Analysis of Early Primrose Recordings with Software Tools

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In many ways, the viola has been the neglected younger sibling of the violin, though it is at least as old as the other string instruments. Solo compositions for and performances on the viola were scarce until the mid-twentieth century. Though not the first violist to record, William Primrose (1904–1982) was one of the early ones and brought attention to the viola when few people thought of it as a solo instrument. So although Primrose did not begin recording until the late 1930s, his recordings in some sense capture "early" viola performance. Modern technology allows us to transfer old LP and 78 recordings into a digital form for detailed analysis. A multitude of programs exist for editing and analyzing sound samples. I used the free[1] program Audacity to work with and dissect three Primrose recordings: A 1938 performance of Ernest Bloch's *Suite for Viola and Piano* and two performances of Hector Berlioz's *Harold in Italy* with the Boston Symphony Orchestra (a 78 disc from 1944, with conductor Sergei Koussevitzky, and an LP from 1958 with Charles Munch). Much is known about Primrose's education, career, and philosphy of the viola; he has written a memoir and been interviewed extensively by scholars, particularly David Dalton. I was particularly interested in listening to the recordings of Primrose in light of his own commentary on viola performance. While many of his ideas do not directly translate into an identifiable aural characteristic, such as posture and bow hold, there are aspects of his playing that can be linked to his written philosophy. Left-hand techniques, like vibrato, portamento, and fingering choice, produce the most readily measurable changes in sound on a recording.

As an early viola star, Primrose is often compared to Lionel Tertis, who is often cited as

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[1]Audacity is distributed under the GNU General Public License and is available at: http://audacity.sourceforge.net/

the first advocate of the solo viola, but Primrose rejected the comparison. He regarded Tertis's style as distinct and nothing like his own (Primrose 165). His style is more naturally traced pedagogically, where his story is ironically similar to that of many violists today. His father was "entranced" by the violin (10), but like many musicians of his time, he regarded the viola as an inferior instrument (19). Thus Primrose began his study on the violin, eventually taking lessons from the well-known violinist Eugène Ysaÿe (1858–1931). According to Primrose, Ysaÿe influenced him the most directly, though Primrose was also inspired by recordings of other violinists, including Kreisler, Elman, and Heifetz (Dalton 14). In his writings, Primrose frequently references Ysaÿe as the source of various performance techniques, from bow use to vibrato.

Ysaÿe's career peaked around the turn of the century (Stockhelm), so he was near the end of his public life and in declining health when Primrose became his student (Primrose 53). The violinist was known especially for his unusual bow grip, mastery of technique, and innovations in performance style (Stockhelm). His most important teacher was the nineteenth century virtuoso Henry Vieuxtemps (1820–1881). Many of the high-level descriptions of his playing are also applicable to Ysaÿe and Primrose. Often compared to Paganini (Ginsburg 25), Vieuxtemps was acclaimed for extraordinary technique, but like Ysaÿe and Primrose, he always considered technique to be subordinate to emotional content (62). Vieuxtemps's playing was refined and elegant (65), qualities which derive from smooth right-hand and right-arm technique. Primrose points to Ysaÿe's bow hold and low arm position (Primrose 61) as critical factors absorbed into his own playing; while this positioning was partly innovative, it was also probably influenced by Ysaÿe's work wtih Vieuxtemps, as the virtuoso was known for his mastery of the bow. Finally,

Vieuxtemps was a violist as well, especially in quartet settings but occasionally as a soloist (Ginsburg 97). So as far as there was a "viola tradition" in the 1800s, Vieuxtemps would have been part of it.

Primrose like to distinguish between violinists who play the "big fiddle" (not understanding the subtle differences between violin and viola) and true violists (Menuhin 173). Since Vieuxtemps probably had more experience on the viola than many of his contemporaries, and Primrose claims to have inherited some measure of technique from Ysaÿe and Vieuxtemps, we can view Primrose's playing as rooted in a nineteenth century tradition. Musicologists place Ysaÿe and Vieuxtemps in the "Franco-Belgian School" (Ginsburg 59). Primrose preferred their style of playing over the German ideal, which he viewed as "dry" and "insensitive" (Primrose 199). His style tends to use more vibrato and less portamento in a typical modern fashion, but his famous sound and approach to tone are somewhat traceable, despite his statement that the viola is an "instrument without tradition" (Dalton 196). The viola may have some tradition after all.

