Lawrence J. Scully

Adventurers in Sound

He Who Lathes Best

by FRITZ A. KUTTNER

NO ONE can be in the record business very long without hearing the name Scully. I forget exactly when I first heard it, but I do remember that I was impressed. Not that it meant anything to me at the time. The man who mentioned it, an audio engineer, did so in such a way that I could not tell whether a Scully was a man or a machine, but there was reverence in his voice. Reverence is rare among audio engineers. My curiosity was aroused.

The name cropped up again, from another quarter, in a week or so (it is odd how often this happens, is it not?). This time I learned that *a* Scully is a machine, whereas *the* Scully is the man who makes them. My informant was a man who coveted a Scully. "I wish," he said, "I could afford one."

I was a little taken aback, for the speaker was someone I rather envied. When he wanted a piece of recording equipment, he picked up the telephone and ordered it. Apparently a Scully was a recording lathe. I asked him, perhaps naïvely, why he didn't have one already.

"You don't know what you're talking about," he replied a little testily. "This thing costs $8,500." I knew enough to know that other lathes could be had for between $1,000 and $2,000. I didn't know whether he would ever bring himself to lay out an additional $6,500 for a Scully, but I did know I had to go and meet Scully, the man who could charge 425% of the going price for recording lathes and still make people buy them. He sounded as if he, and his machines, might be something rather special.

They are.

What I saw when I got to the Scully establishment in Bridgeport, Connecticut, was a dream of high-precision engineering, the Steinway or Rolls-Royce, so to speak, among disk-cutting lathes, and a man representing a standard of perfectionist craftsmanship which has all but vanished from modern manufacturing.

Larry — or, by his full name, Lawrence Jeremiah Scully — took his B.A. at Fordham with the class of '29, so he now must be in his upper forties. But he looks at least ten years younger, and when he begins to explain his beloved machine, his face becomes positively boyish. Of medium height, blond, Scully looks in no way like the stereotype of the inventor or the bookish indoor experimenter. His complexion suggests lots of fresh air, not midnight oil burned in the basement workshop, and the panel on "What's My Line?" wouldn't have a chance with their customary first guess.

The first few minutes of conversation with Scully, however, bring to light the quality of quiet efficiency which distinguishes the man just as it does his product. There is nothing of the egotism, jumpiness, and erratic temper we are inclined to associate with the idea of a successful modern "*inventor*." In fact, Lawrence Scully would probably object to being labeled an inventor; he likes to think of himself rather as a good artisan and craftsman.

This fits a family tradition of the Scullys, most of whom in the last few generations have been artisans, mechanics, makers of things. One of Scully's brothers, to be sure, is a surgeon, but the other Scullys forgive him his medical degree, on the grounds that he does his work with his hands and precision tools.

The Scullys, hailing originally from Ireland, now are settled in Connecticut. John J. Scully, the father of Lawrence Jeremiah, established the family's background in the recording field when he joined the industry in its infancy. From 1904 to 1918 he worked for the Columbia Phonograph Company in Bridgeport, where he contributed to the development of the early dictaphone machine. These were the old days, when record manufacturers had to build their recording equipment in their own workshops. Later, Scully Senior worked for General Industries, making phonograph motors which were delivered to the "furniture people," i.e. the makers of acoustical phonograph cabinets. In 1920 he went into business by himself to make a real recording machine, the first designed by a specialist for use by record manufacturers. It took a full year to complete; it was driven by weights, just like old grandfather clocks.

Its height was almost six feet, and the operator had to stand on a platform to run it. This first acoustical cutting lathe was sold to Cameo Records.

