THE WORLD OF PROFESSIONAL AUDIO: Inside a Major Recording Studio ■ A New Method of "Room Acoustic Tuning" ■ The Art of Small Recording Studios ■ Audio Techniques in a Broadcast Station ■ Plus Regular Features
A dialogue with Bob Fine, colorful and controversial head of Fine Recording, New York City.

In the heart of the "silk-stocking" district of New York City, across the street from proud Steinway Hall and surrounded by the chic boutiques and swank shops that cater to the "beautiful people," stands the Great Northern Hotel. It is old and begrimed, and gives off an aura of genteel shabbiness. In this unlikely locale, the modern studios of Fine Recording occupy some 38,000 sq. ft. of space. A special elevator took me directly to the reception area on the penthouse floor, which is part of the Fine Recording complex, and shortly thereafter I was escorted into the paneled office of Bob Fine, president of Fine Recording. Here are the results of our talk:

Bob, you've been in the recording business since you were a boy of fourteen, am I right?
FINE: Yes, in 1938 I worked for Miller Film in Steinway Hall as a general flunky and as a "wax shaver." In those days we were still doing direct mastering on cakes of wax, and my job was to prepare them for recording.

Is that the same Miller whose cutter you used years later when you were recording the Mercury "Olympian" classical recordings?
FINE: That's right. You may remember how appalled recording people were because Miller wanted a thousand dollars for the cutter. What a change from these days, when a Westrex stereo cutter runs more than four thousand dollars!

I believe your first studio venture was in 1951, after you had left Reeves Sound.
FINE: Right. I was quite happy at Reeves, but I always had a yen to have my own studio and thus Fine Sound came into being in Stony Point, New York. Most of the equipment was in a converted chicken house and the disc-cutting operation was in a former barn. A lot of the recording people resented having to make the trek "up the mountain," but we prospered after a fashion.

It was while you were located at Stony Point that you contracted to do the new Mercury classical series, which gave birth to your recording truck. Wasn't it about this time that you invented Perspectasound?
FINE: Well, you may recall that the movie industry had been taking an awful licking from television, and they were desperately searching for ideas and gimmicks to stem the TV tide. Thus we had the rash of three-dimensional movies and finally Cinemascope, which with the wide-screen aspect ratio, virtually demanded stereophonic sound. The trouble was that true stereo was almost impossible to incorporate into a movie because of the constantly changing perspective. In the long run, it really came down to was that the most practical thing was an emphasis on lateral directionality because of the wide screen. I figured the way to do this was by post mixing after the picture was finished. By means of panning pots and pilot signals to activate left, center and right loudspeakers behind the Cinemascope screen, with deliberate "built-in" directional sound, we could lick the perspective problems. Perspectasound, then, was directional sound on an optical track, which was compatible with standard film reproduction, so all that was necessary was to make one negative. In theatres equipped with the Perspectasound circuitry and three speakers, a quasi-stereo effect was obtained.

I take it that this is when Loew's/MGM showed interest in Perspectasound?
FINE: Actually we had shown the idea to several film companies, but after a demonstration of the system in an abandoned movie house in the Bronx, MGM acquired Perspectasound and Fine Sound and set up our operation in elaborate studios at 711 Fifth Avenue in New York.

A Fifth Avenue studio was a pretty far cry from a chicken house in Stony Point. One thing I remember vividly about that studio at 711 was the fabulous aromas that used to waft up the elevator shaft, since the kitchen of the famous "Le Pavillon" restaurant was on the ground floor. If I remember, you did some pretty big pictures in the Perspectasound process at 711.
FINE: I guess the best of them was the Marlon Brando "Julius Caesar."

I understand that you became embroiled in some sort of patent fight and unfortunate legal problems, which resulted in the ultimate demise of Fine Studio.
FINE: All too true. I never received a nickel on my patents, even though Perspectasound is still used in some foreign theatres. In any case I wanted to start another studio, so to raise money I went to Europe and designed studios. This was just about the beginning of stereophonic recording in Europe in 1956, and I did two in Paris, one on Milan, and several others. I had my lawyer looking for possible studio locations in New York, with the proviso that it should have a ballroom. Shortly afterwards he came up with the ballroom of the Great Northern Hotel; we signed a lease giving us exclusive use of the ballroom and, thus, Fine Recording was born.

