9	0.7	5.6	-7.4	6.2	7.0	1.4	0.2	
30	D3	11.99	0.5	0.7	0.3	-0.9	-0.1	-0.8	1.0	0.8	6.0	-7.8	6.5	7.3	1.4	-0.1	
31	D#3	11.31	0.5	0.7	0.2	-1.1	-0.1	-0.9	1.1	0.8	6.3	-8.3	6.8	7.6	1.4	-0.4	
32	E3	10.68	0.5	0.7	0.1	-1.4	-0.1	-1.0	1.0	0.7	6.7	-8.8	7.2	7.9	1.5	-0.9	
33	F3	10.08	0.5	0.6	0.0	-1.8	-0.2	-1.2	1.0	0.6	6.9	-9.4	7.4	8.1	1.4	-1.4	
34	F#3	9.51	0.5	0.6	-0.2	-2.2	-0.3	-1.5	1.1	0.5	7.3	-10.1	7.8	8.4	1.3		
35	G3	8.98	0.5	0.5	-0.4	-2.7	-0.3	-1.7	1.1	0.4	7.7	-10.8	8.1	8.7	1.3		
36	G#3	8.48	0.5	0.5	-0.5	-3.2	-0.4	-2.0	1.0	0.0	8.1	-11.5	8.5	9.0	1.2		
37	A3	8.00	0.5	0.5	-0.7	-3.7	-0.4	-2.1	1.1	0.0	8.5	-12.1	9.0	9.5	1.2		
38	A#3	7.55	0.6	0.5	-1.0	-4.4	-0.4	-2.4	1.1	-0.3	9.0	-13.0	9.4	9.8	1.1		
39	B3	7.13	0.6	0.4	-1.2	-5.2	-0.5	-2.6	1.2	-0.5	9.4	-13.9	9.7	10.1	1.0		
40	C4	6.73	0.6	0.4	-1.5	-6.0	-0.6	-3.0	1.2	-0.9	9.9	-14.9	10.1	10.4	0.9		
41	C#4	6.35	0.7	0.4	-1.8	-6.9	-0.5	-3.2	1.3	-1.1	10.5	-15.7	10.5	10.9	0.9		
42	D4	5.99	0.8	0.4	-2.2	-8.1	-0.6	-3.7	1.3	-1.6	11.1	-16.8	10.7		0.8		
43	D#4	5.66	0.8	0.3	-2.8	-9.6	-0.7	-4.1	1.4	-1.9	11.7	-17.8	11.1		0.7		
44	E4	5.34	0.8	0.2	-3.3	-11.2	-0.7	-4.6	1.3	-2.8	12.4	-19.1	11.2		0.5		
45	F4	5.04	0.8	0.0	-4.2	-13.3	-0.7	-5.1	1.4	-3.4	12.9	-20.3	11.5		0.4		
46	F#4	4.76	0.8	-0.4	-5.3	-16.0	-0.9	-5.8	1.4	-4.3	13.6	-21.9	11.6				
47	G4	4.49	0.8	-0.7	-6.4	-18.7	-0.9	-6.6	1.5	-5.1	14.3	-23.3	11.7				
48	G#4	4.24	0.7	-1.2	-8.0	-22.3	-1.2	-7.7	1.4	-6.5	15.0	-25.1	11.7				
49	A4	4.00	0.7	-1.5	-9.3	-25.8	-1.1	-8.4	1.5	-7.6	15.9	-26.5	12.0				
50	A#4	3.78	0.6	-2.0	-11.2	-30.2	-1.4	-9.9	1.4	-9.5	16.6	-28.6	11.8				
51	B4	3.56	0.6	-2.6	-13.3	-35.3	-1.8	-11.7	1.3	-11.3	17.2	-30.7	11.6				
52	C5	3.36	0.5	-3.4	-15.8	-41.2	-2.2	-13.6	0.9	-14.1	18.0	-33.3	11.2				
53	C#5	3.17	0.5	-3.9	-18.2	-47.4	-2.6	-15.8	0.5	-17.3	18.5	-35.6	10.8				
54	D5	3.00	0.4	-4.9	-21.5	-55.1	-3.0	-18.2	0.1	-20.8	18.8	-38.8					
55	D#5	2.83	0.4	-5.7	-24.7	-63.3	-3.4	-20.8	-0.3	-24.7	19.5	-42.2					
56	E5	2.67	0.3	-6.9	-28.9	-73.4	-4.0	-24.1	-0.9	-29.5	19.7	-45.9					
57	F5	2.52	0.4	-7.8	-33.1	-84.0	-4.3	-27.1	-1.3	-34.3	20.4	-49.7					
58	F#5	2.38					-4.4	-30.1	-1.6	-39.6	21.2	-53.4					
59	G5	2.24					-5.0	-34.3	-2.2	-46.1	21.6	-57.9					
60	G#5	2.12					-5.4	-38.7	-2.4	-52.9	22.4	-62.7					
61	A5	2.00					-6.0	-44.0	-3.2	-61.5	23.1	-68.0					
62	A#5	1.89					-6.5	-49.8	-4.0	-71.1	23.4	-73.5					
63	B5	1.78							-4.9	-82.3	23.8	-80.0					
64	C6	1.68							-6.0	-95.2	23.8	-87.2					
65	C#6	1.59									23.5	-95.6					
66	D6	1.50										-104.2					

Fig. 4 demonstrates the beat rates of various intervals for the same piano with a 6.0 Stretch Number, correctly tuned to a 6.0 Stretch Number. Column one gives the note number, column two gives the note and octave, and column three gives the number of cents needed to create 1 beat per second at that pitch. Columns four through seven list the beat rates for the Octaves at the 2:1, 4:2, 6:3, and 8:4 levels. Columns eight and nine list the beat rates for the Fifth at the 3:2 and 6:4 levels. Columns 10 and 11 list the beat rates for the Fourth at the 4:3 and 8:6 levels. Columns 12 through 17 list the beat rates for the Major 3rds, minor 3rds, M10ths, M17ths, Double Octaves, and Triple Octaves. In each case, the note listed is the root (bottom) note of the interval.

STRETCH NUMBER = 6.0, BUT INCORRECTLY TUNED TO 4.0 CENTS

NOTE	OCTAVES 1-2	OCTAVES 2-4	OCTAVES 3-6	FIFTHS 2-3	4THS 3-4	3RDS 4-5	10THS 2-5	DOUBLE OCTAVE 1-4
C3	0.2	0.2	-0.4	-0.2	0.7	5.1	5.0	0.9
C#3	0.2	0.1	-0.4	-0.3	0.7	5.4	5.1	0.9
D3	0.2	0.1	-0.6	-0.3	0.8	5.7	6.3	0.9
D#3	0.1	0.0	-0.8	-0.4	0.8	6.0	6.5	0.8
E3	0.1	-0.1	-1.0	-0.4	0.7	6.4	6.9	0.8
F3	0.0	-0.3	-1.4	-0.5	0.7	6.6	7.1	0.7
F#3	0.5	0.5	-0.2	-0.6	0.7	7.0	7.5	1.2
G3	0.5	0.5	-0.4	-0.7	0.7	7.3	7.8	1.2
G#3	0.5	0.5	-0.5	-0.8	0.7	7.7	8.2	1.1
A3	0.5	0.5	-0.7	-0.9	0.7	8.2	8.7	1.2
A#3	0.6	0.5	-0.9	-1.0	0.7	8.5	9.1	1.1
B3	0.6	0.5	-1.1	-0.2	0.6	8.9	9.3	1.1
C4	0.7	0.5	-1.3	-0.2	0.6	9.4	9.8	1.0
C#4	0.7	0.5	-1.7	-0.2	1.9	9.8	10.1	1.0
D4	0.8	0.5	-2.0	-0.2	2.1	12.2	11.6	1.0
D#4	0.8	0.4	-2.5	-0.1	2.3	12.9	12.0	0.9
E4	0.9	0.4	-3.1	-0.1	2.3	13.7	12.5	0.8
F4	1.0	0.3	-3.7	0.0	2.6	14.5	13.0	0.8
F#4	0.6	-0.6	-5.7	-1.4	0.9	13.1	11.0	
G4	0.7	-0.8	-6.7	-1.5	1.0	13.9	11.3	
G#4	0.6	-1.3	-8.1	-1.9	0.8	14.4	11.1	
A4	0.7	-1.6	-9.5	-1.9	0.8	15.3	11.4	
A#4	0.6	-2.1	-11.4	-2.3	0.5	15.8	11.1	
B4	0.6	-2.6	-13.3	-1.6	0.3	16.3	10.8	
C5	0.5	-3.4	-15.8	-1.8	0.0	16.9	10.4	
C#5	0.5	-3.9	-18.2	-2.1	1.3	17.4	9.9	
D5	0.5	-4.7	-21.3	-2.4	1.1	20.1		
D#5	0.5	-5.5	-24.5	-2.6	1.0	21.1		
E5	0.4	-6.6	-28.5	-3.0	0.6	21.7		
F5	0.5	-7.6	-32.8	-3.4	0.3	22.5		
F#5				-5.2	-2.1	20.6		
G5				-5.8	-2.9	21.2		
G#5				-6.5	-3.4	21.4		
A5				-7.2	-4.2	22.1		
A#5				-7.9	-5.2	22.3		
B5					-6.4	22.1		
C6					-7.6	22.3		
C#6						21.6		

Fig. 5 demonstrates the beat rates of various intervals for the same piano with a 6.0 stretch Number, but incorrectly tuned to a 4.0 Stretch Number. Column one gives the note and octave, columns two through four give the beat rates of the Octave at the 2:1, 4:2, and 6:3 levels, and columns five through nine give the beat rates for the Fifth, Fourth, M3rd, M10th, and Double Octave. Note the jump of 1.3 BPS in the Fourths between C4 and C#4, which indicates that the Stretch Number is too low.

STRETCH NUMBER = 6.0, BUT INCORRECTLY TUNED TO 8.0 CENTS

NOTE	OCTAVES 1-2	OCTAVES 2-4	OCTAVES 3-6	FIFTHS 2-3	4THS 3-4	3RDS 4-5	10THS 2-5	DOUBLE OCTAVE 1-4
C3	0.7	1.2	1.2	0.2	1.0	5.4	6.9	1.8
C#3	0.7	1.2	1.2	0.2	1.1	5.8	7.2	1.9
D3	0.8	1.3	1.2	0.2	1.2	6.2	6.8	2.0
D#3	0.8	1.4	1.3	0.2	1.3	6.6	7.1	2.1
E3	0.9	1.5	1.4	0.2	1.3	7.0	7.5	2.2
F3	0.9	1.4	1.2	0.1	1.3	7.2	7.7	2.2
F#3	0.5	0.6	-0.1	0.1	1.4	7.6	8.1	1.5
G3	0.5	0.6	-0.3	0.0	1.4	8.1	8.5	1.4
G#3	0.5	0.6	-0.5	0.1	1.5	8.5	8.9	1.3
A3	0.5	0.5	-0.7	0.1	1.5	9.0	9.3	1.3
A#3	0.6	0.5	-1.0	0.1	1.7	9.4	9.8	1.2
B3	0.6	0.4	-1.3	-0.8	1.8	9.9	10.1	1.0
C4	0.6	0.4	-1.5	-0.8	1.8	10.7	10.7	0.9
C#4	0.7	0.4	-1.9	-0.9	0.7	11.2	11.0	0.8
D4	0.7	0.3	-2.3	-1.0	0.7	10.2	10.0	0.7
D#4	0.7	0.1	-3.0	-1.2	0.6	10.6	10.1	0.4
E4	0.7	0.0	-3.6	-1.4	0.3	11.0	10.0	0.1
F4	0.8	-0.2	-4.4	-1.4	0.3	11.4	10.1	0.0
F#4	0.8	-0.2	-5.1	-0.3	1.9	14.0	12.1	
G4	0.8	-0.5	-6.2	-0.3	2.0	14.9	12.3	
G#4	0.8	-1.0	-7.7	-0.4	2.0	15.6	12.3	
A4	0.8	-1.4	-9.2	-0.3	2.2	16.6	12.6	
A#4	0.7	-1.9	-11.0	-0.5	2.2	17.4	12.5	
B4	0.6	-2.6	-13.3	-2.1	2.2	18.1	12.2	
C5	0.5	-3.4	-15.8	-2.5	2.0	19.0	11.9	
C#5	0.4	-4.1	-18.4	-3.0	-0.4	19.6	11.4	
D5	0.3	-5.0	-21.7	-3.6	-0.8	17.4		
D#5	0.3	-5.9	-25.2	-4.1	-1.4	17.9		
E5	0.1	-7.2	-29.4	-4.9	-2.4	17.8		
F5	0.2	-8.2	-33.8	-5.4	-3.0	18.0		
F#5				-3.7	-0.9	21.9		
G5				-4.2	-1.4	22.3		
G#5				-4.5	-1.7	23.1		
A5				-4.8	-2.2	24.1		
A#5				-5.2	-2.9	24.4		
B5					-3.5	24.9		
C6					-4.5	25.3		
C#6						25.1		

Fig 6 demonstrates the beat rates for various intervals for the same piano with a 6.0 stretch Number, but incorrectly tuned to a 8.0 Stretch Number. Column one gives the note and octave, columns two through four give the beat rates of the Octave at the 2:1, 4:2, and 6:3 levels, and columns five through nine give the beat rates for the Fifth, Fourth, M3rd, M10th, and Double Octave. Note the jump of -1.1 BPS in the Fourths between C4 and C#4, which indicates that the Stretch Number is too high.

