In Theory Only 6/8   19

An Interesting Global Rule for Species Counterpoint

David Lewin

The following scenario must play itself out a hundred times a year. The instructor of a course in species counterpoint transmits to the students an elaborate set of rules for two-part exercises in first species. A student hands in an exercise which obeys those rules perfectly, only to be met by the instructor's criticism that the result is "not musical." "Unfair," cries the student loudly or, what is worse, silently. The instructor, in turn, feels profoundly uneasy at having to enforce strict obedience to a set of somewhat arbitrary rules while also applying an undefined criterion of "musicality" to a melody comprising ten or twelve whole-notes.

After suffering the indignity of this scene a couple of times from the instructor's side, I succeeded about fifteen years ago in finding an additional rule which, when strictly followed in conjunction with traditional rules, by and large excludes the production of exactly those solutions generally criticized as "unmusical." In this paper, I shall discuss the rule as it applies to two-part first species writing in Palestrina Style; the rule applies equally well to other species and other styles, in two or more parts. (Due to cadence exigencies, certain adjustments must be made in exercises involving three or more voices.)

The rule has survived the practical test of four or five counterpoint courses I have taught since formulating it; I offer it here first and foremost for its pedagogical utility. Beyond that, application of the rule involves an interesting way of listening analytically to the global structure of modal melodic lines; such listening has important linear and rhythmic implications. Part I of this paper points out such implications in various first species lines presented to exemplify the rule.

As it turns out, the rule is also useful in connection with computer programming, to produce quickly all legal solutions for a given exercise. Part II demonstrates how the rule functions in a program I wrote some ten years ago for ("musical") first species counterpoint in Palestrina Style. We shall see that the rule leads to computing efficiency when, and only when, it is replaced by a formally equivalent rule which applies to exercises being composed backwards.

Now, for the task of computing all legal solutions for a given exercise, in order to check that the rules will produce essentially those solutions and only those solutions one intuitively wants, the method of generating solutions is irrelevant: computational speed and efficiency are the only criteria at issue. But the fact that the rule becomes much more efficient to apply when one composes exercises backwards is theoretically interesting in itself. Part III explores some formal theoretical implications of that fact.

20   Lewin, Species Counterpoint

In Part IV I discuss aspects of the listening process, in light of various matters raised over Parts I through III. The discussion highlights problems of style, musical syntax, finalism, expectation, implication et alia, as these problems are manifested in a simple context. I suggest it is advantageous to argue these issues in such a simple, even artificially simple, context, rather than in connection with extended masterworks of eighteenth and nineteenth century European tonal art.[1]

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1.   In this connection I am thinking particularly of the issues raised by Eugene Narmour in *Beyond Schenkerism* (Chicago: University of Chicago Press, 1977), and of the later discussions of those issues by Narmour's critics.

Part V returns to a pedagogical context, putting the issues of Parts I through IV into a working relation with the actual teaching of elementary species counterpoint.

PART I: The rule itself

Our imaginary instructor, criticizing a student's exercise as "unmusical," probably means that the line flies apart somehow into an ineffectual congeries of disparate melodic gestures. As Jeppesen puts it, "The melody must be quiet and sure in its movement, so that it is felt as an individuality which knows where it is going and not as a mere victim of circumstances wandering willy-nilly here and there."[2] All

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2.   Knud Jeppesen, *Counterpoint*, trans. Glen Haydon (New York: Prentice-Hall, 1939), p. 109.

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counterpoint texts contain some such piece of advice, and it is not hard for a student to grasp the point intellectually. What makes such a stricture unfair is that it simply advises the student to avoid disorganization and lack of direction without indicating technically how these qualities are to be avoided. The student is as eager as anyone to avoid disorganization, but it is the task of the instructor and the course, not the student, to ensure the desired result; that is, after all, the reason the student is taking the course.