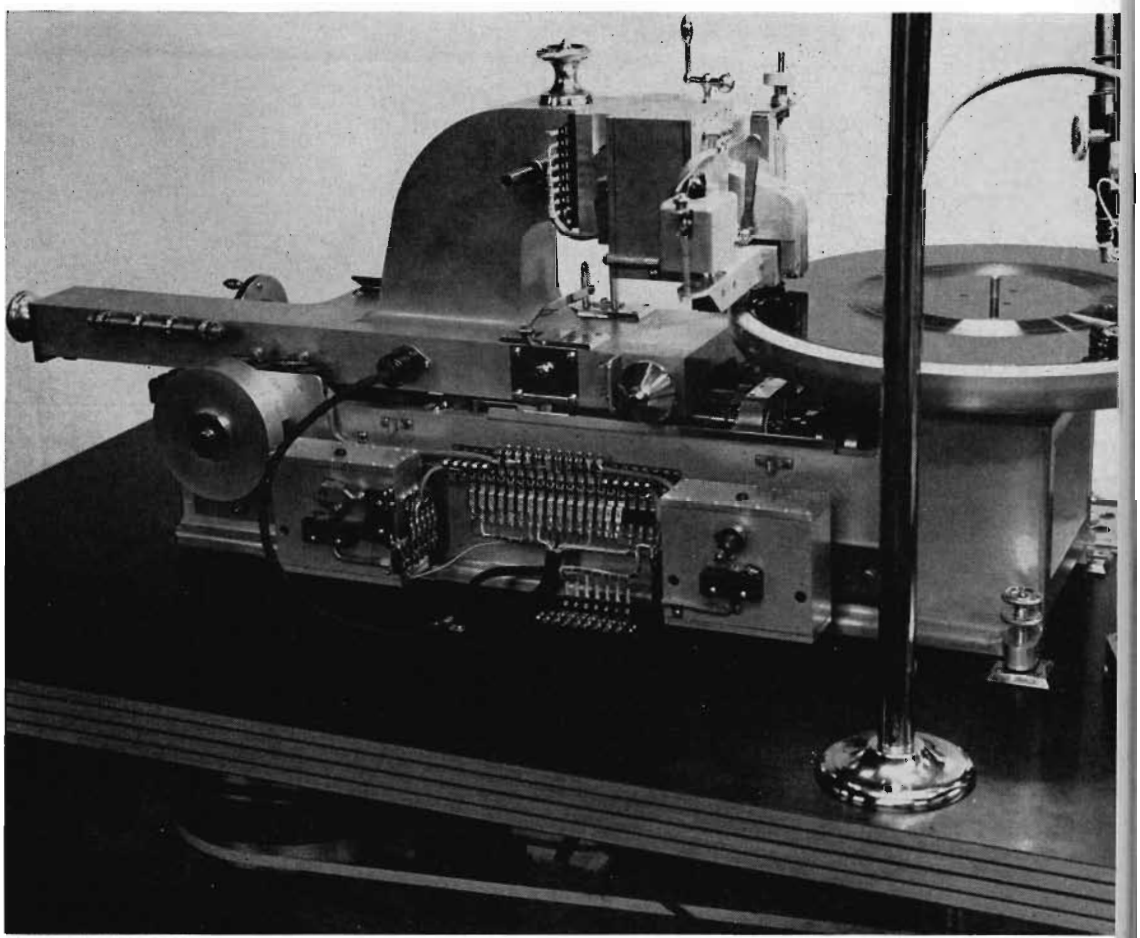
The next four years produced no more than one piece a year. High-precision mechanics and mass production don't go together, from the Scully point of view. In 1924 Western Electric bought a Scully weight-driven lathe for the demonstration of their first electronic cutting system. The cutting head assembly, Scully recalls now, was a closely guarded top-secret, which no outsider could ever set eyes upon; all recording companies, at that time, locked their cutting heads away overnight in the safe, together with the cash and the trade acceptances.

In 1925 things really began to get lively at John J. Scully's. The movie industry switched to sound and all the motion picture outfits began to order recording lathes. This boom lasted four years, but ended abruptly when some miscalculations in Wall Street plunged the nation into the Great Depression. In the same year Larry Scully graduated from college and joined his father in business, or rather in idleness, for there was a complete dearth of orders. A $28,000 bank balance saved up from the era of prosperity carried them somehow over the distance, but things were pretty difficult for both the family and the company. At one time, in 1933, they pondered for weeks whether or not to sell five beautiful completely machined aluminum castings at scrap value — $5 or $6 apiece. Lawrence's memory of these years is still painful, but he believes that working or creating under such duress matures the character. "It sharpens the senses and makes the brain inventive." When it is pointed out that his point of view has been shared by many of the great poets and philosophers, Scully looks pleased but not surprised. The self-sufficient artisan finds it quite natural that wise men should have held similar ideas on the nature of endurance and on the salutary effects of hardship on the creative mind.