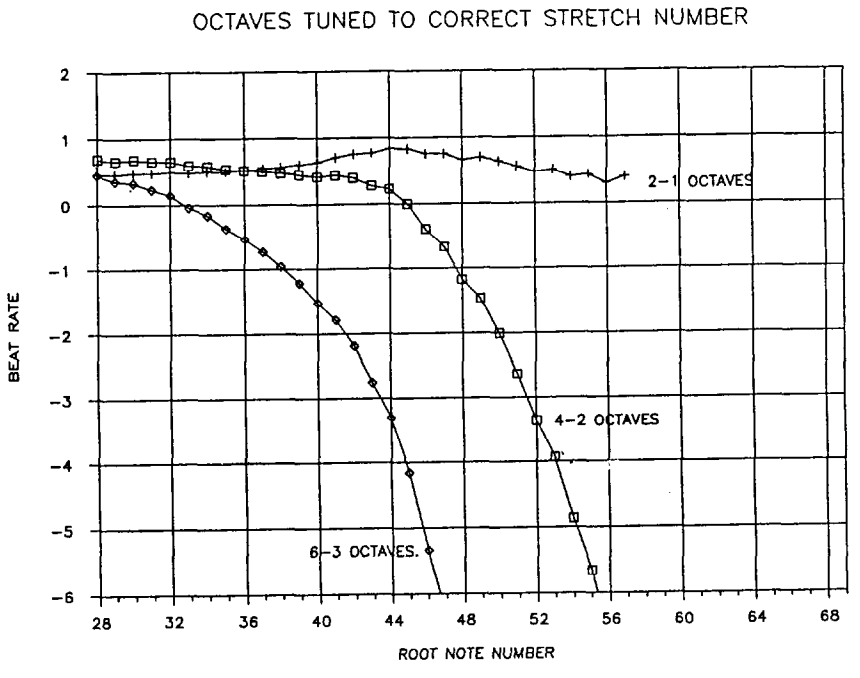


Fig. 7 shows Octave beat rates for three types of octaves as tuned correctly on a piano with a 6.0 cent Stretch Number. Negative beat rates signify a narrow interval. Notice that it is natural for the 6:3 and 4:2 octaves to turn narrow, even though the 2:1 octaves remain wide.

"shift points" will quickly verify the Stretch Number's appropriateness for that piano.

Earlier, I made reference to some altered stretch tables which Jim Coleman had generated as a handout for his Mini-Technical class which he taught a year ago. Since there were inquiries about this handout during Dr. Sanderson's class, I have chosen to reprint it here. These Stretch tunings departed slightly from those in the Accu-Tuner, in that they give tighter octaves. The normal Stretch tunings will provide octaves that give 1/2 BPS difference between the standard 3rd-10th tests. These new values will provide for 1/4 BPS difference between the 3rd-10th tests for octaves.

The width of the octaves can be narrowed by using chart 1, or by using the method described above, which requires reducing the Stretch Number (by about 0.5 cents for 1/4 BPS octaves), and offsetting the lower and upper sets of notes, to maintain the smooth progression of intervals across the shift points

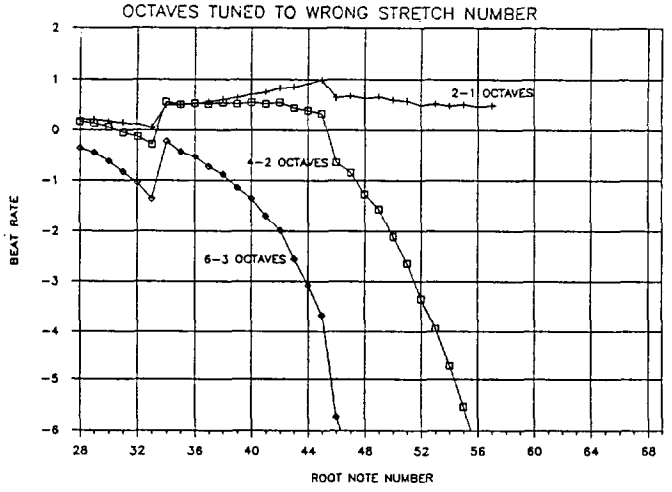


Fig. 8 shows Octave beat rates for three types of octaves incorrectly tuned to a 4.0 cent Stretch Number on a piano with a 6.0 cent Stretch Number. Negative beat rates signify a narrow interval. Notice the "jumps" upward in beat rates between notes F3 (33) and F#3 (34), and downward between notes F4 (45) and F#4 (46).

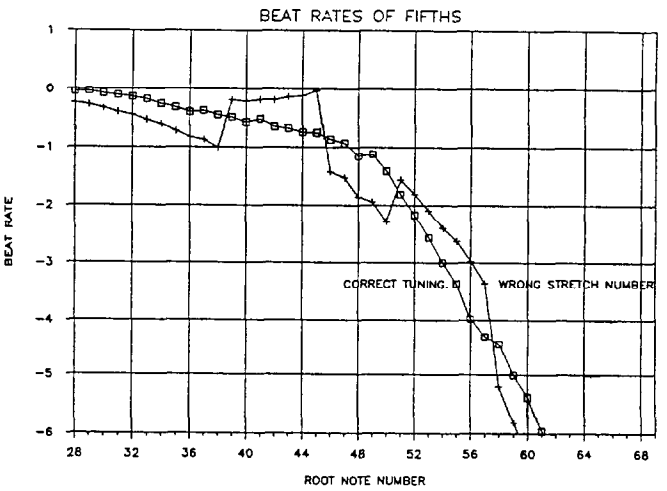


Fig. 9 shows beat rates for the Fifth at the 3:2 level for a piano with a 6.0 cent Stretch Number. The "wrong" curve is for the same piano tuned to a 4.0 cent Stretch Number. As compared to the smoothness of the curve with correct tuning, notice the "jump" up in beat rate between notes A#3 (38) and B3 (39), down between notes F4 (45) and F#4 (46), up between notes A#4 (50) and B4 (51), and down between notes F5 (57) and F#5 (58).

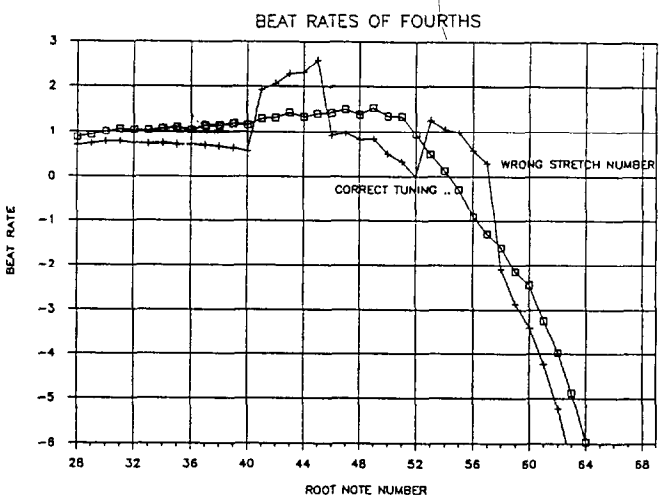


Fig. 10 shows beat rates for the Fourth at the 4:3 level for a piano with a 6.0 cent Stretch Number. The "wrong" curve is for the same piano tuned to a 4.0 cent Stretch Number. As compared to the smoothness of the curve with correct tuning, notice the "jump" up in beat rate between notes C4 (40) and C#4 (41), down between notes F4 (45) and F#4 (46), up between notes C5 (52) and C#5 (53), and down between notes F5 (57) and F#5 (58).

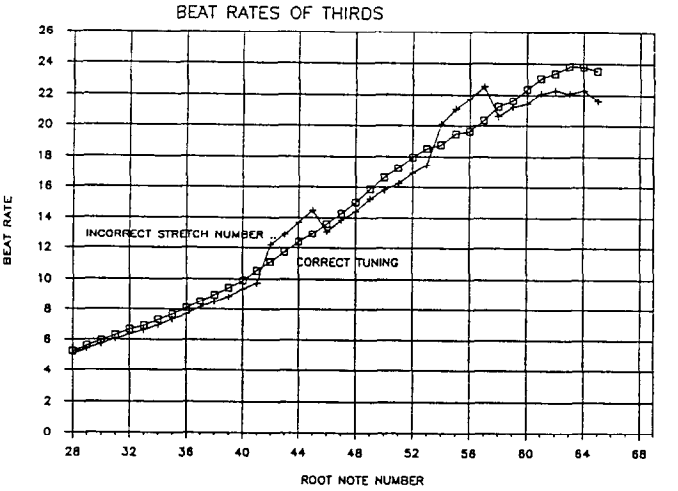


Fig. 11 shows beat rates of Major Thirds for a piano with a 6.0 cent Stretch Number. The "incorrect" curve is for the same piano tuned to a 4.0 cent Stretch Number. As compared to the smoothness of the curve with correct tuning, notice the "jump" up in beat rate between notes C#4 (41) and D4 (42), down between notes F4 (45) and F#4 (46). There are also jumps up between notes C#5 (53) and D5 (54), and down between notes F5 (57) and F#5 (58), although the beat speeds are so fast that these would be difficult to hear.

A Master Class In Temperament Tuning

The following is a reprint of the review of Bill Garlick's class entitled "A Master Class in Temperament Tuning" which appeared in the September 1988 *Journal*.

The final tuning class, "A Master Class in Temperament Tuning" taught by Bill Garlick, is one which I have attended on several occassions. It was a three hour class which was offered twice during the convention. It was mentioned in the class that all fixed pitched instruments require some satisfactory compromise of what is known as Just Intonation. This requires that intervals be mis-tuned from Just or Perfect. The act of tuning an interval "imperfect" or "unjust" is known as tempering, and we call the result *temperament*. It was stated that the combination of choices for tempering are overwhelming, and that for this reason, this class would limit itself to information which illustrates what must be heard to achieve the compromise of Equal Temperament on the modern piano.

In equal temperament on the modern piano, there is not one interval which is tuned just or perfect. All intervals are tuned wider or narrower than just and will produce beats. The wide intervals are: Major 3rds, Major 6ths, 4ths, Octaves, Major 10ths, Major 17ths, and Major 24ths. The narrow intervals are: minor 3rds, and 5ths.

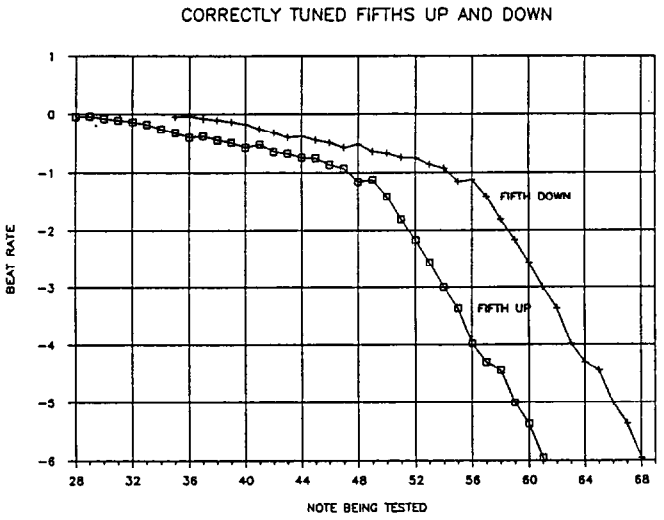


Fig. 12 shows beat rates of contiguous Fifths on a correctly tuned piano with a 6.0 cent Stretch Number. The note number is that of the shared note. Fifths in the temperament are very slow, but become very narrow at some point in octave 5.

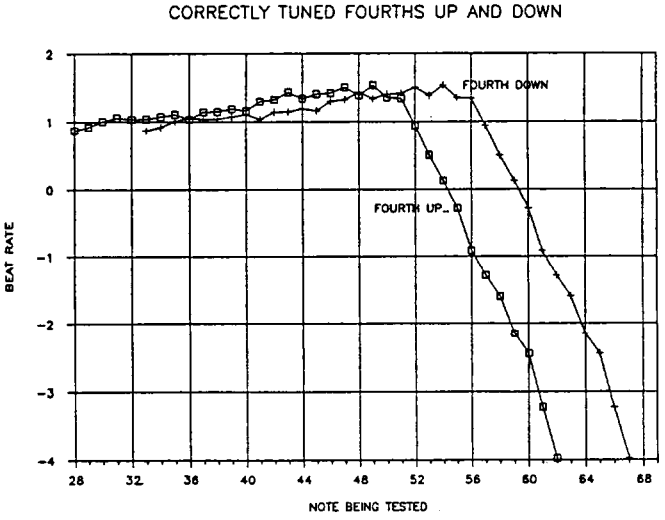


Fig. 13 shows beat rates of contigous Fourths on a correctly tuned piano with a 6.0 cent Stretch Number. Fourths are all beating at about the same speed over the temperament region. However, the Fourths do become

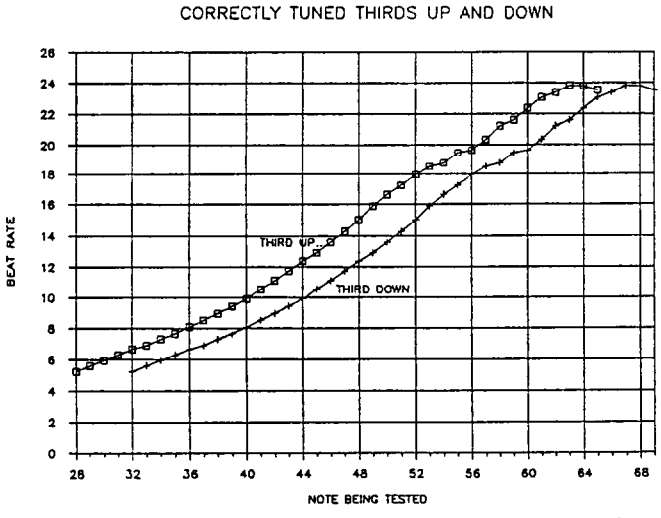


Fig. 14 shows beat rates of contiguous Major 3rds on a correctly tuned piano with a 6.0 cent Stretch Number. The third down retains a constant ratio of 4:5 with respect to the third up over the whole temperament region. Notice that for note C4 (40), the third down beats at 8 BPS, and the third up beats at 10 BPS, which is in the ratio of 4:5.