When one thinks about "an ineffectual congeries of disparate melodic gestures," one can analyze more exactly what typically goes wrong: the line splits into two or more disconnected active registers; the activity in at least one of these registers never comes back to rejoin the main melodic gesture that heads toward the cadence. In Example 1a, for instance, one waits after the fourth note of the melody for the high C to rejoin the lower register. This expectation can be maintained for some time, but once the cadence has been reached in the lower register, time has run out and the frustration is definitive. I call the high C in question "hanging"; it hangs in mid-air, waiting for a suitable note to come along later and connect it to part of the line that will eventually get to the cadence. Since the cadence is in a lower register, one awaits specifically some B or B-flat, a step below that C, to begin an eventual connection of the C with events in the lower register. One anticipates something along the lines of Examples 1b and 1c.

To print this page, select "Print" from the File menu of your browser

In Theory Only 6/8   21

Example 1:

a)   b)   c)

Example 2:

a)   b)   c)

Example 3:

a)   b)   c)

(V ———— i)
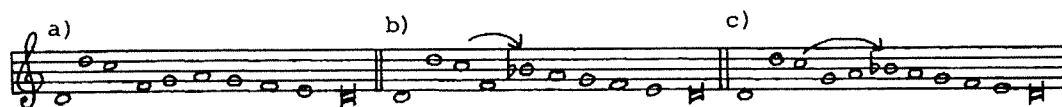
     In Example 2a, the A "hangs" below the cadence. Even though the solitary A does not participate in any larger gesture within the low register, the effect is disturbing because the lack of any linear connection between the A and the final C forces a harmonic synthesis of the A-C relation in our ears at the cadence, a harmonic sensation which unsettles the intended mode. The A, hanging in the low register, awaits some later B to connect it with events in the cadence register, along the lines of Examples 2b and 2c.

     The hanging low A of Example 3a likewise awaits some subsequent B, as in Example 3b. Note how we "hear harmony" at the end of Example 3a. This is not due simply to the arpeggiation of the A triad, but also and even more to the effort of the ear to relate the hanging low A in some way to the sequel of the line: the upper register converges to its cadence via the melodic connections E-D and C#-D; our ears synthesize the hanging A first with the disconnected E and C#, giving rise to the impression of "dominant harmony," and then with the disconnected D, creating the impression of a resolving "tonic harmony" (See Example 3c).

22   Lewin, Species Counterpoint

Our ears supply us with a harmonic cadence in Example 3a precisely because the melody is not cadencing successfully qua melody.

The global rule demands that there be no "hanging" tones in the counterpoint line(s), subject to certain qualifications about the cadence in three or more voices. For two-part counterpoint, we can make the demand formal as follows, taking a "step" to mean a major or minor second.

> FIRST FORM OF THE RULE: For every note X of the counterpoint line lying above (below) the cadence tone, some note lying one step lower (higher) than X must appear in the line at some point subsequent to X.

X will "hang" in our intuitive sense if and only if this rule is violated. Certain fine points involve ficta and other chromaticism, but other rules will take care of these points. Note for instance that Example 4a violates the rule: the F hangs since F-to-G# is not a "step." Example 4b obeys the rule.

Example 4:

a)   b)
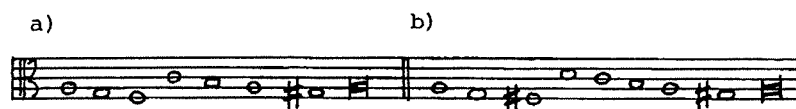
This rule guarantees no unfinished melodic business at the cadence of a line. It specifically guarantees a sense of overall linear *convergence* to the cadence tone: everything above the cadence tone must eventually step down to the cadence, and everything below it must eventually step up to it. (The climax will always lie above the cadence, and the penultimate tone under present rules will lie below the cadence, ensuring at least some sense of convergence.) The rule is somewhat too strict to reflect the practice of Palestrina, but not by much. It is definitely in the spirit of "Palestrina Style," and it produces "musical" results quite consistently when used in conjunction with other, traditional, rules.

The foregoing discussion suggests that we can profitably listen to and analyze even simple first-species lines as composites of various unidirectional conjunct linear gestures. Such gestures typically interact contrapuntally and rhythmically within any one line, creating the impression that the line "knows where it is going," i.e. to its cadence. Figure 1 applies this analysis to the lines of Examples 2c and 1b.