Finally, in 1934, came the break that ended the years of struggle; an order was placed by RCA Victor. The Scullys rushed to the bank and applied for a $700 loan, happily waving the order form. They were turned down; they had never built up a credit background. How they finally managed to finance and fill this vitally important order, Larry doesn't remember, but they did. One thing he does recall: there was not a penny left in the house the day the lathe was installed at Victor.

For a year or so previously, Lawrence had tried to break into the public address system field, and in fact had built a complete installation — one only, and no more — for a hospital. It is still in operation. But between 1934 and 1937 Victor bought a total of twenty lathes, and Larry turned his back on public and private sound systems alike.

The Victor bonanza ended suddenly in 1938. Scully then tried his hand at making and selling beer coolers. As he doesn't care to elaborate on this episode, one may assume it was not exactly a brilliant success. Soon after this venture, George Stewart and C. A. Rackey, engineers for NBC, came shopping for recording machinery for their broadcasting studios. Thirty-six lathes went to the NBC radio stations during the next nine years, interrupted only by the war, which stopped all recording lathe production and put father and son to work on aircraft subcontracts. The one exception was a recording lathe they built in 1943 for the Navy's Underwater Research Laboratories in New London.



PHOTOS BY PAUL RADER

Art in metal: a Scully variable-pitch recording lathe.

With the coming of peace also came more prospetity. From 1945 on, orders for lathes poured in: twenty-two new machines were built in 1945; the Detroit Symphony Orchestra and all the Westinghouse radio stations took two pieces each; General Motors bought one, too. Then followed Columbia, Decca, Capitol Records — and

Western Electric sent a most welcome communication to the effect that they would like to buy twenty-five machines. Foreign companies began to join the throng, and now Scully lathes are running in England, France, Germany, Japan; record makers in Italy, Mexico, Chile, Australia, New Zealand, the Philipines, and even in Soviet Russia are happy with their Bridgeport-made machines.

This highlights a peculiar problem. Scully gets few replacement orders, because Scullys simply don't wear out. Rarely is there heard of a Scully built twelve or sixteen years ago which the owner is willing to sell for $2,500 or $3,000. When he bought it in the early Forties he had paid somewhere around $2,500. This is why I call the machine the Steinway or Rolls-Royce of recording lathes, and for the same reason I would rather buy a Scully for an investment than Mutual Funds. You can't lose on these lathes, and they are considerably more fun to play with than stocks and bonds.

Particularly is this true when you recall that the $2,500 price tag of the past has become the $8,500 of the present. This phenomenon began to develop in 1948, soon after the advent of the microgroove record, when father and son sat down to develop a most exciting innovation which probably has helped as much as any other single factor to make long-playing records the high-fidelity bargain they are. "Variable pitch" is the magic term. If you will bear with me, I will explain it.

Until quite recently, recording lathes cut a fixed number of lines (grooves) per inch of diameter on every disk: 96 lines was most frequent for 78s, and for LPs it varied between 200 and 280 lines. Once the number of lines for a given recording had been selected, it had to be maintained consistently from beginning to end. A certain "feed screw" was mounted into the lathe assembly, which moved the recording head steadily forward at the pitch selected. ("Pitch" is the distance the screw would advance in one revolution.) For soft music and little bass on the tape, the grooves were more widely spaced than desirable, with the result that the cut was uneconomical. With high volume and strong low frequencies, the fixed pitch was too narrow to accommodate the passage in full, and the engineer had to reduce volume and bass in order to prevent the stylus from overcutting the grooves. This meant serious loss of quality and fidelity which could be compensated *in part only* by expensive playback equalization controls. For years the Scullys toiled on the problem, and by 1950 they had solved it: pitch variation at any given moment from 70 to 400 lines, or from 105 to 600, or even from 140 to 800 lines per inch. Instead of several interchangeable feed screws with fixed pitches, a highly complex and smooth-working mechanism was devised and introduced into the machine, and today the engineer may set the advancing speed of the cutting head differently from moment to moment. He can cut a violin solo played in softest pianissimo at 600 or even 800 lines per inch, three times narrower than one could a few years ago; ten seconds later, when the whole orchestra's tremendous outburst with blaring trombones and tubas would have destroyed any master disk made by the earlier method, the engineer turns a knob and widens the groove distance to 70 or 100 lines per inch — and a smooth cut will engrave all the vigor and grandeur which had to be throttled away until recently. Inclusion of this device raised the price of the Scully lathe to $7,300. To record makers, it was worth it.