Bill made the point that to take a single interval and temper it by listening to the resulting beat is not accurate enough. It is necessary to test each note of an interval to a third note, which we call the test note. This creates three intervals, one actually being tuned, and two others whose beats we compare to determine the accuracy of the interval we are tuning. As examples of interval tests, the M3-M10, 4th-5th, and m3-M6 tests were presented as suitable octave tests in the temperament section. In all cases, the beats will be similar for the various tests. The M3-M6 test was presented as a test

Continued on next page

Chart 1: Stretch Values For 1/4 BPS 4:2 Type Octaves

Stretch Number			3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0
Note Played	Oct.	Part. Set	No.	Cents Deviation							
F6	6	1	3.4	3.9	4.3	4.7	5.2	5.6	6.0	6.5	6.9
E6	6	1	3.1	3.5	3.9	4.3	4.7	5.1	5.5	5.9	6.3
D#6	6	1	2.8	3.2	3.6	3.9	4.3	4.6	5.0	5.4	5.7
D6	6	1	2.6	2.9	3.3	3.6	3.9	4.3	4.6	4.9	5.2
C#6	6	1	2.4	2.7	3.0	3.3	3.6	3.9	4.2	4.5	4.8
C6	6	1	2.1	2.4	2.7	2.9	3.2	3.5	3.7	4.0	4.3
B5	5	1	1.9	2.2	2.4	2.7	2.9	3.1	3.4	3.6	3.9
A#5	5	1	1.7	2.0	2.2	2.4	2.6	2.8	3.1	3.3	3.5
A5	5	1	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2
G#5	5	1	1.4	1.6	1.8	2.0	2.2	2.4	2.5	2.7	2.9
G5	5	1	1.3	1.4	1.6	1.8	1.9	2.1	2.3	2.5	2.6
F#5	5	1	1.1	1.2	1.4	1.6	1.7	1.9	2.0	2.2	2.3
F5	6	2	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.4	6.9
E5	6	2	2.8	3.2	3.7	4.1	4.6	5.0	5.4	5.9	6.3
D#5	6	2	2.4	2.8	3.2	3.6	4.0	4.4	4.8	5.2	5.6
D5	6	2	2.2	2.5	2.9	3.3	3.6	4.0	4.3	4.7	5.0
C#5	6	2	1.9	2.2	2.5	2.9	3.2	3.5	3.8	4.1	4.5
C5	6	2	1.6	1.9	2.2	2.5	2.7	3.0	3.3	3.6	3.9
B4	5	2	1.3	1.6	1.8	2.1	2.3	2.5	2.8	3.0	3.3
A#4	5	2	1.1	1.3	1.5	1.7	1.9	2.1	2.3	2.5	2.7
A4	5	2	0.8	1.0	1.2	1.3	1.5	1.7	1.8	2.0	2.2
G#4	5	2	0.6	0.8	0.9	1.1	1.2	1.4	1.5	1.7	1.8
G4	5	2	0.4	0.5	0.6	0.7	0.9	1.0	1.1	1.2	1.3
F#4	5	2	0.2	0.3	0.4	0.5	0.5	0.6	0.7	0.8	0.9
F4	6	4	2.9	3.5	4.1	4.6	5.2	5.8	6.3	6.9	7.4
E4	6	4	2.6	3.1	3.6	4.1	4.6	5.1	5.6	6.1	6.7
D#4	6	4	2.2	2.6	3.1	3.5	4.0	4.4	4.8	5.3	5.7
D4	6	4	1.8	2.2	2.6	3.0	3.4	3.8	4.2	4.6	5.0
C#4	6	4	1.5	1.9	2.2	2.6	2.9	3.2	3.6	3.9	4.3
C4	6	4	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6
B3	5	4	0.9	1.2	1.4	1.7	1.9	2.2	2.5	2.7	3.0
A#3	5	4	0.6	0.8	1.0	1.2	1.4	1.7	1.9	2.1	2.3
A3	5	4	0.3	0.5	0.7	0.8	1.0	1.2	1.3	1.5	1.7
G#3	5	4	0.1	0.2	0.4	0.5	0.6	0.8	0.9	1.1	1.2
G3	5	4	-0.2	-0.1	0.0	0.1	0.2	0.3	0.4	0.5	0.6
F#3	5	4	-0.5	-0.4	-0.4	-0.3	-0.3	-0.2	-0.1	-0.1	0.0
F3	5	4	-0.8	-0.8	-0.8	-0.7	-0.7	-0.7	-0.6	-0.6	-0.6
E3	5	4	-1.1	-1.1	-1.1	-1.1	-1.2	-1.2	-1.2	-1.2	-1.2
D#3	5	4	-1.4	-1.4	-1.5	-1.5	-1.5	-1.6	-1.6	-1.7	-1.7
D3	5	4	-1.6	-1.7	-1.8	-1.9	-2.0	-2.0	-2.1	-2.2	-2.3
C#3	5	4	-1.9	-2.0	-2.1	-2.2	-2.3	-2.4	-2.5	-2.6	-2.7
C3	5	4	-2.1	-2.2	-2.4	-2.5	-2.6	-2.7	-2.9	-3.0	-3.1

for the wide 4th, and the m3-M3 test was presented as a test for the narrow 5th. In both cases the difference between the beat rates should be about one beat per second, the Major Third slower in both cases.

As other comparative tests, the inside M3-outside M6 (G3-B3, F3-D4) test was said to be similar beating, contiguous Major 3rds (C3-E3, E3-G#3) vary in speed by approximately 2 bps, and minor 3rds beat similarly to Major 3rds a whole step above the upper note of the minor third (F3-G#3, A#3-D4).

The point was made that as more and more intervals become present for comparison, the whole arrangement of intervals fits together like a jigsaw puzzle. Understanding these basic principles, however, prevents the whole process from being itself a puzzle.

The Comma of Pythagoras was explained. This comma is the difference in pitch between the tuning of seven pure octaves and twelve pure fifths. By transposing some of the fifths downward into fourths, creating a circle of fifths, this comma can be demonstrated within the scope of one octave. The procedure would be as follows:

1. Tune C4 to fork
2. Tune C3 to C4 (Octave)
3. Tune G3 to C3 (Fifth, pure)
4. Tune D3 to G3 (Fourth, pure)
5. Tune A3 to D3 (Fifth, pure)
6. Tune E3 to A3 (Fourth, pure)
7. Tune B3 to E3 (Fifth, pure)
8. Tune F#3 to B3 (Fourth, pure)
9. Tune C#3 to F#3 (Fourth, pure)
10. Tune G#3 to C#3 (Fifth, pure)
11. Tune D#3 to G#3 (Fourth, pure)
12. Tune A#3 to D#3 (Fifth, pure)
13. Tune F3 to A#3 (Fourth, pure)
14. Tune C4 to F3 (Fifth, pure)

As you may have noticed, C4 has been tuned twice. Use a different string of the unison each time. The difference between the the two unisons of C4 is the comma. Getting rid of this comma was the reason for tempering these intervals.

The next portion of the class is very interesting, as it never happens the same twice. With the above background laid, members of the class are asked to participate by tuning a note in the temperament. (Reference was made to this class in the June '88 *Journal*). This whole process defies a given system for the tuning of equal temperament, as you have no idea what the person before you will have tuned, or from what note, etc. It is interesting that in all the classes which I have attended, a suitable temperament was achieved by the end of the class. This leads me to the conclusion that it does not matter how one gets there, so long as he winds up in the correct place. The class participation is a very interesting aspect of this class. It demonstrates that there are lots of ways to accomplish something when the end goal is clearly defined.

This year, Bill spent the beginning of the class setting forth the purpose of the class, some basic ground rules and definitions. He stated that, "The purpose of the class is to help you do a better job, not to teach you to tune a new temperament. How to get to the end result is the purpose of the class." He also stated that unison tuning, not temperament tuning, is what is hard to do. Even with an unequal temperament.

There was a discussion of which tuning fork to use, the "A" fork or the "C" fork. Bill recommended the "A" fork for ensemble work, but stated that for most work, the "C" fork is adequate. Most historical temperaments were said to have started from C. For the actual class, notes "A" and "C" were both set from the "fork," the Sanderson Accu-Fork, to prove this point. The aluminum forks were discouraged, because the pitch varies so greatly with temperature. The steel fork or Accu-Fork (no longer available) were recommended.

There was not much talk about beat rates. A few, however, were given as starting points. They included:

F3-A3 Major 3rd ≈ 7 BPS
C4-E4 Major 3rd ≈ 10.5 BPS
F3-D4 Major 6th ≈ 8 BPS
A3-C4 minor 3rd ≈ 11.5 BPS

A test note was said to be a reference note against which you compare two other notes. In reference to octave tests, Bill stated that each test gives a different type of octave, and that we must decide which type sounds best for that area of the piano. Since there are several "types" of octaves, there are no so-called "perfect" octaves on the piano.

There was a brief discussion of the history of Equal Temperament. After explaining the Comma of Pythagoras, he stated that equal temperament spread the comma into 12 equal parts, and that each 5th is narrowed by 1/12 Comma of Pythagoras. In Equal Temperament, each half step is in the ratio of the twelfth root of two to one, and because of this, all of the intervals will progress in increasing beat speeds, gradually and evenly. Bill stated that although equal temperament had been known for quite some time, it was not until the Broadwood Piano Company of England mandated in the 1840s that Equal Temperament was to be tuned, that this temperament became the standard.

Tuning The Historical Temperaments By Ear

The following is a review of Owen Jorgensen's class titled "Tuning the Historical Temperaments by Ear." The review is by Kathy Teetsell, RTT, of the Los Angeles Chapter.

Owen Jorgensen, author of the comprehensive reference book, "Tuning the Historical Temperaments by Ear," came to us from Michigan State University's School of Music. The three-hour class he taught in Portland was offered twice, and it had the same title as his book. Concerning Owen's book, by the way, many people have experienced frustration in trying to get a copy, which has been out of print for some years. Owen announced that his new book is nearly ready for publishing. It has so much new information that it definitely should be considered a whole new book, not just a revision of the older one. We should see announcements here in the *Journal* when it becomes available.

Owen's class in Portland "played to a full house" in both sessions. The class could be appreciated on two levels, both of which were fascinating. First, on a technical "nuts and bolts" level, we learned many details of the tunings and temperaments, the order of their popularity, and how to tune several of them

quickly and practically—pencils around the room were scratching like crazy. And second, on a broader scale, many people heard for the first time about historical trends and events that still affect what we do in our work today, and about the changes of theory and practice that swept across various countries. We also heard something of the inextricable tanglings of church, state and art and their effects on tuning, and the reactions of composers (and their works) to various temperaments that rose and declined in popularity. Since many of the technical details can be found in Owen's books and elsewhere, my particular fascination in this class was in letting the underlying larger concepts slowly sink in. The vast background of Owen's technical and historical knowledge has let him sift out these ideas for us from the broad perspective, and it was a rare treat to hear it all put together in the contexts of history and the art of music. Since that is my bias, trying to see the "broad strokes" of the painting, I prefer to use this space to try to review some of those ideas. More nitty-gritty details of temperaments and tunings may be more immediately useful and practical, but they can be found elsewhere.

Many people have taken a little time to play with some temperaments, perhaps following some directions, putting a meantone or some other tuning on a piano to see what it sounds like. The reaction to very wide Pythagorean thirds or fast-beating fifths is often, "Boy, am I glad somebody finally invented equal temperament!" We need to remember many things when considering the history of our profession. They did know equal temperament, many centuries before it became popularly used, and they rejected it for various reasons. Sometimes those reasons were literally tied in with church and state doctrines, such as an overwhelming desire for perfect fifths and fourths for a long period of history. One of the measures of a composer's craftsmanship was how he could work with (or around) awkward intervals—"volume, velocity, or virtuosity," it has been said.

The instruments being used in those days were vastly different—a modern grand piano, heavily framed and scaled, probably would have been treated very differently. The small instruments had light frames and low-tension scales, and the sounds they produced were muffled and quiet compared to what we're used to. Owen stepped to a historical grand that was in the classroom and played a few chords. It was instantly apparent that the faster-beating intervals we object to on today's instruments were not only bearable, they may have been downright necessary for the instrument's sound to have any brilliance and "carry" at all.

Another concept to remember in its context is that there were no professional (piano) tuners then. Temperaments and tunings based on pure intervals or a few equal-beating relationships were simple enough that most composers and musicians were tuning their own. They would have been forced to, anyway, by economics, since all of their light instruments (harpsichords, clavichords, and so on) went out of tune every few days. Owen read examples of tuning instructions, such as one meantone published in 1809. It included phrases like "a fine third, but as sharp as the ear can well bear..." As temperaments progressed, changing and being urged on by active and vocal theoreticians of the day, they got more difficult to tune.

Simultaneously, the instruments themselves were developing as inventors searched for more volume and tone. Heavier frames and high-tension scales began to produce the desired volume and sustain, but they were getting trickier to tune. It became harder to turn the tuning pins and harder to settle the strings so an instrument would stay in tune. (Recognize this yet?) Well-tempered and equal-tempered sounds became more accepted and popular, and composers began to use them despite the fact that they were difficult to tune themselves. *Voila, a* new profession was born—the professional piano tuner.

Another concept that we should remember when we think of our history is that a huge percentage of the repertoire often played today was written in the days before the common use of equal temperament. Owen quoted examples from different composers which showed how a choice of artistic judgement was very likely guided by the key colors then. Think of all the music of Bach, Mozart, Chopin, Beethoven, and dozens of others which dominate many recital programs today. People still talk of the emotions of various keys—like $E^{\flat}$ minor having "despair, tragedy and anxiety," or D major being "joyful, magnificent, and triumphant," and so on. In equal temperament those emotions are no longer literally true. But in artistic use, as the music is played, those key colors can still be heard because they were written forever into the music itself. Some artistic choices depended on several factors influencing the composer. For example Owen pointed out that if you look at Chopin's works as a whole, he avoided the key of C major "like the plague itself" because it was so slow-beating on his particular pianos that it seemed lifeless. He often sought the helpful brilliance of some faster-beating keys. On the other hand, Bach tended to avoid the keys of $C^{\sharp}$ and Eb minor on his harpsichord. His "Well-Tempered Clavier", then, was a work that showed off his craftsmanship in using all the keys, including the "worse" ones where certain intervals had to be disguised or avoided. One might wonder what music these giants would write today on a modern concert grand. Would Beethoven still write so many triple-fortes? Would Bach use quite so many trills and ornaments in certain keys? The possibilities are fascinating speculations.