In Theory Only 6/8   23

Figure 1:
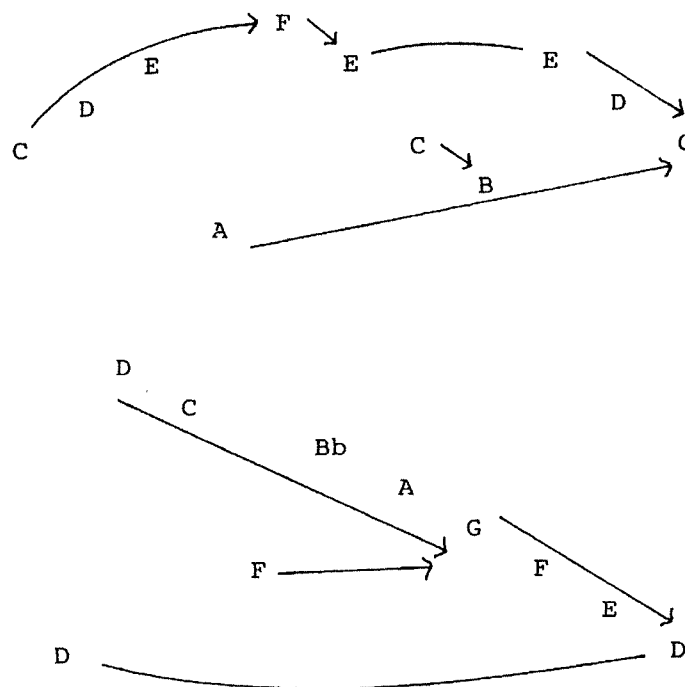
Criteria for defining arrows and slurs on such graphs can be made
formal. It would be out of place to go into such detail here; suffice
it to say that this way of listening provides a means of perceiving a lot
of dialectic and rhythmic activity within even very simple melodic lines.
This is intrinsically attractive, even "musical"; it also enables us to
relate the study of these lines to a wide range of theoretical systems
that go beyond formal counterpoint.[3]

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3. I have in mind particularly a variety of ideas in the writings
    of Schenker and Kurth. Nearer home, the reader will recognize
    a close relationship between the point of view adopted here and
    the formal study of "structual gaps" initiated by Leonard Meyer
    in *Emotion and Meaning in Music* (Chicago: University of Chicago
    Press, 1956), pp. 130-135. Meyer's ideas in this area have
    developed substantially throughout his later writings; they
    strongly influenced Narmour's work (see footnote 1). Much of
    my later text will continue to interrelate suggestively with
    Meyer's "gap" theories.

The analysis attributes one or more precise structural functions,
beyond modal degree, to each individual note as it participates in the
overall structure of a given line. Particularly interesting in this

24   Lewin, Species Counterpoint

connection are notes to which arrows converge. Such notes play the roles
of Pittsburgh, Cairo, Kansas City, St. Louis, etc. to the New Orleans of
the cadence tone. In fact, the "New Orleansness" of the cadence tone in
this model is precisely its significant defining feature as a *melodic*
cadence. If we call the property at issue "closure," then the cadence tone
generally manifests strong closure, while the other tones under discussion
exhibit degrees of closure which vary according to certain measurable
aspects of the arrow-structures on the analytic graphs. The G of Example
1b, for instance, exhibits strong closure.[4] The notion of closure is

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> 4. One can easily hear a transposed Dorian cadence on it, out of
>   context. The opening low D would then hang, but in a fashion
>   idiomatic to sixteenth-century sacred practice.

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useful in formulating a subordinate but handy rule.

> SUBORDINATE RULE: Watch carefully lest the line be overarticulated
> by a strong closure before the final cadence is reached. A strong
> closure on the tonic note of the mode is especially dangerous in this
> connection, particularly when the note in question is the
> antepenultimate note of the line.

Example 5a illustrates the danger. Its closure on the antepenultimate
D is so strong that its last two notes seem only neighboring ornamentation,
serving to prolong a cadence already attained on the antepenultimate note.
So the line does not push to its intended cadence. It is not "bad" as a
line, but the exercise does not fulfill its assigned technical task.
Example 5b also has a tonic antepenultimate note, but here we await a C
or C# past the antepenultimate D because we are aware of the B from
earlier on, which has been temporarily left hanging with a strong local
closure accent on it. With this earlier B in our ears, there is no danger
we shall hear the line close on the antepenultimate D. There is a strong
closure on the C#, but there is of course no danger of hearing a cadence
on that note.[5]

> 5. Compare the effect that C-natural would create here! Such a
>   closure, on a note other than a modal tonic or dominant, often
>   goes unheard against a cantus firmus which tells us what the
>   mode "is." In the free composition of motets etc. such linear
>   closures, when supported rhythmically, are much more weighty;
>   in fact, they often determine medial cadences for modulating
>   phrases. The student may well be encouraged to listen for them
>   early on in the course of study.