Primrose insisted that the viola had its own character, and not all violin approaches would work on the viola. He felt that arm vibrato was superior on the viola, rejecting wrist vibrato as too fast (Menuhin 188). The viola has subtle differences in tone production (Dalton 9). For example, it tends to speak more slowly and does not project as well, so that it is easier to produce an unattractive sound on the viola than the violin. But there are still many nuanced, beautiful sounds that can be produced with subtle control. This requires greater use of open strings (91) and more harmonics and string crossings (114) to exploit the different tone colors available on the viola. Primrose adapted fingering strategies, including extensive use of open strings, low

positions, half-step shifts , and various fingering tricks from Ysaÿe (Primrose 56). These tend to avoid uniformity in favor of cleaner, brighter, more resonant sounds. Right-hand technique was also received from Ysaÿe; in particular, Primrose was concerned with avoiding bow pressure that might produce unwanted noise (Dalton 66). He preferred the upper third of the bow for detache, to avoid the "scrubbing" effect of slow-speaking strings (100). In all cases, variety and beauty were his primary concerns.

Two of the more easily measurable aspects of viola playing are vibrato and portamento. One feature of Ysaÿe's playing that Primrose did not adopt is the slide into and out of the same note, which was considered old-fashioned by most performers in the mid-twentieth century (Primrose 57). Still, Primrose uses portamento in varied ways, more or less pronounced depending on the character of a passage. This can be heard in the Bloch and Berlioz recordings. He also called for many shades of vibrato, saying that vibrato should "enchance what the bow is doing" and that vibrating too intensely for too long is undesirable (161). Ysaÿe's vibrato varied from heavy to almost none, and Primrose conciously embraced this diversity (Dalton 112). However, one must be careful not to read too much into Primrose's comments on limiting vibrato. "Historically informed" performers of Baroque music often discard vibrato or use it only as an ornament, an approach that is totally different from Primrose's. Like Kreisler and later string players in the modern style, Primrose incorporates steady vibrato into his default sound. A quick examination of his recordings will show that he does not play without vibrato very often. His meaning is more subtle and becomes clear with the study of his recordings.

Having acquired some idea of what Primrose had to say about the viola and where he was coming from, I began transferring his recordings into my computer. Converting old recordings

into a modern digital format is always an awkward process. The best a studio can hope to do is to avoid any loss of fidelity, so that the new recording has no more hiss and crackling than the old one. (Of course, it is possbile to apply noise reduction and correction algorithms, but then there is the danger of altering the timbres in the recording. I chose not to apply such corrections.) However, a simple transfer can be made by any researcher using methods that are adequate, if not perfect. The advantages of having a digital version of a recording are great, especially for performance analysis.

The ideal setup is to have a player that outputs a signal directly to a computer. When transferring the 1958 Berlioz recording from LP, I was able to use a library LP player with USB output. The USB output was connected to a computer and the LP recorded silently in real time. This avoids any background noise or additional loss of signal. Such players are readily available for LP and magnetic tape formats. Unfortunately, it can be more difficult to convert older records. This particular LP player was not able to read discs in the 78 format, so I had to find an alternative.

For the 1944 Berlioz and 1938 Bloch recordings, I first attempted to record from a library 78 player through an amplifier and into my computer. But the equipment failed to produce a usable signal. The output was distorted and fluctuated in volume. This persisted regardless of any adjustments I made on the computer or on the equipment, so I resorted to another option. The library had old 78 player with a built-in speaker, but no line out. I acquired a high-fidelity directional microphone and planted it in front of the speaker. After some adjustment of the equalizer controls on the player and the microphone input settings on my computer, I was able to record the 78s with decent quality. The microphone was sensitive enough that the resulting

digital copy sounds very similar to the audible output from the 78 player. I made the transfer in a library work room that is in a mostly isolated corner of a basement, so external noise was usually not a problem—though at one point I was delayed by the sound of a piano lab bleeding through the wall that was picked up by the powerful microphone.

Once the 78 discs were transferred, I spliced together sides where a single movement was divided to fit into 4.5 minute chunks. Editing was facilitated by the free program Audacity (Figures 1-2). The splicing process is not terribly complicated, although the different types of divisions provide various challenges to achieving a smooth transition. I was fortunate to find that the various sides in each recording had the same pitch, tempo, and recording quality, so no global revisions were necessary. If the pitch were off, the speed of the 78 player could be adjusted, or a program like Audacity can alter the pitch and/or tempo (though changing one without the other in proportion would be an approximation and might introduce distortion). Some splices were straightforward attempts to minimize noticable jumps in the sound, while others required minor artistic decisions about tempo or dynamics.