Speaking of leases, how secure is your present lease in view of the fact that you are in an old building, with the present tendency to tear down the old and build still another glass and aluminum skyscraper?
FINE: We have leases running to 1980, and the plot of land the hotel occupies is not in itself big enough to build on. Someone would have to put together a large expensive parcel of land, in addition to the hotel plot, to make a new building a practical proposition.

I assume this is why you are going ahead with your present expansion plans?
FINE: Yes, we now have 38,000 sq. ft. in this building. We occupy the total top of the hotel where we have two mixing theatres, all the disc cutting operations, production offices, and main reception area. On the twelfth floor we occupy 50 per cent of the space, consisting of an office wing, another studio wing, the automated mastering section, the electronic music operation (the Moog synthesizer is here) and a research wing where we carry on research in...
audio and in other electronic but unrelated areas. The lobby of the hotel is where the main studios are located. And our tape duplication plant is in the basement area. When we took over the ballroom, which is now our Studio A, it was a dirty mess, painted a garish red. It had an old oaken stage where the N.Y. Philharmonic used to rehearse. The chandeliers were broken, the wooden paneling largely destroyed. Two years later we restored the ballroom to its former glory, replete with virginal white paint and gilt, as well as new chandeliers.

What changes did you make to turn it into a recording studio? I understand there were large columns in the room which some people criticized for breaking up working space.

FINE: We have had some complaints. Nevertheless we have been able to accommodate 60- to 70-man orchestras for symphonic recordings and motion picture scores with a minimum of difficulties. We built a control room endeavoring not to change the acoustics of the room. The huge old oaken stage was removed and replaced with a smaller stage which we use when it is necessary to elevate an orchestra. As far as I am concerned, the acoustics make up for the small inconveniences.

What is the reverberation time of the ballroom?

FINE: That is an interesting point. Measured by the Academy standard reverb scale, the reverb time is about three seconds.

Isn't that fairly long for recordings?

FINE: Yes, but I don't believe in that reverberation measurement. In the number of times I've spoken to Leo Beranek, and with all due respect to that learned gentleman and his accomplishments, I've disagreed with him on this standard of reverb measurement which is calculated on the basis of how long it takes from the initiation of a sound until it measures 60 dB down. I think this is quite wrong. . . . you do not sense reverb past the point where the sound is down 15 dB. You just don't sense it, or hear it, or feel it. Then you feel that according to your system of measurement the ballroom has suitable acoustics. Measurements aside, don't you feel that the real burden of proof is how your recordings actually sound?

FINE: That's true, but just for the record I think we have slightly over a second of usable reverb. Of course there is still the matter of the frequency spectrum in the room. At what frequencies does the room reverberate? Some rooms have huge peaks at say 400 cycles [sic] or standing waves which by oscillatory reinforcement can make a room appear to have more reverb. I am considering that you must take the frequency spectrum into the reverb picture and measure from about 800 cycles upward. Below 800 cycles, reverb just isn't significant.

In addition to the ballroom which is your Studio A, I notice a Studio B just off the hotel lobby. Would you describe it?

FINE: Studio B used to be the serving kitchen for the ballroom. We cut it off from the ballroom and put in an isolation wall which weighs several tons, but which is in a "floating" mode to avoid sound transmission. Studio B is fairly small, but with a high ceiling. We use it a lot for voice recording and for rock-and-roll dates and orchestras. We think it has a good sound, but it is a contrived studio, whereas Studio A has its own completely natural sound.

Getting back to the ballroom, when you do "pop" dates there, do you use the natural reverb or do you augment with reverb chambers?