PART II: A "musical" computer program

The first form of the rule is clumsy and inefficient for programming.
To apply it, one would have to generate all lines that were otherwise
legal and then test each line, note by note, to see if any note hung. An
enormous number of complete lines would be generated and tested for some
time by this method, only to be ultimately rejected. To streamline the

In Theory Only 6/8   25

Example 5:

a)   b)
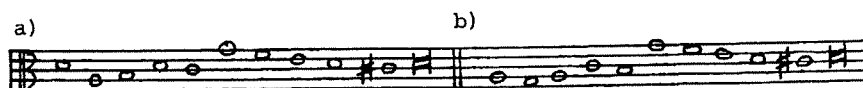
program it is useful to compose solutions backwards from the cadence,
applying the second form of the rule (below) to each note of the line as
it is generated backwards.

> SECOND FORM OF THE RULE: Let HIGH(N) be the highest note after the
> Nth note of a line; let LOW(N) be the lowest. Then the Nth note
> itself must lie somewhere within the register spanned by a major
> second below LOW(N) and a major second above HIGH(N), inclusive.

This second form of the global rule is formally equivalent to the
first form. It is very efficient for programming the retrograde
composition of exercises because it imposes strong constraints on the
active register within which the machine is searching for "the Nth note"
at any given time. For instance, the final segment displayed in Example
6a has C# for its lowest note and E for its highest note; in seeking to
generate a legal tone to precede that segment, the machine need only
test notes between B and F# inclusive. For B is a major second below C#,
F# is a major second above E, and the second form of the rule restricts
attention to this active register. The first form of the rule tells us
that any note below B or above F#, if used to precede Example 6a, will
hang and must therefore be rejected. Similarly, when the program looks
for a legal note to precede Example 6b, it can immediately restrict its
attention to notes lying within the octave A-A inclusive.

Example 6:

a)   b)
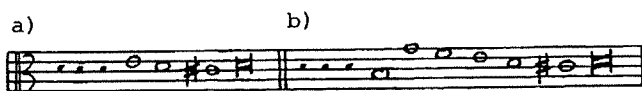
Using the second form of the rule, it is a comparatively
straightforward task to devise a program which, given a cantus firmus,
will systematically construct all legal counterpoint lines. The program
starts with known legal cadence formulas and proceeds recursively,
extending each provisional legal final segment backwards, one note at a

26   Lewin, Species Counterpoint

time, to a longer legal final segment. The following discussion
illustrates the characteristic activity of this program, which uses the
rules of counterpoint summarized in the Appendix to this paper.

     Let us suppose the program has just now reached the stage symbolized
by Example 7. That is, it has just now ascertained the E-D-C#-D is a
legal final segment for the given exercise, and is beginning a search for
legal seventh notes to precede that final segment.

     Example 7:
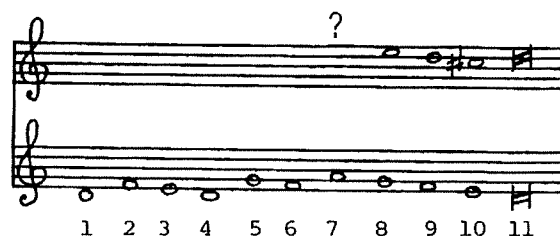
     First the program computes the values HIGH(7)=E and LOW(7)=C#. The
search for note 7 will be confined to a certain active register, between
MAX(7) and MIN(7) inclusive. The second form of the rule immediately
assigns the provisional values MAX(7)=F#and MIN(7)=B. Then a number of
subordinate tests are performed to see if the value of MAX(7) can be
lowered, or that of MIN(7) raised, by any other consideration restricting
the active register at this stage.[6] In the present situation such is not

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  6. For instance, if the vertical interval of event 8 were a fifth,
      note 7 of the counterpoint could not approach note 8 in direct
      motion against the cantus; MAX might be lowered or MIN raised
      accordingly. Rules forbidding certain successions of melodic
      intervals in the counterpoint line could tighten MAX and/or MIN
      at this stage; so could rules forbidding "overlapping" of the
      voices in direct motion.


the case; MAX(7) remains =F# and MIN(7) remains =B.