Sometimes it is refreshing to stop and think a minute, to take stock of what it is we do and why we do it that way. Seeing ourselves in the perspectives of history is one way to find new understanding, and Owen's class was a good look into our past.

My thanks to Kathy Teetsell for her help in reviewing this class.

In closing, I would like to share notes from Jim Coleman's class, which was titled "Preparing for the PTG Tuning Exam." The notes are titled "A Brief History of the PTG Tuning Test" and contained information which I found most interesting. Jim's story follows on the next page.

During the first year of Don Morton's last term as President of PTG, he appointed Dr. Sanderson and myself to serve on a blue ribbon committee to try to develop a new tuning testing program which would be a little more objective, i.e., less subjective to the whims of the examiner or the reputation of the examinee. We each started working on this independently.

I began developing criteria for scoring the temperament area where points were accumulated at any point where there was a reversal in beat rates as one played ascending intervals of each kind. In my preliminary tests in Arizona, I discovered that examiners would not hear things the same way, because they may be listening to different coincident partials. At any rate, I did come up with a way to score based solely on aural principles.

Dr. Sanderson's approach was different in that it used an electronic measuring device to show how close or how far away an examinee's tuning was from an agreed-upon previous master tuning. In our first meetings together, both systems were used. We were amazed at how close our final scores were when utilizing the aural scoring method and the electronic scoring method.

Don Morton was one of the first to take the temperament test in Cincinnati, in 1978. Don is an excellent tuner, so we only gave him a couple of minutes to set a temperament in order to insure that we would have some errors to score. He did not disappoint us. Here again, before a class of volunteers, it was shown that our two systems gave quite similar results. By this time, I began to feel that Dr. Sanderson's system was simpler to use, and was less likely to introduce subjective judgements.

Extensive tests were given all over the country, including places like Los Angeles, Dallas, Michigan, Chicago, Salt Lake City, Denison, San Francisco, San Jose, and in many places in the Eastern seaboard area, where Dr, Sanderson and I were refining the system. After about 300 tests on volunteers were given, we had a fair idea what the level of our present Craftsman members was. We set our scoring and tolerance system so that 80 percent of our present members would pass at an 80 percent grade. Our intention was that in the future, the test scoring would become more strict as we raised our standards. It was Don Morton's dream that the testing of piano technicians would someday be similar to taking a Bar Exam in the legal profession, or taking the test for becoming a CPA. He envisioned a time when we would have regional testing centers that would be booked-up well in advance, and aspiring young technicians would be eager and willing to pay a high fee for the privilege of taking the exam. Well, today we have a good start toward the realization of his dream. We hope that soon an RTT will be looked upon with the same degree of respect which is accorded those in the accounting profession.

Just before the new Tuning Test became official, we realized that there was a hesitancy on the part of some strictly-aural tuners to be judged by a machine. They also felt that if a person could not tune to some degree aurally, he really should not be in the same class with a good aural tuner. We struck a deal! We showed that aural tuners were not being scored according to a machine tuning, but to an aural tuning which was recorded on a machine. Then, when we required one who tunes with a machine to at least demonstrate a certain degree of proficiency by tuning strictly aurally, most resistance was gone.

Many aural self-testing techniques were learned by the early examiners and examinees. One of the most useful tests was the contiguous interval tests. We learned which areas of the piano were best for using the M3-M10, M10-M17, or m3-M6 tests for octaves. We discovered a certain amount of concensus as to the degree of stretching preferred by the better tuners. We allowed more tolerance in the lower bass and upper treble where there was less unanimity of thought or practice.

Since the acceptance of the new tuning test as the only official test at the council meeting of PTG in 1980, most effort has been put forth in the area of simplifying the administration of the test, developing a trained core of certified examiners, and upgrading the system with minor changes in tolerances and scoring methods.

It is obvious to me that the development of this tuning exam has had the side effect raising the level of awareness and understanding of the art and science we are engaged in. In keeping with this, I am pleased to announce a series to be authored by Michael Travis. His subject will be preparing for the tuning exam, and the series will describe each portion of the exam in detail, and suggest techniques and methods that a prospective examinee might practice in order to pass the exam. I am sure we will learn a lot about tuning in the process.

Until next month, please send your letters, questions and comments to:

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Introduction Of Equal Temperament; Acoustics Of Galileo

Jack Greenfield
Chicago Chapter

Lutes Tuned In Equal Temperament First

The mathematics of equal temperament became a subject of scientific interest in Europe after its general adoption for tuning the six-string lute. During the years from about 1550 to 1650, the lute was widely used as an alternative to keyboard instruments, especially in France. The six-string lute was usually tuned with the open strings spaced in major fourths except for a major third between the middle strings, for example: G_2, C_3, F_3, A_3, D_4, G_4. Since just major fourths are 498 cents wide and major thirds are 386 cents wide, it was necessary to widen either or both the third and the fourths. Another variable that made tuning a complex operation was adjustment of placement of the 12 movable frets that divided the octave.

A difficulty of any meantone, pythagorean, and other Renaissance keyboard tuning system applied to the lute was that unisons and octaves produced on different strings did not match. Early during the 16th century, musicians performing on fretted instruments found that more satisfactory intonation could be obtained by placing the frets so that the ratio of string lengths of neighboring chromatic notes was equal for the entire octave. In a study published in 1577, in discussing application of this principle for frets on viols, Francisco Salinas gave the first precise definition of equal temperament, "the octave must be divided into 12 parts equally proportional, which 12 will be equal semitones."

Methods Of Lute Octave Division

The theoretical division of a vibrating musical string length into 12 segments which decrease in length at a constant proportionate rate was difficult to solve by late 16th century mathematics. Salinas gave a procedure for drawing a series of lines representing string segments by a geometrical method that required the use of an ancient mechanical drawing aid known as the *mesolabe*.

Four years later, in 1581, Vincenzio Galilei, who had a background of experience as a skilled musician as well as a knowledge of theory, discussed a more practical system for tuning fretted instruments in his book *Dialogo della musica antica e moderna*. Galilei specified the simple ratio 18:17. Beginning with an open string, each fret was placed so as to shorten the speaking length of the proceeding chromatic note by 1/18. Such a mathematical division leaves the speaking length of the 12th note at 50.363 percent of the length of the open string for an octave ratio 1.986:1 instead of the traditional 2:1 just division. The theoretical cents value of Galilei's 18:17 semitone is 99, adding up to octaves 12 cents flat. Galilei did not believe the octave discrepancy to be objectionable from a practical standpoint. This is evident from the wide use of the 18:17 semitone ratio for fretting by performing musicians. In a recent study on historical tuning, Lindley points out that the slightly reduced octave string length ratio compensates for the increased tension caused by pressing the string to the fret and by the inharmonic timbre which tend to raise the pitch.

Galilei's disregard for the 2:1 octave ratio aroused considerable criticism from conservative theorists, especially from his former teacher and bitter opponent Gioseffo Zarlino. In 1588, in his book *Sopplementi Musicali*, Zarlino offered his opinions on Galilei's ideas and presented three more new geometrical methods for laying out string divisions on fretted instruments. Other scholars also interested in the mathematical challenge took up the study and began to offer their methods, geometrical as well as numerical, for placement of frets or for determination of monochord divisions.

Stevin Proposes The 12th Root Of Two

The first European scholar to use the 12th root of two as a semitone factor for equal temperament was Simon Stevin. Stevin, an eminent mathematician and physicist of the Low Countries, also had a background of army and civil engineering and business finance. He now is best known for his influence in the universal adoption of the system of decimal fractions. Although some forms of the decimal system were known previously, they were used in few mathematical computations. Most calculations were carried on in common fractions or to a lesser extent in sexagesimal fractions as applied to measuring time or angles. In 1595, Stevin published a book *De thiende* ("The Tenth") in Flemish, *La disme* in French, explaining the decimal system and giving practical details. Stevin's recommendations were quickly adopted with few changes other than improvement of his symbolism.

Stevin's study of the theory of musical tuning appeared in his book *Van de Spiegeling der Singconst* written in about 1596 but not published until 1884. Stevin's figures for equal temperament were expressed in terms of monochord string lengths decreasing proportionately by the factor 12th root of two. Since a mathematical process for extracting

the 12th root had not yet been developed, Stevin derived his figures indirectly in several steps involving extraction of cubic and fourth roots and proportions. He used two slightly different procedures arriving at results with maximum errors equivalent to 0.4 cents and 1.0 cents as calculated by Barbour. More precise determination of monochord divisions for equal temperament with the 12th root of two by use of logarithms were shown in a book published in 1630 by Johannis Faulhaber, an engineer. This calculation was given as a sample problem illustrating the system of logarithms introduced in 1614 by John Napier. Theorists did not consider Stevin's factor and Faulhaber's figures as the definitve answer to the problem of dividing the octave into equal semitones, and they continued to study other numerical, geometrical and aural methods.

Even though Stevin based his semitone factor on the pythagorean or just 2:1 octave ratio, he regarded just ratios as approximations. He believed that intervals with irrational ratios were just as "true." Modern studies have confirmed that ratios of many octaves, "true" by aural standards are not precisely the same but vary within narrow limits. Semitone ratios vary proportionately. An example of the differences in octave ratios second semitone factors for Galilei's 18:17 lute fretting and for the octave partials of middle C in a finely tuned modern grand piano are shown in the table.

The New Grove Dictionary of Music and Musicians' (1980) definition by Lindley states: "A tuning of the scale based on 12 identical fifths and with the octave divided into 12 equal semitones." This definition applies regardless of variations in octave ratios and semitone factors and does not exclude division of the octave by aural fine tuning.

Mersenne Recommends Equal Temperament For Keyboard

There is evidence indicating equal temperament in rather vague tuning instructions and musical compositions for keyboard written during the 16th century when some form of meantone was normally used. During the 17th century, Marin Mersenne's *Harmonie universelle* published in 1636 helped popularize keyboard equal temperament. This book, one of the most important references on Renaissance and early Baroque tuning contains information on just intonation, meantone and equal temperaments, a review of work of others as well as his own studies. While he considered meantone proper for contemporary music, he urged adoption of equal temperament as a practical necessity, especially for groups of instruments played together. In his instructions for keyboard tuning, he was the first writer to discuss tuning in equal temperament by counting the beat rates of tempered fifths.

Galileo And The Physics Of Music

Although more limited in scope than the range of topics in music covered by Mersenne, Galileo Galilei's (1564-1642) studies on musical tones were no less important in establishing the science of acoustics. Mersenne was a scholar who specialized in study of the production of musical sounds, Galileo was a mathematician, physicist, and astronomer who regarded musical tones one of the many physical phenomena he investigated.

Galileo was born in Pisa, entered the University there in 1581 to study medicine but changed to mathematics. In 1585 he left and then spent four years at his parents' home in Florence while he continued to study the works of the ancient Greek scientists on his own. He began his career as Professor of Mathematics at the University of Pisa in 1589. Three years later he accepted an appointment at the University of Padua where he remained until 1610. At that time, famous as a result of his discoveries in physics and astronomy and his essays and books, he gave up teaching to devote full time to research for the rest of his life under the patronage of Cosimo II, Grand Duke of Tuscany in Florence.

Galileo established the modern scientific method of research by experiment, observations and quantitative description, halting the prevailing influence of the philosophical speculation of Aristotle and other ancient Greek scholars of science in Europe. He determined fundamental laws of mathematical relationships between variables that explain the action of many physical phenomena. He also invented and built many of the scientific instruments he needed for his research.

Galileo had a special interest in mechanics, falling bodies, acceleration and other forms of motion. In 1583, while still a student he became interested in the movement of pendulums after watching the swinging of a lamp at the cathedral in Pisa. By experimentation, Galileo showed that the motion of a pendulum was caused by the acceleration of gravity and not by the action of air as believed by contemporaries. He determined that the period or frequency of swings is independent of the mass or material of the bob and of the amplitude (if the arc is small). In modern physics, the swings of a pendulum are classed as "simple harmonic motion." Such vibrations can be traced as a sine curve by a pen attached to the bottom of a pendulum over a strip of paper moving at a right angle to the direction of the swings.

Having been taught how to play the lute and familiar with the research of his father, Vincenzio, on musical tones, Galileo included many experiments with string vibrations in his studies on motion. He did not write about this research until late in life, in his book *Discorsi intorno a due nuove scienze.* (*Dialogues Concerning Two New Sciences*). Fifteen pages on his work in musical acoustics contain the following observations:

1. He commented on the similarities between motion of pendulums and

Octave Ratios And Semitone Factors

Type of Octave	Octave Ratio	Semitone Factor**
Pythagorian	2:1	1.059463
2nd/1st partials*	2.00115:1	1.059514
4th/2nd partials	2.00420:1	1.059645
8th/4th partials	2.01684:1	1.060206
Galilei lute	1.98556:1	1.058824

*Frequencies (Hz) of C4 partials in an aurally fine-tuned grand piano (*Journal*, June 1978, p. 14)— First: 261.3, Second: 522.9, Fourth: 1048.0, Eighth: 2113.7

**Semitone factor= $\sqrt[12]{\text{Octave Ratio}}$

vibrating strings.

2. He restated the relations between frequency and the length, diameter and tension which were also given by Beneditti, Beeckman and Mersenne.