FINE: We use EMT's reverb chambers because, with the sound preferred in today's pop market, with ears attuned for exaggerated reverb, it is too difficult to use natural reverb. Then, too, if you have a singer in a live room, close to a microphone . . . where you want isolation . . . you eliminate so much of the natural reverb you must make up for it with EMT's. Unfortunately, when you are recording rock and roll and all these wild, screaming, brassy things . . . a live studio is extremely difficult to handle. For rock and roll the most successful approach seems to be these low-ceilinged, very-dead studios, where they don't really do conventional mixing and can control the sound quite readily. I like the sound of a big wild orchestra in a live room, but it is difficult to mix and achieve instrumental isolation. However, when you talk of isolation in stereophony, the acoustical coupling is important and many people really don't like that.

I understand you have recently installed 8-track recorders in the ballroom and that this solves acoustic problems to a certain extent.

FINE: Since we have installed the 8-track Ampex and will soon be installing 12-track Scully recorders, the ballroom has sort of been "rejuvenated" for pop recording. You see, we no longer record in the classic sense of the word. Now we lay down against an electronic click track [A click track is like an electronic metronome with beats down to a 32nd note, but 1/8ths notes are usually used] . . . the rhythm on say two or four tracks . . . the drums, bass and guitar, and any other rhythm instrument, and we record a basic rhythm track on the machine. Everyone works with earphones . . . no one

---

Fig. 1—Recording sessions in Fine Recording's Studio "A"—the ballroom.

Fig. 2—Chief Engineer Ted Gosman at controls of the console used for Studio "A" sessions.
works live anymore... everything is recorded against these electronic metronomes. We may put out 30 to 40 earphones on a big date... one for each musician. As I said, we make a rhythm recording on 2 to 4 tracks of the eight-track machine, put the machine into "sel-sync" operation [sel-sync (selective synchronization) works this way: whatever has previously been recorded is played back on the record head... the record head becomes a playback head... and a 4th head records the new material on another track in synchronization with the previously recorded sound. It is really just an elaborate head switching system. After each track is recorded, you rewind to the start and you are ready to add another track or tracks, as the case may be. As you can see, the possibilities are limited only by the number of tracks available.] If there is a woodwind section we sel-sync record them on another track or tracks, as required. The woodwind instrumentists hear the rhythm tracks through their earphones and play against the rhythm. Next we sel-sync the brass on one or more tracks in the same fashion as the woodwinds. If there are voices they are usually recorded sel-sync on tracks 7 and 8. The voices are recorded singing the same material on the two tracks, but at different times. They sing the same harmonies, etc., but when you mix the tracks together, because their timing is not that precise due to the human element, you get this bigger sound which enables voices to compete acoustically against the huge sounds of brass and rhythm.

Bob, with so many tracks being used for the various elements in a recording, I can see now why you are installing 12-track machines and would probably like to put in that monster 24-channel Ampex which uses tape two inches in width, if you could afford it.

FINE: Well, I think it tends to get ridiculous after a certain point. You could put practically every instrument on its own track with the 24-channel unit... and in certain of these wonderfully complex rock-and-roll recordings they do just that... recording sounds that are humanly impossible to produce on a standard recording basis.

Once all 8 tracks are recorded, what is your next step?

FINE: We go into a re-mix situation where we literally re-create the session from the stored information. That can go on for hours and hours... which for a studio is economically very nice... it's a new thing which never was done in studios before. It is a new market because, after all, in the recent past you fixed a date and, outside of a few balance adjustments, that was it; there was no further processing. Now you have 8 or 12 separate sources of information and it's a whole new world of recording that can be either abused or used constructively.

I presume that, once you mix all the tracks, it is brought down to a two-channel stereo recording for the ultimate consumer product, be it disc or tape in its various formats.

FINE: You know it all used to be mixed right down to monophonic, but with the demise of mono recordings, we do two-channel stereo, unless it is for a foreign market where mono still is predominant.

At this stage, I suppose the A&R producer is the one who decides where the various tracks should be placed in terms of left/right stereo orientation.

FINE: Yes, and he may also decide to "pan" some tracks... all of our consoles are equipped with panning pots... he may want an effect like a marching drum. What the producer may desire may be so complex as to require another 8-track mix from the original 8-track recording.