     The program now starts testing notes in the active register. It
begins by setting TESTING(7)=MAX(7)=F#. It runs F# through various
tests, to see if it is legal as a "seventh note" that extends Example 7
backwards. F# quickly fails one of two tests: there is no subsequent G
or G# to which it can "resolve," and it creates too many consecutive
vertical sixths with the cantus. The program therefore now lowers
TESTING(7) to F-natural, and runs F through the same battery of tests.
F also fails, creating too many consecutive sixths. The program therefore
lowers TESTING(7) to E. The rules in effect permit a counterpoint note
to be repeated or sustained once per exercise, and the program knows that
Example 7 involves no repeated notes as yet, so E passes all the tests.
A flag is marked to show that, with TESTING(7) currently =E, the repeated

In Theory Only 6/8   27

note option is now in use. Holding TESTING(7)=E and MIN(7)=B, the
program moves recursively onward to the status symbolized by Example 8.

Example 8:

   1   2   3   4   5   6   7   8   9   10 11
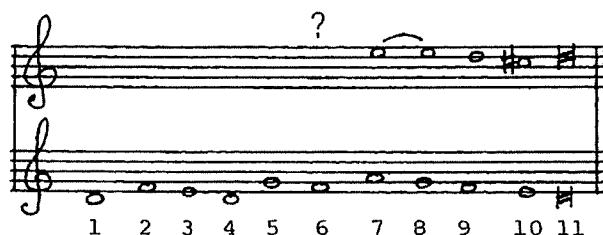
Now we are essentially in an analog to the the original situation.
The program computes HIGH(6)=E and LOW(6)=C#. It then provisionally sets
MAX(6)=F# and MIN(6)=B. Then it inspects other constraints that might
further restrict the active register of search. Here, since vertical
interval 7 is a fifth, MIN(6) can be raised to E: any lower note 6 for
the counterpoint line would create a direct fifth against the cantus.
So MAX(6)=F# and MIN(6)=E.

TESTING(6)=F# fails a number of tests. TESTING(6)=F also fails.
(It creates a vertical octave, which present rules do not permit in the
middle of a phrase.) And TESTING(6)=E fails many tests. Now the
program has finished testing all possible values for TESTING(6) through
the entire range from MAX(6) to MIN(6). Since each possibility has been
worked back to success or failure, it is time to return to test a new
seventh note.

TESTING(7)=E is accordingly now wiped out and replaced by TESTING(7)=Eb.
The flag that showed a repeated note at TESTING(7) is cancelled, and we
return to the search for legal seventh notes to extend Example 7 backwards,
now with TESTING(7)=Eb and MIN(7)=B. That is, we return to the appropriate
place in our TESTING(7)-loop.

TESTING(7)=Eb fails; so does TESTING(7)=D. TESTING(7)=C# sends the
program into a new TESTING(6)-loop, symbolized by Example 9.
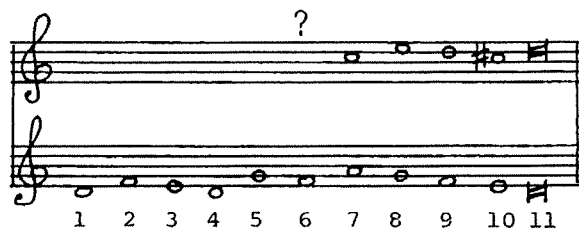
Example 9:

         1   2   3   4   5   6   7   8   9   10 11
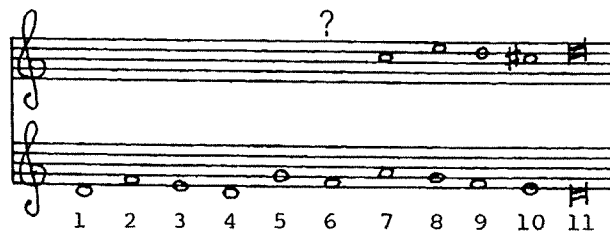
28　　　　Lewin, Species Counterpoint

After all backwards extensions of Example 9 have been worked out to success or failure, the program will eventually finish testing TESTING(6)= MIN(6), and send itself back into its current TESTING(7)-loop. At that point, TESTING(7) is lowered from C# to C, and C is tested as a putative seventh note to extend Example 7 backwards. TESTING(7)=C passes all tests, and thus sends the program off into a new TESTING(6)-loop, symbolized by Example 10.