3. He pointed out the errors possible in the pythagorean doctrine of identifying intervals by ratio of string length alone. The pitches sounded would be altered by changes in tension or selection of strings of different diameters. The direct reason for the sound of an interval is "the number of vibrations of air waves that go to strike our eardrums."

4. He stated that the degree of consonance of the tones of an interval depends on the number of impacts from the higher tone that coincide with the impacts of the lower. "Agreeable consonances are pairs of tones which strike the ear with certain regularity."

5. He described several experiments to demonstrate his conclusions. In one made with "musical glasses" partially immersed in a large vessel of water, the 2:1 octave relationship was illustrated by the corresponding size of ripples on the water when the glasses were caused to vibrate and "sing." In a second experiment, by scraping an iron chisel over the surface of a brass plate with parallel fine streaks, he produced shrill sounds with a definite pitch. He found that pitch depended on speed of scraping or distance between streaks. A third demonstration was a visual analogy of consonance using a group of pendulums. When the lengths were in consonant ratios, the oscillations formed a pleasing pattern of motion. With pendulums hanging in irregular length ratios "the eye is confused by the disorderly succession of cross threads. In like manner the ear is pained by the irregular sequence of air waves."

6. He explained the principle of sympathetic resonance by an analogy with pendulum motion. The pendulum has a specific frequency that depends on its length. If small impulses of force are applied periodically at the specific or "resonant" frequency, oscillations of large amplitude can be built up.

Galileo's view and his blunt outspoken attacks on beliefs held by conservative scholars created enemies as well as admirers. In particular, the Church objected to his espousal of the theory that the sun was the center of the solar system contray to the orthodox belief that the earth was the center of the universe. In 1633, he was brought to trial for heresy and he was sentenced to house arrest. He completed his last book, *Dialogues Concerning Two New Sciences*, while confined to his villa near Florence. The manuscript was smuggled out of Italy and published in Leyden in 1638. He died in 1642. Fifty years after his death, the City of Florence erected a monument in his honor at the Church of Santa Croce where he was buried. ■

Selected References

D. Abbott, editor, *Physicists*. Peter Bedrick Books (1984). "Galileo."

J.M. Barbour. *Tuning and Temperament*. Da Capo Press (1972 reprint of 1951 Michigan State University Edition).

C.B. Boyer. *A History of Mathematics*. Princeton University Press (1985 Paperback printing).

Galileo Galilei. *Dialogue Concerning Two New Sciences*. Dover (paperback edition of translation by H. Crew and A. de Salvio).

F.V. Hunt. *Origins in Acoustics*. Yale University Press (1978).

M. Lindley. *Lutes, Viols and Temperaments*. Cambridge University Press (1984).

The Dictionary of Scientific Biography. Charles Scribners Sons (1970). "Stevin, Simon."

How Good Is Your Health Insurance?

Janet Leary
Economic Affairs Committee

A day in the hospital averages more than $640, not counting doctor bills. It is now commonplace for a suburban hospital to charge in excess of $400 a day for a semi-private hospital room. Every year one out of five families faces medical bills—beyond those covered by any insurance or program they are enrolled in exceeding five percent of their income.[1] As health insurance policy costs increase, like most other Americans you are probably either paying out substantially higher premiums, paring down the insurance coverage you receive, or losing some control over the care you receive.

There is no standard health policy.

The benefits offered vary from company to company requiring shopping to find the most cost effective plan considering your needs and the benefits offered. There are two kinds of health insurance: basic and major medical. Each is sold separately, or you can purchase a combination of the two which is called a comprehensive plan. As an example—Blue Cross is a basic plan while Blue Shield is a major medical plan. They can be bought separately or together in a comprehensive plan called Blue Cross/Blue Shield.

Basic Plans Usually Cover:[2]

- Hospital room and board for a set number of days—usually 120 to 365 days with your major medical kicking in to cover additional days. If you buy a comprehensive plan, look for 100 percent coverage of a semi-private room after deductibles are paid with a $1,000,000 lifetime ceiling.
- Normal nursing services.
- X-rays.
- Lab tests.
- Hospital miscellaneous.
- Drugs and medications.
- Simple surgical procedures.
- Doctor visits in hospital.
- Physician ordered diagnostic tests and procedures—in and out patient (i.e. CAT scans and EKG's).
- Anesthesia.
- Assistant surgeon.
- Emergency room medical charges for accident or injury.

Major Medical Extended Catastrophic Plans Usually Cover:[3]

- Surgical fees.
- Private duty nurses.
- Oxygen and blood services.
- Outpatient care.
- Office visits.
- Drugs and appliances (including diabetic supplies).
- Home health care.
- Consultations.
- Skilled nursing home care.
- Respiratory, physical, and speech therapy.
- Emergency room for illness.

How Can I Reduce The Cost Of My Health Insurance?

1. Increase your deductible. This requires that you set aside in a savings acount the difference to satisfy your increased deductible cost if it's substantial—this is called self-insuring.
2. Increase your co-insurance amount—for instance, from a 80/20 plan to a 70/30 plan. Co-insurance refers to the percentage of medical expense that the individual must pay, with the insurance company paying the rest. Generally plans are 80/20 with a $5,000 cap. This means that after you pay the deductible amount, your insurance company pays 80% of medical bills and you pay 20% up to $5,000—thereafter, the insurance company pays 100%. Some of the better plans have a cap of $4,000, and list your maximum cost per year at $1,000.
3. Enter into a cost containment plan whereby any non emergency surgery must be approved—in procedure and cost—by the insurance company before the physician can proceed with the surgery. Many of these plans also demand second opinions on elective surgeries, and may actually stipulate the recommended length of stay in the hospital after surgery. These cost containment plans also favor use of out-patient facilities for many procedures.
4. Exclusion of maternity benefits. Childbirth costs are averaging about $4,300 per birth. One out of four women of childbearing age do not have maternity coverage. While many plans may cover birth expenses, half the plans in the U.S. today do not cover routine medical care for newborns in the hospital. If no pregnancies are planned in the future, eliminate this in your plan. Don't pay for coverage you won't use.
5. No dental coverage.
6. Limited or generic prescription coverage.
7. Limited mental/alcohol and drug treatment health care benefits. This is an area that many policies either exclude or limit.
8. Purchase an HMO plan. Health Maintenance Organizations or HMOs are organized around a group of physicians who together offer comprehensive health care for their patients. The problem with HMOs is that you have no choice of a hospital or physician.

The Self-Employed And Health Insurance:

The self-employed person looking for coverage often does not have the luxury of joining a group plan. He or she also doesn't have an employer helping to foot part of the bill. To make matters

worse, an unincorporated business or an S corporation is not allowed fringe benefits such as 100 percent deductibility of hospitilization and group term insurance as business deductions. This results in a higher federal and social security tax. These same benefits, however, when given to employees, are exempt from the employee's income. In this case, the intent of Congress is obviously to deny owners of businesses the same tax benefits their employees and corporations enjoy.

When you are on your own as a self-employed individual, your premiums are generally higher than your corporate counterparts, the policy you buy may require you to take a physical exam, and preexisting conditions such as respirtory problems, cancer, diabetes, cardiac or coronary artery disease may make you uninsurable. At this point in time, an increasing number of carriers require an AIDS test or blood samples sent overnight to their labs for additional testing. With genetic markers for specific diseases being discovered, and the inaccuracy of lab testing in general, I would be extremely cautious of this sort of insurance investigative work. A physical performed by your personal internist may be an alternative. It's definitely more controllable.

Group Plans:

Group plans are usually less expensive than buying an individual plan. Be careful; some plans I have seen exclude benefits and cancel your policy if you are unable to work at least 30 hours a week after a specified period of time such as 90 or 180 days. This is a grave problem. If your illness or disability is extensive and you cannot work, you may need to look for another plan in a state of uninsurability.

What Should I Look For In A Health Insurance Plan?

1. A maximum pay-out of at least $1,000,000 over the life of the plan per family member. Some plans have a yearly cap of $250,000. If you are in a serious physical situation, $250,000 may easily be insufficient. At present the typical plan caps out at $1,000,000 while some providers are offering a life-time cap of $2,000,000.
2. $1,000 limit on out-of-pocket costs per year per family member after the deductible is met. Look for this clause in your policy—it's the "stop loss benefit." A good plan will limit the stop loss to $3,000 for the entire family.

   Determine what co-insurance and deductible amount is right for you. Many plans have deductibles ranging from $150 to $1,000. The deductible is the initial amount of expenses an individual must pay before his or her insurance carrier starts paying benefits. The deductibles may need to be satisfied for each family member. What is preferable and typical in the better plans is first-dollar coverage for the remainder of the family after either two or three family members' deductible is met in a given year.

   Here's a typical scenario:
   $250 deductible on each family member with a 80/20 co-insurance amount capping out at $5,000, lifetime limit of $1,000,000. If someone is hospitalized in this family scenario they must first pay bills in the amount of the $250 deductible, then pay 20 percent of all costs up to $5,000—which is $1,000, at which time the plan begins paying 100 percent of all usual, customary and reasonable charges. Their total pay-out can be as little as $1,250. If, however, they did not inform their physicians that they nor their insurance provider will pay anything above what is UCR (usual, customary and reasonable), they may have added expenses. Health care providers do not ordinarily give you or your physicians a carte blanche on costs, but instead have schedules of costs that are typical for a particular physical problem in your locale. Check with your insurance company and physicians.
3. All the options covered under the basic and major medical plans listed above.
4. No calendar year maximums—they're inadequate.
5. When benefits are expressed in percentages—100 percent of covered services. If the plans pay a percentage below 100 percent, look for a stop-loss on your co-insurance of $1,000 per calendar year per family member with a maximum of $3,000 per family.
6. No per-day caps on intensive care units (ICUs) or coronary care units (CCUs).
7. No limits on miscellaneous hospital charges. This includes everything that is not room and board charges. Be sure this is included.
8. 100% of charges for room and board of a semi-private room. Accept no monetary limits on this feature.

Medicare:

Medicare, a federal health insurance program available to people who are 65 or over, and to some younger totally disabled people, does not cover all their medical expenses. It is not, and never was, designed to be a complete health insurance program. What do you do to fill in the gap? On the market are "Medigap" policies that are thought to perform this function.

The biggest problem with group policies is that they terminate at age 65. If you would like a plan to supplement Medicare when you become 65, you would then have to apply for another plan. The availability of automatic conversion is an important option. This conversion option is allowed without taking a medical exam—so it's an obviously important option. If you are presently covered in a group plan, look to see if your policy is convertible into a group Medigap type plan; if not, you'll have to buy an individual plan. If you are presently covered under an individual plan check to see if it's convertible at age 65. If you are a bad risk (and who isn't; we all die at some point in time) they will simply deny you coverage, so think ahead!

Many think that Medicare, particularly when supplemented with Medi-gap policies, will cover virtually all medical costs. This is an incorrect assumption. Medicare is designed to cover acute care such as hospitilization or outpatient treatment; it pays only two percent of the chronic or long-term care that nursing homes provide. Also, Medicare pays this nursing home care only when the care is necessary as an aid to the patient's recovery from an acute medical condition. Long term chronic care is not covered. Long term chronic care, however, is what bankrupts hundreds of thousands of Americans each year. Each year, half a million elderly people use up their life savings for nursing home care, and then revert to Medicaid. Whatever Medicaid will not cover must be shouldered by each individual. Conservatively speaking, with one year in a nursing home costing on an average

$20,000 to $40,000 a year and an overall average stay of 2.5 years, it's easy to see how this can be a severe financial problem. To further compound the issue, many states allow hospitals and nursing home facilities to attach your outstanding bill against the equity of your home. Imagine a scenario where the remaining spouse loses their home and life savings as a result of outstanding and extended nursing home bills accumulated by the now deceased spouse. This happens every day. Find out if your state laws allow this to happen.

As added protection, some health insurance companies offer policies that cover long-term care. These policies are marketed as comprehensive long-term health care policies. You must look for a policy that pays long-term nursing home care at all levels—skilled, intermediate, custodial; heavy, medium and light care; in a residential facility or as home care. Some policies have a catch that you must precede any coverage by a minimum three-day hospital stay. Since the most common need in care of the elderly is not for medical conditions that can be effectively treated in a hospital—an Alzheimer's patient, for instance, would have his/her care excluded by this provision. Some insurance companies waive the hospital stay requirement for a 20 percent increase in premium. Ask your agent to explain the policy you are looking into. Have your agent show you in the policy where it states the exclusions and conditions of long-term care.

Is Your Hospitalization Company Financially Sound?

Go to your local library and ask if they have A.M. Best & Co. Insurance Reports. Best rates companies as to their financial soundness, provides information on premiums, measures service and rates of customer complaints. The copy at my library was Best's Life Insurance Reports. It listed each company in alphabetical order, showed the portion of life insurance and health insurance in their portfolio expressed in dollar values. It listed the states the company is licensed to do business in, Best ratings for two previous years and their present rating, plus much more additional information. It did not, however, list premium amounts, service or customer complaints, so I'm assuming there are different editions of this text.

Ratings of A+ mean excellent or superior, while B is considered good. Any rating below B is very questionable. If your insurance company falls into this category it's time to start shopping for a new policy. Why? Companies that are consistently rating on the low side have a greater tendency to cancel groups, or even a whole state of policy holders if they have high "pay-outs" in the group. This puts you in a very uncomfortable position if your policy is all of a sudden cancelled. Besides, going through Best you'll see that there are numerous companies with A and A+ ratings.

Every state regulates the sale of insurance policies within their state. Three of the states with the most strict rules and procedures are California, Pennsylvania and New York. Of these three, New York has the strictest insurance laws. Just ask your insurance company if it is qualified to do business in the state of New York. many A and A+ rated companies are not licensed to do business in New York. They may be financially sound, but would prefer to avoid the inconveniences of New York's restrictions. Rather than flatly discounting the company if they are not licensed to do business in New York, expect the company to be at least A rated, and ask associates about their claim experience with the company. If the company doesn't retain an A rating, drop them and find a company that is licensed in New York.