In the Bloch suite, the first transition at[2] (5)+1 is over a held harmonic note in the viola. The timbre does not match exactly from one side to the next, but this is fixed with a simple cross-fade, where the old side fades out at the same time that the new side fades in. I had to decide how long to make the resulting note, but since it is effectively under a fermata, there is a wide range of lengths that could work. This joining technique also works in the second movement, where a D-sharp in the piano is played on both sides at (8)+6.

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[2]I use the convention that a number in parentheses is a "rehearsal number," and any second number is an offset from a rehearsal number. For example, (5)+1 is one measure *after* rehearsal 5, or the second measure *of* rehearsal 5.

Another type of transition uses what we might call "unelision," where an elided cadence has been split over two sides. At (14)+7 in the first movement, the last note of the viola is played alone on one side and the piano begins without the viola on the next side. Since these events are supposed to be simultaneous, I lined them up in Audacity. This results in a doubling of the background noise where the tracks overlap, so I used a combination of noise reduction (on one track) and fade out to smooth the transition. A similar process reconstructs the elision of left and right hands in the piano at (14) in the last movement. Fading out a piano chord under another track can happen quickly without being noticiable, since the piano already has a naturally short decay.

The 1944 Berlioz recording required some artistic choices. For example, at (4) in the first movement, the side switch occurs over a grand pause after a ritardando. The length of the pause in the spliced version is determined entirely by the person doing the splicing. I worked with it for a while, trying different amounts of rest, until I found what was to me a satisfying duration. The next transition is tricky because it occurs over a barline in tempo at (8). I had to make micro-adjustments until the timing was perfect to avoid a noticable disturbance of rhythm, and I used a tiny cross-fade to smooth the join. One odd thing about this join is that Primrose ends the old side forte and aggressive, while on the next side he enters with the orchestra, and both are playing quietly. I chose to leave his dynamics intact, creating a subito piano effect that is not indicated in the score; alternatively, I could have used a partial fade out on the viola solo to force a dimenuendo. There is no way to make the entrance on the new side louder without significant distortion.

Not all splicing is entirely satisfying. In the second movement of the Berlioz, a join

occurs over the double barline at (27)+8. After the usual cross-fading and alignment, the ties in the upper strings and bassoon are lost. Nothing can be done to recover this without serious artificial editing, e.g. using a fragment of sound to build a loop and create a fake hold. However, the simple methods outlined before will work in most situations; the rest of the Berlioz is spliced in the same way. In this case, most listeners will not hear the broken tie unless they are carefully following a score.

Figures 1-2 illustrate the use of Audacity for splicing.