Example 10:

After all backwards extensions of Example 10 have been worked out to success or failure, the program will eventually finish testing TESTING(6)= MIN(6), and will send itself back once more into its current TESTING(7)-loop. At that point, TESTING(7) is lowered from C to B, and B is tested as a putative seventh note to extend Example 7 backwards. TESTING(7)=B fails.

Since B=MIN(7), the program has now finished testing all possible values for TESTING(7) within the active range MAX(7) to MIN(7). Since all possibilities for extending Example 7 have now been tested back to success or failure, it is now time to return to the current TESTING(8) loop. The program returns, that is, to the status symbolized by Example 11, where MIN(8)=B has already been computed and the current value of TESTING(8), which was just =E, is now lowered to Eb.

Example 11:

In Theory Only 6/8   29
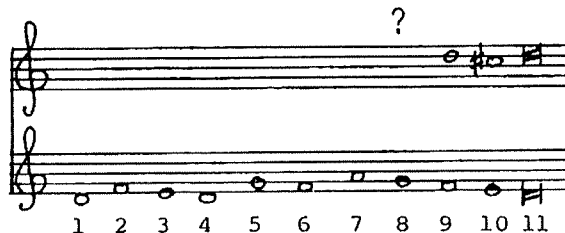
And so forth. The rules force the counterpoint line to end with
C#-D, so when the program has finished pursuing TESTING(9)=MIN(9)=B
back to (success or) failure, it has finished finding all solutions that
cadence at the octave above the cantus.

At the time any such solution is generated, the program will be
in a TESTING(1)-loop. TESTING(1), as a putative opening note for the
counterpoint, must pass certain additional special tests; if it passes,
the provisional solution is then checked as a whole for good behavior
with respect to climax treatment. According to the results of that
check, the solution is printed or rejected. The program then continues
its TESTING(1)-loop.

The reader, by simulating the behavior of the machine, will soon
discover how quickly and relatively easily all the legal solutions to
a given exercise can be found by this method. The pedagogical
question that arises, to what extent beginning students should be allowed
or encouraged to use this algorithm themselves, will be taken up in Part
V of this paper.

For computer buffs, the programming method here may suggest the
technique of backward chaining frequently encountered in general problem
solving. The reason this suggestion arises is that we tend to think
metaphorically of the opening and closing notes of an exercise as an
"initial state" and a "goal state" respectively. A little thought will
make it clear that this metaphor, while seductive, is not exact. The
goal state is the complete legal exercise, or the family of all such, not
the last note of one exercise. The initial states and intermediate
states are any commenced or partially completed exercises. In particular,
there is no reason why a provisionally legal string for notes 1 through
4 should have any systematic priority over a provisionally legal string
for notes 6 through 9 or, for that matter, a provisionally legal solution
for notes 2, 4, 7, and 9, as possible "intermediate states" in the
solution. The metaphor that the opening and the cadence of a first-
species line are an initial and a goal state of a well-defined process
is only Jeppesen's idea of the line as an organic "individuality which
knows where it is going," put into fancy modern dress. The locution is
a function of Western thought from the Renaissance through the nineteenth
century; it addresses our response to the structure of the line, but it
does not address that structure directly.

PART III: The structure of solution-families

Example 12 displays a list of unison-cadence solutions for the
indicated cantus firmus. The thirteen diatonic solutions are listed in
the order the program of Part II discovers them. (This can be seen
when the solutions are read in retrograde, from 1 through 13.) There
are no essentially chromatic solutions for this exercise; that is, the
chromatic solutions are all inflections of diatonic solutions. The
pertinent ficta for legal chromatic solutions is indicated on Example 12.