Other sources of information are the Better Business Bureau, or your state insurance department. Your state may have a consumer division that handles insurance company complaints and conflict resolutions.

Shop around for your health insurance. This doesn't mean just price (as you already know from reading this article). The coverage and exclusions and limitations must fit your needs and your family situation. While you and your family are still healthy, switch companies until you've got the best policy possible. This may take several years. The reason I mention "while you're still healthy" is because as soon as you have any serious, potentially serious or long term condition, or any condition that alludes diagnosis, the insurance company will call your problem a "preexisting" condition. A preexisting condition is a health problem that existed prior to a person's becoming insured. Policies with pre-existing condition limitations will not pay benefits on these prior health problems for a specified period of time. Some may not cover the pre-existing for the first two years, others will completely deny you coverage on that condition for the life of the policy. If the latter happens, all the information on your condition (from physicians, neighbors, hospitals, etc.) gets fed into their database awaiting other insurance inquiries. Being turned down by one company simply makes it more difficult to become insured. So while you are "young and healthy" obtain a plan that is non-cancellable or guaranteed renewable.

What Can You Do If You Are Uninsurable?

Write or call your state or county department of insurance. In every state some government body regulates insurance companies. In the state of Ohio where I reside we have a last-ditch option: by Ohio law HMOs in the state must accept individuals with medical problems regardless of health status during one month each year. It isn't well publicized so you'll have to call your state or county department of insurance. I am not aware of rules in other states, so if any readers out there can pass on some additional information on this topic, drop me a line and I will pass it on to our readers in an upcoming article.

Health Insurance Strategy

Buy the most insurance you can get for the highest deductible. A few companies carry policies with deductibles of $15,000. These policies are inexpensive, but they shelter you only from catastrophic or costly expenses. An extremely high deductible should never be purchased unless you have a considerable amount of money set aside to immediately satisfy the deductible, disability, and some extra money just in case some of the medical expenses are not covered. This strategy is called self-insuring. Choose a deductible that is as high as possible leaving that deductible amount in your savings account. If you can't set aside the deductible—it's too high for you, so choose a lower deductible.

Estimates of 1988 health care costs for one worker was $2,544, up six percent from the previous year (says Hay/Huggins Co., an employee benefits consulting firm in Philadelphia). This average cost is a 182 percent increase from 1980, when the same family health policy cost $900. We are not out of the woods as of yet. Health care costs are

still increasing substantially more than inflation. Physicians, the insured, hospitals, insurance companies, etc. keep pointing to each other as the cause for increasing costs. In a situation like this you can't afford to overlook your health plan. If you have an excellent plan, is it competitive cost-wise with comparable plans? If your plan is inadequate in some areas, are you in a position to make a change? Do you even know what coverage you have? Review your plan every year and vigorously shop for a better plan while you are still young and healthy.

Footnotes:

1. *Changing Times,* May 1988, pg. 49.
2. *Insurance* by David W. Kennedy; 1987 HP Books; pg. 135.
3. Ibid; pg. 136.

References & Recommended Reading:

- *Changing Times,* May 1988, pg. 49; "Health Insurance—What You Need and What You Get" by Phillip Godwin & Suzan Richmond.
- *The Complete Guide to Health Insurance* by Hogue, Jensen & Urban. 1988, Walker & Co.
- *Your Medicare Handbook,* available from the Social Security office.
- *A Guide to Health Insurance for People with Medicare,* available from the Health Care Financing Administration.
- *HMOs* by Jill Bloom, 1987, The Body Press, a division of HP Books, Inc. Explanation of HMOs with an extended appendix of countless HMOs in each state.
- *Insurance* by David W. Kennedy; 1987 HP Books. An excellent book on all types of policies—health to homeowners.

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P.O. BOX 252
MONTAGUE, CA 96064

1989 President's Club members included, from left, Danny Boone, Ed Barber, Margie Williams and Larry Crabb

Coming Events

Sept. 9, 1989	**San Francisco Chapter One-Day Seminar** San Francisco State University Contact: Margie Williams (415)524-0390
Sept. 23-24, 1989	**Milwaukee Chapter Days** Howard Johnsons, 611 W. Wisconsin Avenue, Milwaukee, WI Contact: Rudolph Moroder, 3916 N. Frederick Ave., Shorewood, WI 53211 (414) 332-8474.
Oct. 1-3, 1989	**Florida State Conference & Seminar** Clarendon Plaza, 600 North Atlantic Ave., Daytona Beach, FL 32018 Contact: Walter Pearson, 1128 State Ave., Holly Hill, FL 32017-2728 (904)255-4804.
Oct. 6-8, 1989	**Ohio State Conference** Holiday Inn North, Dayton Contact: Francis Hollingsworth, 2271 E. Spring Valley Paintersville Rd., Xenia, OH 45385 (513)372-1981.
Oct. 13-15, 1989	**Texas State Association** Lubbock, TX Contact: Bob Johnson, 3224 92nd, Lubbock, TX 79423 (806)792-9712.
Oct. 20-22, 1989	**New York State Conference** Queensbury Hotel, Glens Falls, NY Contact: Robert Reeves, RD #1, Galway Rd., Ballston Spa, NY 12020 (518)885-5472.
Oct. 27-29, 1989	**North Carolina State Conference** Hyatt Winston-Salem Contact: John Foy, 195 Fayetteville St., Winston-Salem, NC 27107 (919)773-1754.
July 7-11, 1990	**33rd Annual PTG Convention & Technical Institute** Hyatt Regency Dallas at Reunion Contact:Piano Technicians Guild, Inc., 4510 Belleview, Suite 100, Kansas City, MO 64111 (816)753-7747.

The Auxiliary Exchange

President's Message

With the volume of compliments this writer received about our annual convention, we can only conclude that once again the Auxiliary racked up another successful event. The ambience of the Red Lion Inn was delightful, the food served was delicious and we have some really special members who are dedicated. They must be mentioned and thanked once again in these pages.

In alphabetical order, there's **Julie Berry** who as usual competently handled our final event, the Organizational Forum. It was **Ruby Discon** who offered, then followed through placing the flags and roses around all of the place settings at the Installation Luncheon. Now everyone knows the colors of the Oregon State flag. Were it not for **Wilda Fries** we would not have had the beautiful fashion show of Native Americans as our special program at the luncheon. This innovative program developed by Irene Cly of the Bureau of Indian Affairs is just 'getting off the ground' and we are proud to have played a small role in furthering an interest in the culture, customs and heritage of the American Indian.

Nita Kadwell spent over an hour instructing us about antique and art glass in addition to donating a cut-glass bowl which was raffled off and the proceeds donated to our Scholarships Fund. Everyone who had to wait in the hall for the doors to open for our luncheon enjoyed **Randy Potter's** prepandial offerings. It was **Jennifer Reiter** who ordered all the flags, their double holders, the red roses and all the royal-blue napkins. As the rose city of the West, we had to have Portland's roses. Our flags, too, were ordered months before President Bush told us to respect our flag!

Ginny Russell gave a fine business class. Her delivery was crisp, well-planned and of value to the spouse of the novice or seasoned technician. In her memorial presentation Phyllis Tremper selected appropriate scriptural texts, words to live by and to remember deceased members of the Auxiliary. Our scholarship winners Julian Chen and Su-yen Wong played valiantly at our Tea, despite piano-pedal problems. We've learned a lesson for the future: check out the piano in advance (by the artist) and where a problem exists, flag down any one of the 800 technicians in the hotel.

Agnes Huether

Convention Highlights: Above, a member of the Northwest Indian Tribes displays native American finery during a fashion show, part of the Auxiliary's Installation luncheon. During the luncheon, new board members assumed their new offices for the coming year. They are, from left, Agnes Huether, president; Arlene Paetow, vice president; Judy White, recording secretary; and Barbara Fandrich, treasurer. Not shown are Corresponding Secretary Marge Moonan and Immediate Past President Ginger Bryant. At right President Agnes Huether introduced the new board members during the convention closing luncheon.

Recently our Auxiliary president went on an important mission which stands to benefit us all. At first glance the trip Agnes Huether took to the Orient may not appear to be much more than a vacation she had topped off by a visit to Japan so husband Charlie could attend a convention of the International Association of Piano Builders and Technicians (IAPBT). That's the way it is with the Auxiliary—many of the things we do as an organization seem to be very casual on the surface, but they do have a significant impact on events.

Agnes was ambassador for all North American members of the Auxiliary. Her presence at the IAPBT convention represented in an official way the fact that we feel there is a place for spouses—most of whom are women—beside piano technicians. In North America couples share an interest in each other's professional pursuits.

Since many Piano Technicians Guild technicians are women and most PTG Auxiliary members are women, the presence of our PTGA president in the group helped to reinforce the idea that in our culture women and men work together and participate freely together in professional activities. (It should be noted that half of the current class of students at the Yamaha Piano Technical Academy are women!)

Wives of Japanese technicians served as hostesses on a great tour of Kyoto with lunch at a traditional inn. The hands of friendship extended across the ocean as Asians and North Americans sat together on tatami mats, giggling over the intricacies of balancing tofu on chopsticks and enjoying each other's company in spite of a language barrier.

Randy Potter offered strolling entertainment during the Auxiliary Installation Luncheon.

It was my privilege to participate also as a member of the Auxiliary and a spouse of the IAPBT conference. At one of the shrines we visited, a Japanese wife came and linked her arm in mine as we walked. No words were needed to express the feeling of friendship and hospitality which grew out of the IAPBT. convention. And there we were with our official PTGA president to represent us all.

A similar thing happens here at home. Even though some Auxiliary activities seem like frivolous ways to pass the time while technicians attend classes, most of us have used the Auxiliary and its activities as a way to get acquainted with other spouses of technicians. From the opportunity provided by the Auxiliary we have developed many friendships. Many of us would agree that some of our most valuable and enduring friendships have been made with people we met through the Auxiliary.

As a longstanding member and past president of the Auxiliary myself, I was proud to see Agnes Huether representing us all as a goodwill ambassador extending our joint hand of friendship to piano technicians and their families from Japan, Korea, and Taiwan. Thank you, Agnes, from all of us.

Julie Berry

A Very Happy Birthday

To at least 13 of our members who will be celebrating with another candle on their birthday cake we salute the following women. (Maybe this listing will be of some help to the Guild members who might just chance upon the Auxiliary Exchange page!)

Good wishes to Mary Lyons of Oklahoma, Sept. 1st; Betty Defebaugh of California, Sept. 4th; Cordelia Grijalva also of California, Sept. 6th; Ruth Juhn of New York, Sept. 13th; Virginia Sellers of Minnesota, Sept. 13th; Deanna Zeringue of Louisiana, Sept. 14th; Mabel Hiatt of Virginia, Sept. 17th; Doris Zimmerman of Illinois, Sept. 18th; Joann Biegler of California, Sept. 20th; Arlene Boyd of Louisiana, Sept. 21st; Helen Hollingsworth of Ohio, Sept. 24th; and Jane Baker of Texas, Sept. 28th.

When October gives a party and invites all the leaves to show their colors of red, green, gold and yellow the following will be celebrating the natal day. We send birthday greetings to: Charmaine Haas of Michigan, Oct. 5th; LaVeta Holmes McGary of Texas, Oct. 5th; Barbara Fandrich of Arkansas, Oct. 9th; Barbara Zeiner of Pennsylvania, Oct. 12th; Wintress Gentry of Louisiana, Oct. 13th; Delia Shull of California, Oct. 19th; Malinda Dobrins of New York, Oct. 24th and Barbara Yepson of Pennsylvania, Oct. 24th.

P.T.G. Auxiliary Executive Board

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Congratulations To Beverly Shaffer From The Piano Technicians Guild Foundation

Beverly, a Montgomery, AL, piano teacher, received a $500 Piano Technicians Guild Foundation scholarship for continuing education during the Music Teachers National Association Annual Convention in Wichita, KS, April 1-6. She will use the scholarship for advanced study with Steven Hall in Atlanta, GA.

A recipient of Bachelor and Master of Music degrees in Piano Performance from George Peabody College, Beverly is now adjunct faculty at Auburn University and Huntingdon College, and maintains a private studio in which she teaches both piano and Kindermusik. She is a nationally certified member of MTNA.

* * *

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Tech Gazette

Yamaha Piano Service September, 1989

Yamaha in the News

YAMAHA PIANOS SELECTED BY KAPELL COMPETITION FINALISTS

Haesun Paik, first prize winner with conductor Stanislaw Skrowaczewski.

All three finalists in this year's William Kapell International Piano Competition chose to play Yamaha concert grand pianos in the orchestra finals, held at the John F. Kennedy Center for the Performing Arts in Washington, D.C. on July 22.

The Kapell, renowned as one of the world's most prestigious competitions, this year drew one of the strongest field of competitors in its 19-year history. Thirty hopeful pianists, including previous winners of other top competitions, represented 20 nations. Each of three finalists selected to play a Yamaha CF III concert grand piano in the final round with the National Symphony Orchestra.

This underscores the growing acceptance of Yamaha pianos in the concert and artist field. The three semi-finalists in June's Van Cliburn Competition also selected to play Yamaha concert grand pianos. And the winner of that competition has

Sylviane Deferne, second place winner 1989 Kapell competition.

agreed to produce a disk of classical music for use with the Yamaha Disklavier™ piano. Availability of that disk will be announced soon.

MIDI Corner

DISKLAVIER™ PIANO MAKES A GRAND ENTRANCE IN FALL, 1989

This fall, the Yamaha Disklavier™ piano will be available in a grand version. First release of the Disklavier™ grand will be in three sizes: 5'3", 5'7" and 6'.

Just as with the upright version, the Disklavier™ grand begins with a traditional acoustic piano. A second piano function for studio-quality playback of recordings in true reproducer style is then added. A third function allows the Disklavier™ grand to accurately record anything played on the piano. And finally, the Disklavier™ piano's MIDI capabilities allow it to play outboard MIDI instruments in real time from the keyboard, or play-back up to 16 channels of music stored on 3.5" computer disks.