All through 1950 the family team worked on the new variable pitch lathe to have it ready for the Audio Fair in the Fall. While work was progressing on the final assembly, Scully Senior died, without an opportunity to see his achievement in actual operation.

Since then Lawrence Scully has been on his own as a businessman and constructor of miracle machines. The last five years have shown clearly his aptitude in both fields. Pondering on the consequences of the introduction of variable pitch, he realized the existence of a problem almost impossible of solution by even the most musically erudite of recording engineers. If the variable pitch feature was to work at full efficiency, the operator of the machine had to develop a fantastic timing accuracy: every low bass note, every slight increase in volume had to be anticipated by about two seconds — the time it takes the turntable to complete one revolution. If the pitch were not widened by the lathe operator sufficiently ahead of time, the stylus might still overcut the *previous* groove and destroy an otherwise perfect master disk. The knowledge of the musical score and of the performance essential for efficient operation of the *Continued on page 147*

ENCORES

ROSSINI's *Otello* had awakened the germs of my musical instinct; but the effect *Don Giovanni* had on me was very different in its nature and results. I think the two impressions might be said to differ in the same way as those produced on the mind of a painter called from the study of the Venetian masters to the contemplation of the works of Raphael, of Leonardo da Vinci, or of Michelangelo.

Rossini taught me the purely sensuous rapture music gives; he charmed and enchanted my ear. Mozart, however, did more; to this enjoyment, already so utterly perfect from a musical and sensuous point of view, he added the deep and penetrating influence of the most absolute purity united to the most consummate beauty of expression. I sat in one long rapture from the beginning of the opera to its close.

The pathetic accents of the trio at the death of the Commendatore, and of Donna Anna's lamentation over her father's corpse, Zerlina's fascinating numbers, and the consummate elegance of the trio of the Masks and of that which opens the second act, under Zerlina's window — the whole opera, in fact (for in such an immortal work every page deserves mention), gave me a sense of blissful delight such as can only be conferred by those supremely beautiful works which command the admiration of all time, and serve to mark the highest possible level of aesthetic culture.

— *Charles Gounod:* **Autobiographical Reminiscences** (*London, 1896*).

able to minor ills, but only a few cartridges are so constructed as to permit any remedial action by the user. In variable-reluctance types with detachable styli, the stylus bar can be checked visually for centering between the pole pieces, and can be straightened with tweezers if out of alignment. The only FM pickup currently on the market is supplied with complete instructions for trimming up the oscillator and stylus position. But for most other cartridges, there isn't much that can be done outside of keeping their styli free of dirt and dust.

The factors dealt with thus far are primarily those which affect a pickup's performance per se. Tone arms and the effects of auxiliary equipment on a pickup's performance will be dealt with in a subsequent article.

SCULLY

Continued from page 64

lathe clearly might exceed the capacities even of a veteran orchestral conductor. There also was the additional difficulty of precisely estimating the amount of additional groove-spacing desirable for any musical passage forthcoming from the master tape. In an effort to solve these problems Scully got to work, with W. R. Dresser, an electronics engineer, and after long experimentation came up with an answer: automation.

On the recorder used for mastering playback, a second monitoring head is mounted before the actual playback head. From the supply wheel the tape is led, via a system of rolls and guides, to this "monitoring station" set one or two seconds ahead of "cutting time." Here the volumes and frequencies are measured, and by way of a complex system of amplifiers, potentiometers, feed motors, and adjusters, the variable pitch control is continuously activated and adjusted to whatever pitch width is needed next. An "excursion control" and a "return control" (a time-delay network) see to it that the new pitch is exactly right for the following passage and that it returns to a lower level with a sufficient amount of delay to protect the preceding groove from being cut into.