Returning to the ballroom, Bob, I take it that a recording in the classic three-channel stereo "symphonic style," with the traditional instrumental positioning, is quite rare these days?

FINE: Certain people still like the "pure" 3-channel approach, and we do some occasionally. Nowadays most producers are of the type where 50 men can be playing and they want to hear an electric harpsichord isolated, and at a louder level than the group. It is incongruous, but it is typical of today and is at least legitimate in terms of an interesting sound, if nothing else.

What are your feelings about the use of compressors or limiters?

FINE: When you put any limiting equipment that is of a type where you rectify the output of an amplifier and apply it back to change the gain of the input stage of the amplifier, you are seriously affecting pulse information. That is one of the reasons that 8 or 9 years ago we changed our whole compression system. We do not use an RC-type compression system. Our compressions systems are based on the factor that the long-wave information is redundant and is consuming the greatest power. Our compressors pass pulses and act on long-wave information. The result is great presence on a record or a film without having a tremendous amount of electrical energy to deal with. With a normal type of compression system you can hear the "gating." Just jangle a key ring or put maracas in front of a mike with the compressors on and listen to what you have at the output. In cases of very efficient modern compressors, you don't hear the keys or the maracas unless they are down below the thresholding levels of these instruments. Put a piano through this kind of compression and you can turn a piano into an organ!

Do you use putting or compression on classical material?

FINE: We do have to in some cases of extreme dynamic range, which we have done for years. We do have to use manual monitoring; this is always done with A&H people... not with engineers. There are real-time situations where you cannot possibly involve yourself with the dynamic range you have on the tape... it is usually impossible to put it on a record. If you make a record with too wide a dynamic range, people can't listen to it... or don't want to be bothered with the constant adjustment of controls. We can record a wider dynamic range than we do on any medium that we make... but every time we have fought this battle that people should listen at the right level for the proper dynamics, we lost the battle. We therefore temper the dynamic range to within usable levels below normal room levels. Our original Mercury classical recordings had so much dynamic range we used to get complaints from the field that people would lose whole sections of pianissimo music when they adjusted the fortissimo to the low listening levels prevalent in most apartments and in many homes.

Are you still interested in film work?

FINE: Most assuredly. We have two theatres on the top floor where we do motion picture mixing. This is in our Studio C.

Do you use 35mm magnetic film in the scoring studios?

FINE: We use both tape and film, and can go from one medium to the other merely by switching.

Are your consoles of solid-state design?

FINE: We are in the process of installing solid-state consoles in all the studios. At the moment, the consoles are tube jobs with the exception of a new solid-state unit in Studio D. The console in the ballroom has a turret that controls reverb. I mention this because we used to have concrete reverb chambers in the basement, which at one time were food storage lockers. They (Continued on page 100)
BEHIND THE SCENES
(Continued from page 12)

were great chambers, but they were costing us too much in rental so we put in EMT units. We found an interesting thing with the EMT units quite by accident. We put them right in the ballroom and found that we got acoustic coupling of the EMT's from the orchestra in the room, aside from the electrical drive, and it makes an unusual sound. I have an idea that ultimately, if we ever get time, I want to suspend plates in the studio over the various orchestral choirs . . . probably they will be much lighter in weight than the plates in the EMT, but likely of hardened steel. With them we'll pick up reverb selectively from the sound waves of the orchestra impinging directly on the driving unit. It may be impractical, but I'd like to try it.

How many inputs on your consoles? Does it vary?
FINE: Studio A has 14 inputs, Studio B has twelve. The new console for Studio A will have 24 inputs with a 16-channel output, plus a semi-computerized matrix mixing system, where you mix the monitor. In these multi-track systems, where you record wide open to the 8 or 12 tracks, where there is no mixing, they mix the monitor, listen to every channel and mix in on the monitor so they hear some semblance of what they are doing, even though it has nothing to do with what is going on the tape. You also need an earphone mixing system, which we have in Studio A, because you are selecting from so many tracks a mixture of something to feed to the musicians to sel-sync against. Speaking of earphones, we are thinking of adapting an old Hollywood movie technique that is quite interesting. I should note at this point that all the 8- and 12- and 24-track recording of today is merely a modern upgrading of what are essentially old movie techniques.