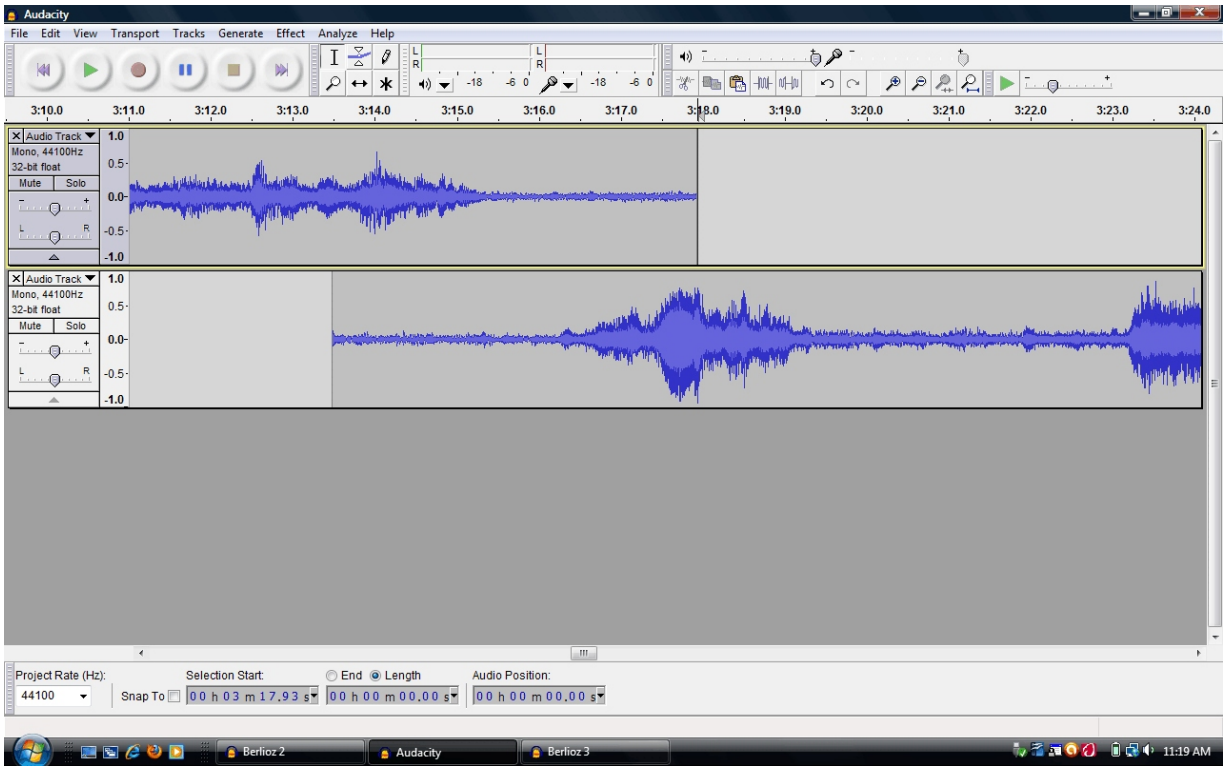

Figure 1. Lining up two tracks in Audacity.

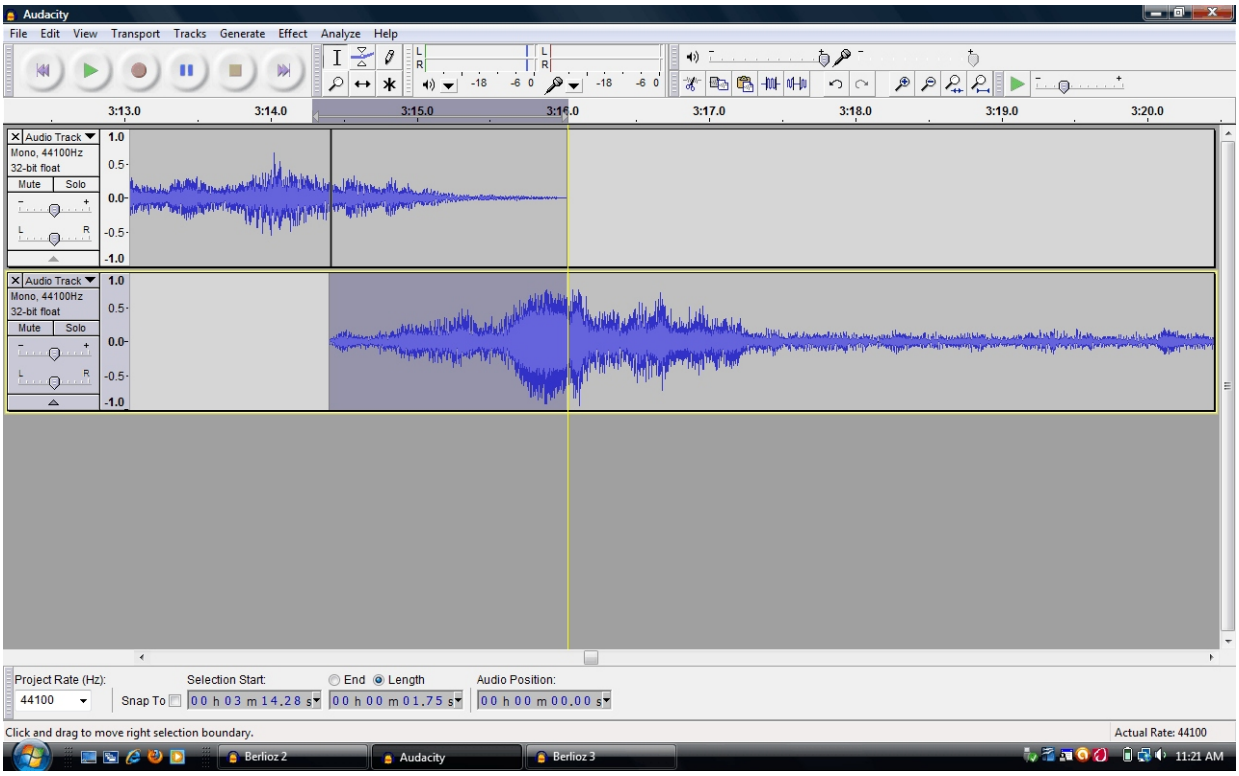

Figure 2. Fading out the old track (done) and fading in the new one.