Multi-channel capabilities allow the Disklavier™ piano to add groups of other string Quartet or jazz group instruments, each playing its own part to traditional piano accompaniment. Connecting the MIDI "out" cable to additional or different tone generators produces a virtually limitless range of musical expression.

Yamaha Thanks the Guild

We at Yamaha offer a sincere thank you to everyone who made the PTG convention so successful and enjoyable. We deeply appreciate all the hard work of the guild officers, institute staff, and all the great people at the home office.

Thanks also to everyone who attended our classes and came to the Yamaha party. Special thanks to the extremely talented "A-440" combo who entertained us. We especially enjoyed the search for the bass player "hidden" behind the piano when, in fact, the bass sounds were created by using the MIDI "keyboard out" function and played on the Disklavier™ piano!

Yamaha will participate in:

Sept. 15-17:	Monterey Jazz Festival
Sept. 19-22:	Disklavier™ Piano Seminars
Oct. 24-27:	Disklavier™ Piano Seminars
Sept. 25-29:	Little Red Schoolhouse

PTG SEMINARS

Oct. 1-3:	Florida State
Oct. 13-15:	Texas State
Oct. 20-22:	New York State
Oct. 20-22:	North Carolina State

YAMAHA™

SEPT. **UPDATE** 1989

Published Monthly For Members Of The Piano Technicians Guild, Inc.

Council Approves New Pacific Northwest Region

Four new board members, including one who will represent an entirely new region, were elected during the first one-day Council meeting in recent years. The meeting, held during the Guild's recent convention in Portland, OR, was July 9.

After voting to establish a Pacific Northwest region consisting of Alaska, Alberta, British Columbia, Idaho, Montana, Oregon, Utah and Washington, delegates from the new region elected Seattle Chapter member Stephen H. Brady Regional Vice President.

Other new Regional Vice Presidents elected were: Don Valley, Southeast; Michael Drost, Central West; and Fern Henry, Western. President Ron Berry, Vice President Nolan Zeringue, Secretary-Treasurer Bob Smit, Northeast RVP Norman Heischober, South Central RVP Danny Boone, and Central East RVP Bruce Dornfeld were re-elected.

A total of 82 delegates representing 1,728 voting members, or 68% of the franchised membership, participated in the meeting. In other business, delegates voted to:

- Direct the president to appoint a special committee to study proposed establishment of a franchised non-tuning Registered Technician membership category.
- Approve changes to Bylaws IV.2, including a section encouraging RTTs to take the current set of RTT exams in order to facilitate statistical studies and refinement of exam procedures and scoring. Retaking the exams will not affect an RTT's membership status.
- Revise Bylaws V of the RTT exams, including changing section 3a to state: "A candidate who tuned initially using a visual tuning instrument must also retune octaves 3 and 4 aurally only

Continuing on next page

In Respectful Memory...

Raye A. McCall, RTT

Raye McCall, 61, passed away July 30 after a lengthy illness.

Raye, who joined the Pomona Valley Chapter as an RTT in 1967, had been active in the Guild throughout his career. With his wife Ruth, he operated McCall Piano Service, providing glues, epoxies, lubricants and his other inventions to technicians around the country. She will continue to operate the business.

In 1987, Raye took over the tutoring portion of the Guild Technical Institute and played

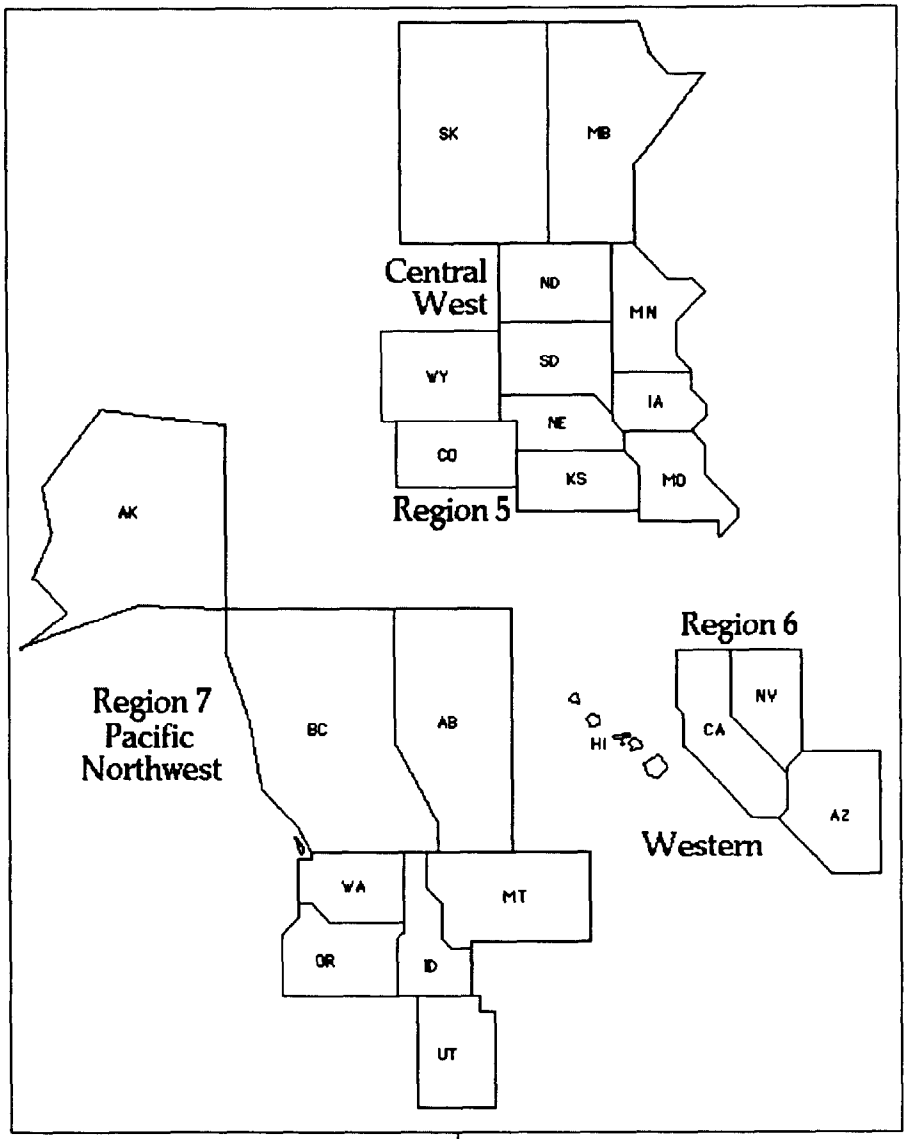
Continued on page 3

Board members elected during the recent Council meeting are, (back row from left) Norman Heischober, Northeast RVP; Michael Drost, Central West RVP; Stephen Brady, Pacific Northwest RVP; Donald Valley, Southeast RVP; (middle row) Bruce Dornfeld, Central East RVP; Fern Henry, Western RVP; Danny Boone, South Central RVP; (front row) Robert Smit, Secretary-Treasurer; Ronald Berry, President; and Nolan Zeringue, Vice President.

Council...

and score at least 80% in pitch, temperament, and mid-range." The change to 80% will be effective Jan. 1, 1990.

- Revise Bylaws VI.1 to remove the former "Guild bequest" status and change requirements for senior member status.
- Approve Guild Sustaining status for Jess Cunningham, New Orleans, LA, and Chapter Sustaining status for Ernest Pasquerette, Youngstown, OH.
- Refer proposals to establish a continuing education program and change the Guild's disciplinary code back to the Continuing Education and Code of Ethics committees respectively. Delegates also voted to reformat the disciplinary code.
- Delete item 5 regarding the use of tuning aids from the Guild Code of Ethics.
- Accept a revised technical exam as the Guild's single official technical exam, removing the existing "Los Angeles" version effective June 1990.
- Elect a Members' Rights Committee composed of Vivian Brooks, Gary Neie and Tom McNeil.
- Elect Fred Tremper, Del Fandrich and Willis Snyder to serve on the Editor Advisory Committee.
- Elect a 1989-90 Nominating Committee composed of Teri Powell, Ruth Brown, Gracie Wagoner, Otto Keyes and Don Mannino. Alternates are Sharla Kistler and Bob Russell Jr.



The above items are only a brief resume of Council actions and do not represent an official record of the meeting.

Newly elected Regional Vice Presidents Steve Brady and Fern Henry met with their new regions during the convention. Brady represents Region 7, which was formed from chapters in regions 5 and 6, which is represented by Henry.

President Ron Berry presided over the first one-day Council meeting in recent years.

Board Agrees To Host IAPBT Headquarters

The Guild's Home Office will also function as headquarters for the International Association of Piano Builders and Technicians (IAPBT). The expansion of the Home Office role in IAPBT was approved during the pre-Council meeting of the Guild board, which was composed of President Ron Berry, Vice President Nolan P. Zeringue, Secretary-Treasurer Bob Smit, Immediate Past President Marshall Hawkins, Northeast RVP Norman Heischober, Southeast RVP Larry Crabb, South Central RVP Danny Boone, Central East RVP Bruce Dornfeld, Central West RVP Gracie Wagoner and Western RVP James Bryant.

IAPBT delegates who recently met in Kyoto, Japan, had requested that the Guild conduct the group's headquarters activities. The request was brought before the board by Berry, who was elected president of IAPBT during its meeting.

During its meeting in Portland, the board also:

- Increased the percentage of the Guild's gross income transferred to its emergency reserve fund from one to two percent annually.
- Approved establishment of a committee to study the feasibility of restructuring Guild regions into several smaller regions.
- Tentatively selected Sacramento, CA; Milwaukee, WI; and Knoxville, TN, as convention sites for 1992, 1993 and 1994 respectively, and directed the Home Office to negotiate future convention dates so that the opening ceremonies fall on a Wednesday.
- Instructed the Home Office to publish the next membership directory as the April issue of the *Journal,* noting that members whose dues are not paid in full on March 2 at the end of the delinquency period will not be listed.
- Accepted a teacher relations handbook developed by that committee.
- Approved membership in the National Piano Foundation, and directed the Home Office to explore closer cooperation with that organization.

The post-Council Board, with the addition of new members Don Valley, Southeast RVP; Michael Drost, Central West RVP; Fern Henry, Western RVP; and Stephen Brady, who will represent the Guild's new Pacific Northwest Region, met July 13. During that meeting, the board:

- Directed the Examination and Test Standards Committee to develop a standardized test for visual aid and aural tuners, with emphasis on making aural verification a scored part of the test.
- Approved further development of a French-language soundtrack for "The Unseen Artist" film.
- Directed the Home Office and Institute Committee to explore the possibility of holding an annual convention and technical institute in Hawaii in 1996.
- Approved establishment of a committee to investigate establishment of a "Registered Technician" category of membership, the committee to consist of Mitch Kiel, Ken Hannah, and Bernard Mollberg.
- Approved the following as new Certified Tuning Examiners: Keith Bowman, John Grutzmacher, James Hill, Ramon Ramirez, Kathy Teetsell, Denis Wilkinson and Alan Wright. The following CTEs were recertified: Danny Boone, Larry Crabb, Ed Dowling, Chris Finger, Al Jeschke, John Phillips and Ken Williams.

As Council delegates wrapped up their one-day session, tellers were left behind to finish tallying ballots from various committee elections.

McCall...

an important role in coordinating those convention activities. Raye was also active in California State Convention activities, and was a frequent instructor at local, regional and Guild conventions.

A native of Marshalltown, IA, Raye moved to Pomona in 1948. He trained under Fred Odenheimer at the Los Angeles Trade Technical College. He also was a life member of Optimist International.

Raye is survived by his wife, Ruth; a son, Ronald; a daughter, Arlene Jeanette Belter; and five grandchildren.

1989-90 Guild Committees Listed

Awards
Bob Morris, *chair*
LaRoy Edwards
Hilbert Felton
Jack Sprinkle
Bill Stegeman

Bylaws
Sharla Kistler, *chair*
Jim Birch
Don Mannino
Bob Smit, ex-officio

Chapter Newsletters
Jim Hill, *chair*
Garland Goodwin
Roy Howard
Wade Johnson

Chapter Management and Achievement
Webb Phillips, *chair*
Ruth Brown, Northeast
Christie Cornetta, Southeast
Keith McGavern, South Central
Bob Morris, Central East
Paul Olsen, Central West
David Abdalian,Western
Dick Beaton, Pacific Northwest

Chapter Program Development
Randy Potter, *Chair*
Wayne Yockey
Yat-Lam Hong

Economic Affairs
Carl Root, *chair*
David Barr
Janet Leary

Examinations and Test Standards
Wayne Matley, *chair*
Al Sanderson, *advisor*

Tuning Test Subcommittee
Michael Travis, *chair*
Jack Stebbins, Northeast
David Frease, Southeast
Gary Shulze, South Central
John H. Baird, Central East
Kent Swafford, Central West
Teri Powell, Western
Ward Guthrie, Pacific Northwest

Technical Test Subcommittee
Bill Spurlock, *chair*
Mike Carraher, Northeast
Jim Harvey, Southeast
Martin Wisenbaker, South Central
Steve Hornbeck, Central East
John Minor,Central West
Carl Lieberman,Western
Randy Rush, Pacific Northwest

Exam Review Subcommittee
Greg Hulme

Editor Advisory Committee
Willis Snyder, *chair*
Del Fandrich
Fred Tremper

Internal Code of Ethics
Collette Collier, *chair*
Willis Snyder
Charlie Huether

International Relations
Ed Hilbert, *chair*
Ellen Sewell
Charlie Huether
Hans Sander
Ralph Long

Members' Rights
Vivian Brooks, *chair*
Tom McNeil
Gary Neie

Council Minutes Approval
Sharla Kistler, *chair*
Bill Adams
Fred Tremper

Membership Promotion
Dick Quint, *chair*
Greg Shaffer
Chuck Erbsmehl
Leon Speir

Nominating
Teri Powell, *chair*
Ruth Brown
Gracie Wagoner
Otto Keyes
Don Mannino
Alternates
Sharla Kistler
Bob Russell

Teacher Relations
David Rostkoski, NW, *chair*
Pauline Fox, Northeast
Monica Hern, Southeast
Dan Skelley, South Central
Virgil Smith, Central East
Lucy Urlacher, Central West
Lorelle Nelson, Western

Trade Relations
Brian Mott, *chair*
Paul Monroe
Marshall Hawkins
David Barr
Jim Houston

Continuing Education
Ellen Sewell, *chair*
Bill Moonan
Phil Gurlick

Visually Impaired
Bob Qualls, *chair*
Martin Nemecek
Ken Serviss
Jack Sprinkle

College and University Technicians
Tom McNeil, *chair*
Charles Ball
Russell Brown
Bob Grijalva
Michael Reiter
Dean Shank
Ken Sloane
Bob Stephenson
Lou Tasciotti
Rolf von Walthausen

Foundation Publications
Charlie Huether, *chair*
Yvonne Ashmore
Jack Greenfield
Del Fandrich

THE SOUNDBOARD

Letters from readers on organizational matters will be published in this space each month. Letters should be concise and may be edited for length and style.