30   Lewin, Species Counterpoint

Example 12:

In Theory Only 6/8   31

Figure 2 is a forwards-oriented transition graph which generates
the list of diatonic solutions. That is, each left-to-right path along
the arrows of the figure is one of the solutions listed in Example 12,
and each solution corresponds to some such path. Parenthesized
horizontal segments within the graph, that is (E D G), (D C), and
(F D E), indicate melodic cells of two or more notes that appear as
linear units in a solution. An arrow leading from the third note of a
solution to the left parenthesis of (E D G) indicates that the solution
is to continue with E, D, and G as its fourth, fifth, and sixth notes
respectively. The little circle on the graph is a dummy continuation
symbol; it enables us to avoid some crisscrossing lines in the visual
format. The dummy circle can be approached either from the indicated D
or the indicated C; it can be left by proceeding either to (E D G) or
to the indicated E.

Figure 2:
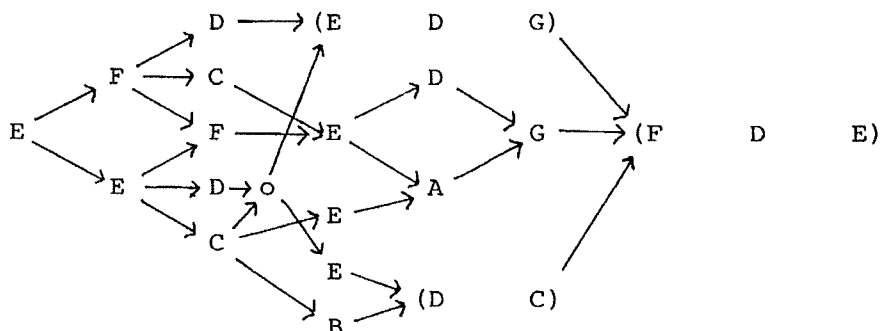
The figure articulates naturally into three sections, each of three
notes' length. The opening section displays completely free branching
among the various possible choices for the first three notes. That is,
Figure 3 is completely equivalent to Figure 2 as far as the first three
choices are concerned.

Figure 3:
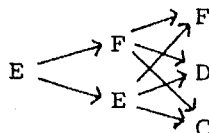
32   Lewin, Species Counterpoint

At the choice of the fourth note on Figure 2, branching abruptly
becomes constrained. Constraints continue over the choices of fifth
and sixth notes. We can call this part of Figure 2 a "middle section."
The choice of notes 7, 8, and 9, on Figure 2, is not just constrained
but completely forced. We can call this part of the figure a "closing
section."

Considering how the list of solutions was generated in Part II,
it is reasonable to view the restrictions on the middle section as
arising from the backwards influence of the closing section: notes 4
through 6 are constrained, not by any feature of the opening material,
but rather because they are obliged to aim for notes 7 through 9 in
a manner obeying our global rule. It is thus appropriate to view the
solution family as structured not only by a forwards-oriented graph
(Figure 2), but also by a backwards-oriented graph. Figure 4 is such
a graph; it generates the list of solutions as well as does Figure 2.

Figure 4:
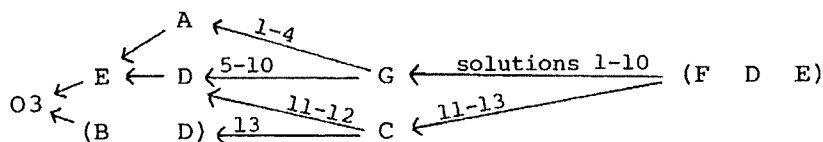
On the figure, the symbol "O3" means "any suitable opening three-
note figure," given the backwards path so far, selected from among the
storehouse of incipits which Figure 3 provides. Figure 4 shows how the
machine "saw" its choices, given the program of Part II. I am suggesting
that Figure 4 reflects more than that, as a model for conceptually
organizing the list of solutions. For instance, the fact that the sixth
note of a legal solution must be either G or C does not arise from any
consequence of the possible opening figures displayed in Figure 3; rather,
it is a function of the constraints imposed by the obligatory cadence
figure on the note that is to precede it, given the rules in force, the
global rule in particular. Figure 4 brings out this aspect of the
situation clearly; Figure 2 obscures it.