You mean they actually did multi-track recording in those days?
FINE: I'll give you an example. In the old musical pictures of the Astaire/Rogers era, the orchestra recording was made, then the singing recording . . . all on optical push-pull tracks, and on synchronized equipment. This was played back to the artist who was photographed lip-synching to the sound. Loren Ryder of Paramount Pictures made an ingenious invention in the late thirties. He felt there was something missing about those people dancing in the musicals . . . the real sound of their clothing, the real sound of their dance.

stage which could pick up the real sound of the dancing and moving around, since the mikes naturally could not pick up the voice and orchestral tracks.

How do you intend to use this technique?
FINE: Well, we have such a maze of wires in the studio when we put out as many as 40 earphones on one of these 8-track pop recordings, that we are thinking of installing a similar radio transmitter earphone system. The only thing to figure out is how to keep the earphones from vanishing after each session.

I suppose you try to use some inexpensive phones, but there is a limit as to how much you can restrict quality.
FINE: Right, but even the little phones such as supplied with transistor radios cost 50 cents apiece. Nevertheless, we are going ahead with the radio earphone system for the flexibility it will afford.

Bob, in which of your studios do you prefer to do a rock-and-roll recording?
FINE: We are presently building Studio E, which among other things will have an especially dead room for this type of multi-track recording. However, as I have pointed out, due to the use of pick tracks and sel-sync, even the ballroom is suitable.

On these rock-and-roll dates, the musicians are equipped with electric guitars and other electric instruments, each with its own amplifiers and speakers. I assume you don't pick up the sound of their speakers via microphone, but go into your preamps directly from their bridging outputs?
FINE: No, we don't go in direct. But it is wise to eliminate mikes. I've found that the only place you can get that raw sound peculiar to these instruments is across the voice coil of their speakers. You don't get the same thing out of their bridging amp output because it is before the power stage. So we are putting in a system that clips right to the voice coil. This picks up all the "distortion" that gives these instruments their "character" and would appear to be a product of the clipping of the output transistors.

Disc cutting has always been one of your major interests. What constitutes your present system?
FINE: Our stereo disc mastering equipment is of our own design. You'll be interested to know it was installed 9 years ago. We took a different philosophy about what is necessary to cut a stereo disc than generally prevails in the industry. For one thing, we use

Fig. 3—Cutting Engineer George Pirogov is shown at the controls of a Scully lathe used by Fine Recording.

Fig. 4—35 mm magnetic film dubbing in Studio "C."
200-watt-per-channel modified McIntosh’s as our cutting amplifiers. And we use only the original Westrex 3A cutter.

Why is that, Bob? I’ve heard comment that “fine ought to get modern and use the Westrex 3D.”

FINE: We modify the suspension of the 3A ourselves. We don’t use feedback. We use something else because we don’t believe in feedback, especially the Westrex feedback system, because that is not a true way to correct mechanical motion.

That surprises me. Weren’t you always an advocate of feedback in the days when you used the Miller cutter?

FINE: It is not the same feedback... the Miller used a mechanical feedback. There were certain rods in the cutter that had to be tuned. At any rate, with our present system we can put pulse information and high frequencies on a record without resorting to Conax equipment. [the Conax equipment is a frequency-selective limiting system] Almost every studio in New York uses Conax equipment because the Westrex 3D systems will not pass high-frequency, high-power information, so they use frequency compression systems to get the level on their records. Six or seven months ago we got a Westrex 3D cutter and set it up on another Scully lathe. We were asking ourselves whether we were behind or ahead in cutting technology and thought it was time for a general review of disc cutting. We set up the 3D without a Conax and fed it and our 3A system the same program material. As far as I was concerned, the 3D didn’t put what I wanted on the disc. The 3D exhibited that d.c. blocking which comes from feeding instability in the system... it just sounded nothing like we were doing. You couldn’t put anywhere near the peak levels on the record that we could with our system.