Once the recordings were transferred to my computer, I listened to make general comparisons. The Bloch was recorded in 1938, near the beginning of Primrose's solo career. Both Berlioz recordings were made with the Boston Symphony, but with different conductors, and by 1958 (the second recording) Primrose had changed violas and was much later in his public career. Despite the chronological separation, the recordings are remarkably similar, especially those of *Harold in Italy*. The Bloch tends to be more intimate and expressive at times, with faster vibrato and more portamenti, but this is natural for a chamber work reflecting the Jewish influences of the composer. The most noticiable tempo differences in the Berlioz can probably be attributed to the different conductors.

On first hearing, the two Berlioz recordings have much in common. The tone is similar, as far as I can tell, though the later LP format has less hissing. Tempi are often very close, with a notable exception in the March of the Pilgrims. The 1958 recording is much faster at the *canto religioso* after (27). Otherwise the 1944 recording is only marginally slower in most movements. Primrose uses similar bow strokes, often preferring detache when staccato is printed. This produces notes that are separate but less likely to be covered by the orchestra—an important effect in the heavily orchestrated work. Primrose observed that Harold in Italy is more like a tone poem with an important viola part than a concerto (Dalton 196). The viola must work to be heard above the orchestra in many passages. At (7)+3, Primrose is bold enough to take the run up an octave for this reason. Minor recomposition of this nature was not out of the question for Primrose, though some performers would object on philosophical grounds. His primary concern was always, "How does it sound?" (Dalton 106).

One factor that is relatively easy to measure from a digital recording is vibrato speed. I selected passages where the viola is heard clearly and took samples of long notes and slow measures. Vibrato is easiest to measure on a single note, although groups of several long notes can also work. Once I had selected a section of the recording, usually 2-3 seconds in length, I used the "change tempo" feature in Audacity to slow the section to half speed. Audacity's "change tempo" algorithm compensates to keep the music at the same pitch at the cost of some distortion when the tempo adjustment is large. "Change speed" adjusts the tempo without distortion but changes the pitch in proportion. A 50% tempo reduction was usually enough to count vibrato oscillations accurately, and the distortion was not enough to disrupt the counting process. For each sample, the oscillation count divided by the time in seconds gives the average

number of oscillations per second (e.g. 5 Hz). The inverse of this measurement is the period from one oscillation to the next (e.g. 0.2 sec).

I consolidated the measurements from various passages in the Berlioz recordings, along with a few measures from the Bloch, into a spreadsheet for comparison (Tables 1-3). The "count" column shows the number of pitch oscillations in each sample, and the "time" column shows the length of each sample. The remaining two columns show the speed of vibrato. Primrose's vibrato tends to be slightly slower than that of the violinists measured by Daniel Leech-Wilkinson in his survey of vibrato (ch. 5, ¶8). This substantiates Primrose's claim to prefer slower vibrato on the viola. A variety of vibrato speeds is also apparent. The Bloch samples are from a passionate section of the piece, so Primrose uses a faster vibrato. In the Berlioz, the slowest vibrato is measured at the first viola entrance. Here, the viola has a gentle tune in the lower register accompanied by the harp, so a slow vibrato is sensible. Primrose actually uses a slightly slower vibrato in the second phrase on both recordings. The fastest vibrato was measured after (36), at the "Reminiscence of the pilgrims' procession." Perhaps the extra expressivity associated with faster vibrato is meant to evoke nostalgia as the theme from an earlier movement returns.

	Count	Time (sec)	Rate (Hz)	Period (sec)
(2)+8	20	3.7	5.4	0.19
(2)+9	22	3.8	5.8	0.17
(2)+12	18	3.7	4.9	0.21
(2)+13	20	4	5	0.2
(23)+4 to 5	17	2.9	5.9	0.17
(23)+10 to 11	18	3	6	0.17
(24)-1 to (24)	15	2.7	5.6	0.18
(33)-7	13	2.5	5.2	0.19
(33)-6	15	2.2	6.8	0.15
(33)-5	13	2.2	5.9	0.17
(33)-4	12	2.1	5.7	0.18
(33)-1	10	1.8	5.6	0.18
(36)+2 to 3	18	2.5	7.2	0.14
(36)+4 to 5	21	3.1	6.8	0.15

Table 1. Vibrato in Berlioz 1944 recording (78).