Really to appreciate this automatic feature one has to see it in operation; it is almost uncanny. Larry

Continued on next page

SCULLY

Continued from preceding page

demonstrated for me the cutting of a "harmless" guitar passage. From the monitoring speaker came the sound of a softly strummed solo, and the automatically controlled pitch dial swayed gently and mysteriously to and fro somewhere between 320 and 360 lines per inch; the disk on the lathe revealed an extremely fine and narrow cut in the microscope. Then the guitar melody began to work toward a climax, and suddenly the dial jumped high, to about 220 lines. Two seconds later the final tone sounded from the speaker, a beautifully sonorous bass E, the instrument's lowest tone. The lathe had cut one single wide-spaced line and then stopped automatically — the piece had ended.

In some awe you stand in front of the machine, realizing that now any high-school youngster can cut a master disk more nearly perfectly than anyone could have done three years ago. The high-priestly art of fine master-cutting, jealously guarded and proudly executed so long, now requires little more skill than it takes to operate a TV set. Push one button, and the lathe cuts a clean lead-in spiral; button No. 2 will cut a narrow spacing band; the next one a somewhat wider band; No. 4 a beautiful lead-out spiral.

This is what you can see on the outside of the machine, but its greatest beauties of workmanship are hidden beneath and behind the shiny surfaces. Take that turntable, for instance. It appears to be simply a large piece of round polished metal, heavy enough to spin evenly around. But through its surface many tiny holes are bored, all of them leading to a system of canals cast into the bottom of the table. Air is sucked in at high pressure through the holes and canals, thus snugging the disk tightly and evenly to the turntable's surface. The idea: to prevent even the slightest vertical sway of the cutting stylus and to avoid any variation in the depth of the cut, both of which may show up as minor distortions in the final pressing. Other parts of the mechanism cannot be seen at all, but only appreciated from a verbal account of their functioning.

There is the feed-screw which, after accurate machining, is placed in an automatic lapping machine especially

Continued on page 150

SCULLY

Continued from page 148

designed and built by Scully for this purpose. This automatic mechanism continually feels the screw and makes adjustments in the lap to correct any minute errors in the screw. The lapping process in this machine lasts from twenty to thirty hours. In a similar way all other parts are treated, resulting in a degree of precision found in hardly any other contemporary manufacturing process. One realizes easily why this magnificent instrument with its new automatic features sells at the price it does, and why Scully is not making more than about one piece per month. This furnishes plenty of work for himself and for the nine skilled craftsmen working with him in his Bridgeport machine shop. So far only fourteen machines with the automatic variation feature have been put into operation since manufacture of this latest model started in 1955. The production of twelve, or even twenty, lathes a year is not enough to make anyone rich. But Larry Scully now makes a living in moderate comfort and in freedom from worries other than those routine to any normal business activity.

Relaxed in his pleasant, unpretentious home, an admitted family man, he enjoys light records; classical music is not really to his taste although he has done so much to give us the finest classical disks we could hope for.

When Scully is hit by an idea or inspiration, he sits for hours in an armchair, or — late at night — even in bed, with a pad of letter paper on his knees, scratching alternately on it and at his head with a pencil. His creative work is done always at home, never at the factory. For fun and exercise, he occasionally plays a round of golf. He claims to have no hobbies; he feels he has made both avocation and vocation of his one great enthusiasm: conceiving and building beautiful precision instruments for the making of records.

However, in his house there *is* a home-assembled hi-fi system, with loudspeakers projecting through the living-room wall into the adjoining pantry. The system is unfinished, of course. Every genuine system must be, and this one built by a perfectionist is no exception. In the basement, conversion work has produced an amusing mixture of bar, playroom, and playpen, with all the woodwork, paneling, floor covering and interior decoration by Larry, with the assistance of the youngsters. The area I call the playpen contains a tremendous array of railroad tracks, trestles, crossings, switches, trains and locomotives, with diesel engines, all operated and steered by remote-control buttons, knobs, and dials. I voiced the opinion that it was, possibly, not Judy and Jerry alone who played with the basement railroad, and I delight to report that Larry's feeble attempts to clear himself of suspicion were completely unconvincing. For hours I searched grimly for at least *one* sign of human imperfection in this perfectionist atmosphere, and finally I found one. The piano is dreadfully out of tune.

TRADER'S MARKETPLACE

Here's the place to buy, swap, or sell audio equipment. Rates are only 30¢ a word (including address) and your advertisement will reach 60,000 to 100,000 music listeners. Remittance must accompany copy and insertion instructions.