I was under the impression that most companies using the 3D are using the HAECO amplifiers, which are reported to be quite good.

FINE: Yes they are, and the HAECO is quite an improvement over the Westrex amplifier, which is really rather primitive. But this still does not overcome the problems of the 3D. The 3D, by the way, was made with a looser suspension to reduce the power requirements. I don’t believe in that. I feel that a cutter should be absolutely rigid. The Miller cutter had no movement of the armature at all... you actually distorted the metal with a magnetic current.

Some people will never be “in.” Their fancies run high and they are fanatically loyal to logic, imported beer and aged cheese.

Their taste in music can run the gamut of Beattle fad, Bach fugue and Ravi Shankar.

The one thing that is most common is a demand for great performance.

When the conversation becomes subdued and the mood softens to a “listen,” the cartridge used is the ADC 10E-MKII.

Top-rated, this mini cartridge is almost human in its instinct. It brings out the brilliance, from the lowest bass to the highest treble.

HiFi Stereo Review in an independent survey made these claims, “...its ability to track highly modulated grooves at only 1 gram, is a feat achieved by few cartridges in our experience.” And, “...it would track the HF/SR test record at 0.5 gram, lower than any other cartridge tested.”

And, England’s Hi-Fi News had this to say: “It can be stated unequivocally that this is a beautiful pickup which must be ranked among the best available.”

The cost is high. Just a breath under sixty dollars. But understandably so. Our appeal is to a small “out” crowd. For complete information write ADC or hear it at your ADC dealer.

They still don’t know how we did it

Getting the big sound of a 12-inch woofer and a midrange tweeter from an enclosure measuring only 7 1/4 x 10 1/2 x 5 1/2 inches was thought to be impossible.

The famous Maximus 1 changed all that. Today, our ultra-compact Maximus has imitators, but the creative and advanced engineering that made it possible is still there in every speaker system of the Maximus line.

Budget systems, compact units, or magnificent 4-speaker 3-way systems. Seven superb speaker systems, from $39.95 up. Find the one for you. See your Maximus dealer.
I notice you still use the Scully lathes. Do you anticipate any changes, perhaps to the new Neumann computer lathe, for example?

**FINE:** I think they are fine machines and are good for studios with a great amount of disc cutting, but they are concessions to individual mastering. In other words we took off all the Scully sensing equipment on our automatic variable pitch lathes. This would have made life easier having it, but it can’t “think” how much the time factor is on the record or how loud you want the record to be. So you are making a concession whether you master with a Scully or Neumann or Ortofon automatic system. You never really make a record on this kind of equipment that has that little extra something in it that makes it a better product. I believe that when you go to the trouble and expense of making a symphony recording or any high-quality recording, it deserves to be cut onto a disc with individual attention to levels and dynamics and every other significant parameter. However, just so I won’t be accused of sour grapes … if I had the amount of disc cutting that RCA and Columbia do, I would own an automatic Neumann too!

Bob Fine has often been accused of putting too much level on records.

**FINE:** It’s true … I feel that the records should have a lot of level on them. I must confess we do get up to extreme velocities.

Up to 30 centimeters per second, I understand.

**FINE:** Yes, peaks of 30 cm, but in defense I challenge you to see a Teldec, a Grampian or a Westrex 3D cutter put that down on a record, and put it down with complex pulse.

Can present playback equipment cope with these high velocities?

**FINE:** Most certainly the better stereophonic arms and cartridges can, and even some lesser consumer equipment, which is getting better all the time.

In addition to all your studios you have a tape-duplication facility in the basement of the hotel. Is it the usual master playback with reel-to-reel slave machines, or do you use a common mandrel system?