	Count	Time (sec)	Rate (Hz)	Period (sec)
(2)+8	21	3.4	6.2	0.16
(2)+9	18	3.4	5.3	0.19
(2)+12	15	3.3	4.5	0.22
(2)+13	17	3.5	4.9	0.21
(23)+4 to 5	14	2.3	6.1	0.16
(23)+10 to 11	9	1.5	6	0.17
(24)-1 to (24)	10	1.9	5.3	0.19
(33)-7	11	2	5.5	0.18
(33)-6	11	2.1	5.2	0.19
(33)-5	10	1.8	5.6	0.18
(33)-4	11	2.1	5.2	0.19
(33)-1	10	1.8	5.6	0.18
(36)+2 to 3	14	2	7	0.14
(36)+4 to 5	20	2.7	7.4	0.14

Table 2. Vibrato in Berlioz 1958 recording (LP).

	Count	Time (sec)	Rate (Hz)	Period (sec)
m. 2	20	3	6.7	0.15
m. 6	21	3.5	6	0.17
m. 8	23	3.8	6.1	0.17
m. 14	20	3.3	6.1	0.17

Table 3. Vibrato in Bloch, third movement (78).

Another feature of Primrose's vibrato is that it is not steady from one note to the next. One particularly obvious example is in the 1944 Berlioz recording. In measure (33)–7, vibrato rate is 5.2 Hz, and the following measure is 6.8 Hz. The intensification is audible and almost certainly the product of a deliberate artistic choice. In all the samples, the overall range of vibrato speed spans about 4.5 to 7 Hz (average period 0.22 to 0.14 sec). We can see that, as Primrose stated in his commentary on performance, variation of vibrato is important to his style. Though he vibrates almost all the time in slow passages, individual notes may be vibrated slower or faster.

Slowing sections of the recording can be useful for portamento and fingering analysis. I did this for many passages in the Berlioz, looking for changes of fingering or slides between the 1944 and 1958 versions. Many of the fingerings appear to be identical. Differences seemed more common in slower passages. For example, at (3)+6, both recordings include a slide down to A, but only the later one has a slide up to E-flat. Two measures later, the 1944 version includes a "gratuitous" slide on the repeated C. The insertion of a portamento like this one that is technically unnecessary can add expressivity. A special kind of "fake" portamento occurs at (4)–2 in both recordings, where Primrose slides down to an open string. Since the ending note is not fingered, the performer must slide toward the scroll and then smoothly release the string, simulating a portamento to the lower note.

A quick passage after (13) illustrates Primrose's use of open strings for extra resonance and brighter sound, as well as harmonics for color effect. I listened to the passage under tempo and recorded the audible fingering clues, which were identical in both recordings; Primrose must have liked the fingering to continue using it for two decades. Open strings tend to be a little

brighter, as stopped strings are slightly dampened by the human finger. Also, the pitch of an open string is always steady and always the same, where a stopped note (even a fast one) can be vibrated or adjusted in pitch. Harmonics have a similar smooth and bright quality to open strings, although they may be "thinner" (having fewer composite frequencies) but cannot be confused because no natural harmonic produces the same pitch as any open string. In the passage after (13), open strings can be heard at the G in (13)+5, the D in (13)+6, the A in (13)+7, and the G in (13)+11. The effect in (13)+6 is interesting, as Primrose slides up to a harmonic on the D string at the end of the measure, jumping to the A string for the same note in the next bar. Then he returns to the D string in the following measure. So (13)+5 is played sul G, (13)+6 is sul D, (13)+7 is sul A, and (13)+8 sul D. Each measure is on a different string, even where the notes do not naturally suggest this fingering; the result is a sparkling variety of colors, with the timbre shifting in rhythm for several bars.

Modern software lets us take a closer look at old recordings and analyze details that are otherwise difficult to hear. This can be especially useful when applied to the performances of an important soloists who has left written commentary on performance style. With no audio to analyze, we are left without a frame of reference for phrases like "fast vibrato" or "frequent portamento." But with Primrose, we are able to interpret his writing in context. He uses varying speeds of vibrato, which can be measured with careful examination. Often his fingering choices result in audible effects that are more easily heard when magnified by software tools. Portamentos, harmonics, open strings, and other fleeting devices can be identified more accurately at slow tempos. Digital transfers offer one more practical benefit other than analysis: long movements that have been split over multiple sides can be spliced together, in most cases

hiding the switch from the listener. With the help of technology, the modern musician can enjoy and analyze early viola recordings better than when they were made.

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