To The Soundboard

I sincerely hope that I may be accorded space in the *Soundboard* to present a dissenting point of view to that espoused by Mr. Willem Blees, Registered Tuner Technician, St. Louis Chapter 631 of The Piano Technicians Guild, Inc. His letter appeared in the April 1989 issue of the PTG *Journal* and was concerned with the subject of PTG for RTTs only.

Mr. Blees' ideas are certainly not new; as a matter of fact, they go all the way back to the thirteenth century in northern Europe. The beginnings and rise of the trade and craft guilds occurred within the trade areas controlled by the Hanseatic League of Cities.

Apprentices in the craft guilds were virtual slaves of the *Master Craftsman.* After seven to twelve years these trainees could take a test to become a *Journeyman,* which allowed them, finally, to earn some wages. The next step also could take a number of years; the journeyman was required to present a masterpiece of his craft to the Masters of the Guild to be judged by them as being worthy of being called masterpiece. If he passed, at long last, he became a *Master Craftsman.*

Later, toward the end of the 1200s, the number of people who could become Master Craftsmen was severely limited. This was intended to limit the production of goods, allowing prices to rise throughout the Hanseatic League. Much later, still, one could become a member of some guilds *only* if that person's father was or had been a member of that guild.

Looking at this development with a dispassionate analysis, this was a restraint of trade, as evidenced by the limitation of the number of Master Craftsmen, and the entire ploy revolved around only one thing: Money!

Does Mr. Blees and perhaps others who may agree with his point of view, see some real or imagined threat to their own incomes based upon the present membership structure of the PTG? Each person should please examine his/her own innermost thoughts about this possibility.

First, I submit that the question proposed to the guild by Mr. Blees—*Should the Piano Technicians Guild, Inc. be only for Registered Tuner Technicians?*—is probably illegal, since the guild has already been forced to restructure its membership policies.

Second, I suggest that this is not the time to regress. This is an era in which the PTG should be flourishing, and I feel Mr. Blees' proposal should not be seriously considered. Acceptance of such a membership policy would wreak damage to the very core of PTG, resulting in membership losses among associate members. We would then be on a time machine trip back to the beginning of the fourteenth century, instead of a forward looking blast-off into the twenty-first century, complete with innovative educational programs and a friendly, cooperative and helping attitude toward the men and women who will in their turn become the backbone of RTT membership.

Whether Mr. Blees likes it or not, the PTG needs people such as I, an Associate Member, who has had a successful career as a musician and educator and who will become an RTT eventually. You may be sure that I bring the same professional attitude and commitment to excellence that I exercised as performer and teacher to my work as a piano technician; however, on a very personal level, acceptance of Mr. Blees' proposal would force me to re-think what the worth of the organization is to me. I could very well decide that I don't need the PTG in order to make a living as a professional piano tuner/technician.

Cecil F. Whitaker
Pomona, CA, Chapter 917

Who Runs PTG?

When I first joined PTG Jim Burton was our Executive Director. Later there was Don Santy. Barbara Parks took the post when we hired the Martin-Fromm management group, and then Larry Goldsmith. This year we formed our own Head Office Management Team, which Larry ably heads.

When I started attending PTG meetings, Ken Kadwell was president. Don Marton was next, followed by the late Bob Russell, Sid Stone, Erney Pruitt, Charlie Huether, Marshall Hawkins, and currently, Ron Berry.

But I still haven't mentioned who runs PTG.

You do. I do. and any number of our 3,687 members run PTG. Whether you are a Registered Tuner-Technician or Associate member, *you and I* run PTG. Not the Executive Director and not the president.

We have a fully functioning, well-organized democratic-republic form of self-government. *We* make motions in our local chapters, which can become by-laws Amendments at the Council of Delegates at our annual business meeting each July.

And it only takes one person to start it. *One* person suggested several years ago that the Western Region was so large it should be made into two Regions. He persisted, and this year we have a new region, the Pacific North-

Soundboard...

west. One person made a couple other suggestions, which his chapter delegate at the 1988 Council saw added to this year's agenda. That chapter has only nine members.

And yet, although *we* run PTG, nearly *half* of us voted to let *them* vote for us this year. At the Council of Delegates Sunday, July 9 in Portland, only 81 of our 161 chapters were represented by delegates and/or alternates. By voting strength, which is how quorum is declared, we had 68% represented. The rest of us, I mean the rest of *you*, voted to agree with whatever the rest of *us* decided was best for our organization. Of the new Pacific Northwest Region's 17 chapters, only nine were present at Council to vote it in. And the nine-member chapter that submitted the by-laws revisions did not bother to send anyone to speak for their proposals (which may have had something to do with their defeat).

I suppose there will be those who do not agree with some of the results of the Council meetings. If you are a member of one of the 80 chapters who were unrepresented at the Council, keep in mind that by not coming your vote was "I want whatever you decide is best." If you are a member of one of 81 chapters who were present at Council, find out how your delegate voted, and why. Did your chapter give him voting instructions, or by not instructing him, did you vote "whatever you decide is best"?

Perhaps the Council actions have sparked your interest, and you would like to become involved in running PTG actively, instead of passively. Bravo! We need you, and want your help. If you are among the 80 chapters, it should be fairly easy to get elected as a delegate or alternate next year. and if you are part of the 81 chapters, become involved at the chapter level with a goal towards being in Council next year. The first three years I was "involved" in Council I was not a delegate or alternate but as an observer in the back. During breaks or by a note I gave my opinions to our chapter delegate. (This year there were always less than 20 observers during the Council session). And if you want to propose a by-laws change, remember that it starts with *one* person (Associate or RTT), in *one* chapter (even a small one).

Who runs PTG? *You do.*

Randy Potter, RTT

Chapter Management Awards Presented

Seventeen Guild Chapters were honored for their outstanding achievements during the past year in Convention Regional Awards Programs. Winning chapters were also recognized by Committee Chairman Webb Phillips during the closing luncheon. Chapters honored were:

Large Chapter Category
Twin Cities, MN, Chapter, *First Place*
Connecticut Chapter, *Second Place*
Houston, TX, Chapter, *Third Place*
Cleveland, OH, Chapter, *Honorable Mention*

Intermediate Chapter Category
Reading-Lancaster, PA, Chapter, *First Place*
Rhode Island Chapter and Baltimore Chapter, *Second Place*
Kansas City, MO, Chapter, *Third Place*
Pomona Valley, CA, Chapter, *Honorable Mention*

Medium Chapter Category
Oklahoma Chapter, *First Place*
Maine Chapter, *Second Place*
Syracuse, NY, Chapter and Richmond, VA, Chapter, *Third Place*
Quad Cities, IL, Chapter, *Honorable Mention*

Small Chapter Category
South Central Pennsylvania Chapter, *First Place*
East Texas Chapter, *Second Place*
Little Egypt, IL, Chapter, *Third Place*

Los Angeles Chapter member Kathy Teetsell received a special distinguished service plaque from Regional Vice President James Bryant during the Convention Regional Awards program.

Houston Represents Guild In Teacher Gathering

Editor's note: Guild chapters and state organizations have been very successful in working with various teachers' organizations around the country. In this article, reprinted from a report to the Guild Teacher Relations Committee, tells how his chapter worked with the music teacher organization in his state. Additional information on this topic will be available very shortly in a handbook, "Presenting Programs To Teachers," prepared by the Guild's Teacher Relations Committee.

Keith Matis
Houston, TX Chapter

The PTG Houston Chapter well served a prime directive to promote the piano tuning and servicing industry generally and the PTG in particular with its presence at the Texas Music Teachers Association (TMTA) state convention in Galveston's Moody Convention Center on June 16-20, 1989. We kept a booth manned in the exhibit hall and were active participants in the convention's contest winners' awards ceremony.

According to Louise Christensen, one of the convention organizers, there were almost 4,000 convention registrants in attendance, about 1,500 students and the rest teachers, from throughout the state.

Our booth was attended with volunteers, one RTT and one associate member at a time, for the three days the exhibit hall was open (Saturday through Monday, June 17-19). Coat and tie were required. A VCR and TV set were kept playing *The Unseen Artist*, a PTG promotional film, for people to watch. A grand and a vertical action model were on the table for our people to demonstrate the mechanics of piano actions to the public and various hand-outs were stacked on the table for passers-by to take. A count of 382 people was taken of people who showed an active interest in our booth. People who just walked by and looked were not counted. Our volunteers reported that, of these personal contacts, all showed an interest in learning about the Guild and about pianos. All were either teachers or serious students. Questions ranged from, "What does my daughter mean when she says the piano feels mushy?" to, "Is taking care of 70 pianos at my school really a full time job?" Names in the January, 1989 *Piano Technicians Journal* of technicians from around the state were given out to people looking for a technician.

There were three times when a representative from our chapter was acknowledged at a TMTA function. Once was at a TMTA General Session when all of the exhibitors were introduced to about 45 TMTA members in attendance.

A second time was Saturday evening at the Galvez Hotel at the convention banquet of about 150 officers of various TMTA chapters form around the state. Martin Wisenbaker, RTT, representing our chapter, sat at the head table and was among about six people recognized for various TMTA distinctions. Martin's was that he would be presenting the PTG scholarships at the Winner's Program later that night.

The third acknowledgement came at the Winner's Program at about 10 p.m. that night in the recently renovated 1894 Galveston Grand Opera House. Martin gave a short speech to the audience of about 600, and presented the two PTG scholarships to their recipients. Pictures were taken with the contest winners and the symphony conductor for possible publication in *The American Music Teacher*, the journal of the Music Teachers National Association.

The Houston Chapter's participation in the TMTA convention was thus an unqualified success. If the $200 cost of the booth had been spent on advertising, it could not have targeted the audience as well, nor could it have reached them on such a personal level. The PTG scholarship program is an excellent teacher relations program which gives us state-wide and possibly nation-wide recognition. Every effort must be made to ensure that the PTG's profile remains prominent at all future music teacher conventions of this type.

President Ron Berry pins an RTT pin on the lapel of Per Brendstrup during the convention closing luncheon. Brendstrup was one of several who passed their RTT tuning exams during the convention. The Guild's Examinations and Test Standards Committee offered tuning and technical exams throughout the convention.

Dates & Deadlines

September 29, 1989
Deadline for requesting Home Office to collect chapter dues.

October 19-22, 1989
RTT Tuning & Technical Examinations, CTE Recertification. New York State Conference, Queensbury Hotel, Glens Falls, NY. Contact: Stephen Snyder (518) 854-3888.

October 27-29, 1989
RTT Tuning Examination. North Carolina State Conference, Winston-Salem, NC. Contact: John Foy, (919) 773-1754.

November 25-26, 1989
RTT Tuning & Technical Examinations. Elizabethtown, PA, Area Examining Board. Contact: Mike Carraher, (717) 367-8256

January 1, 1990
1990 dues due.
Deadline for submission of awards nominations to Awards Committee. Contact: Bob Morris, 1729 D Valley Road, Champaign, IL 61820.
Proposed bylaws changes due to Bylaws Committee. Contact: Sharla Kistler, RD #8, Box 461, Allentown, PA 18104.

January 31, 1990
1990 dues delinquent

February 1, 1990
Deadline for submission of officer nominations to Nominating Committee. Contact: Teri Powell, 1666 W. 261 St., Harbor City, CA 90710.

March 2, 1990
Members who are delinquent in 1990 dues to be dropped from roster.

July 7-11, 1990
33rd Annual Convention and Technical Institute. Hyatt Regency Dallas. Contact: Home Office, 4510 Belleview, Suite 100, Kansas City, MO 64111.

Newsletter Debuts

The *PTG Leader Letter*, a newsletter for chapter presidents, Guild committee members and others with administrative responsibilities in the organization, made its first appearance in early August.

The new publication will carry expanded information on Guild deadlines and procedures.

Chapter News

The Reading-Lancaster, PA, Chapter will host its annual tool auction and party October 7.

Let us know what you're up to!

Current Regional Membership Status

Northeast Region	832
Northeast RTTs	546
Southeast Region	593
Southeast RTTs	398
South Central Region	320
South Central RTTs	216
Central East Region	623
Central East RTTs	406
Central West Region	366
Central West RTTs	261
Western Region	622
Western RTTs	422
Pacific NW Region	326
Pacific NW RTTs	223
Total Membership	3729
Total RTTs	2472

Retiring board members Marshall Hawkins, left photo, Larry Crabb and James Bryant, were honored during the closing luncheon for their service to the Guild. Also retiring from the board was Gracie Wagoner. Hawkins completed his term as Immediate Past President, and Crabb, Bryant and Wagoner were Regional Vice Presidents.