**FINE:** We have a master and ten slaves in a special modification which is saving us a lot of money. Heretofore, if we were not running the kind of tape format the slaves were set up for, the machines were idle and non-productive. Now these ten slaves have a programmed head system. They have a 52-prong machined base, with a 52-prong plug-in head assembly which is changed for each tape configuration. On quarter-inch tape we have interchangeable heads for monophonic, two-track, and four-track. On cassette 150-mil tape, we have two- or four-track heads. The heads pick up the guidance of the type of tape and there is room to program the tensions on the machines and what kind of a master is being used … either loop or reel to reel. On the top of each head is a level and bias control … no more dildling with the bias controls on rear panels. So whatever kind of tape format we are asked to duplicate, it is a simple matter of plugging in the appropriate head, and this keeps the “down-time” on the machines to a minimum. We do cassette duping at 16 times speed ratio, reel to reel at 8 times speed, and 8-track cartridge is also duped at 8 times the speed ratio. The 8-track is made on another bank of ten slaves which we are going to convert to the plug-in programmed head system.

High bias levels seem to be the particular curse of present cassettes. Can’t anything be done to bring the bias down to “tolerable” level?

**FINE:** There is a very critical bias-frequency and bias-level problem when running cassette dupes at 16 times the speed. There are also problems of stability with the tape and tape tensions on the duplicators. We are making progress in overcoming these problems. We are now looking into different types of bias systems. We are looking into different bias arrangements than just the bulk pumping of bias into a head to record. There has been a lot of saturated gap recording. I have no experience with it, but question the merits of this approach. I believe there will be technological advances that will eliminate the basic practical problems of bias on tape. Most present oxides are a holdback. In our duplication set-up we have tried many different kinds of tape, and only one tape works well at high speeds.

What are your feelings about the new DuPont chromium dioxide tape?

**FINE:** I think there is great potential in the Crolyn tape.

What about the reported abrasiveness of the tape to the hand and the requirement for almost double the bias?

**FINE:** The bias problem exists because of the present configuration of the circuitry. We certainly can build new equipment to handle this, and I believe the abrasiveness can be licked.

Do you think tape and disc can continue
to co-exist in the music market?
FINE: Very definitely. I think both mediums have yet untapped potential.
I am very optimistic about tape as a recording medium. With its constant
lineal speed there is no diameter problem, as in the case of discs. Since most
music has a loud finale, and this usually appears at the inner diameter of
a record, we run into tracking difficulties. This has no relevance in tapes. Of
course, one of the big problems in tape duplication is the number of generations
we must go through before we get to the consumer product. What we get
from a record company is usually a third generation working part. This
is, in essence, library material which we can't cut up, so from that we make
an intermaster, which is then compressed in dynamic range to give us a
better signal-to-noise ratio with all the dubbing going on. Then the tape goes
through program preparation, according to whether it is cassette, 8-track,
etc., and a running master is made. This is your dubbing master for high-
speed duplication. The result of all this
is that we may have gone through six
or seven generations. Which, incidentally, is what makes the Dolby system
so useful in this respect. Naturally all
this dubbing of tape cannot be com-
pared with a record, which, at worst,
is a third-generation product. Conse-
quently, a good record is quieter than
most pre-recorded tapes, and why the
record still is so strongly competitive.

The cassette seems to have caught the
fancy of the public. Would you venture
some prognostications about the future
of cassettes?
FINE: For one thing, I have no doubt
that chromium dioxide tape is a su-
perior medium for cassettes. I foresee
that a whole LP' record can be con-
tained in a package half the size of the
present cassette, running at a speed of
a half-inch per second, that will give
you a frequency response from 15 Hz
to 20 kHz. There should be no prob-
lem with heads. The cassette will be
"bubble" packaged, which should cost
less than a cent and a half, and the
total cost will be less than a record
pressing. I envision this within 5 years.

What about signal-to-noise ratios?
FINE: It will be far superior to what
we have now. You see, head technology
is moving at a tremendously pace.
This is due to the stimulus of sophisti-
cated telemetry systems in the space
program, where they are doing incredible
things with frequency response at
slow lineal speeds. I am certain many
of these advances will "filter" down to
the consumer level.