Example 13 is an analog of Example 12, using a longer cantus firmus
with the cadence an octave above. Figure 5 is the corresponding analog
of Figure 4. It is a backwards-oriented graph for the generation of
Example 13, back from the obligatory "closing section" (notes 9-10-11),
through the thereby-restricted "middle section" (notes 3 through 8), up
to "O2," which means "any suitable two-note opening motive selected
from the free-branching opening section of Figure 6." Figure 6 here
is the analog of Figure 3 earlier.

In Theory Only 6/8   33

Example 13:

34　　　　　Lewin, Species Counterpoint
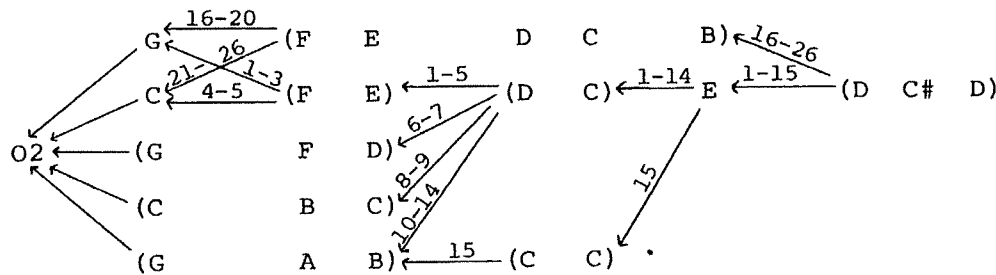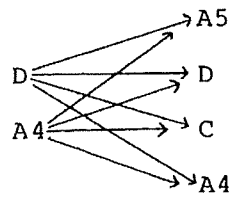
Figure 5:

Figure 6:

An attempt to construct an analog of Figure 2 here, that is, a forwards-oriented graph to generate the solutions of Example 13, would become mired in complexity. Backwards-oriented graphs will generally be simpler, in connection with such lists, than the corresponding forwards-oriented graphs.

The work of Part III so far suggests a useful theoretical view of the structure of a solution-family, given a cantus firmus and a cadence tone. The family as a whole has a well defined "opening section," "middle section," and "closing section." The closing section is provisionally defined as that final segment of the solution which is completely fixed, in common to all members of the solution-family. Given the rules in force here, the closing section must comprise at least the last two notes of the exercise. The opening section is provisionally defined as the largest initial segment within which forwards-branching remains completely free, given the possible first notes, the possible second notes, etc. That is, if we suppose the opening section to be N notes long, then any possible first note, followed by any possible second note, . . . , followed by any possible Nth note, will appear within some particular solution as the first N notes of that solution. The middle section can be provisionally defined as what is left over between the opening section and the closing section. A more useful way of articulating the middle section is to note that the relative amount of choice in forwards-branching drops abruptly going forward into the beginning of this section, while the relative amount of choice in backwards-branching rises abruptly going backwards into its end.

In Theory Only 6/8   35

Now "the relative amount of choice" in the formal transition-graphs
at issue can be measured precisely by a suitable mathematical formula.
This suggests that we can comfortably replace our rigid provisional
definitions by more sensible generalizations. The closing section is
that during which the relative amount of choice in a backwards-branching
system is and remains relatively low. At a certain point in the
backwards-oriented system, the relative amount of choice available will
take an abrupt leap upwards; this articulates the end of the middle
section. The opening section is that during which the relative amount
of choice in a forwards-branching system is and remains relatively
high. At a certain point in the forwards-oriented system, the relative
amount of choice available will take an abrupt leap downwards; this
articulates the beginning of the middle section. These generalized
definitions, besides being comfortable from a common-sense point of
view, are necessary for some first-species solution-families, for almost
all second-species families, etc.

Of particular theoretical and critical interest is the observation
that the categories of opening, middle, and closing section, as defined
here, are not features of any particular individual melody; they are
rather features of the *family* of all legal solutions, as a whole. This
seems bizarre in some ways, but also attractive and suggestive in others.

PART IV: Listener response

In fact, the generalized definitions above seem suggestive in a
wide range of musical contexts, particularly contexts that evoke the
metaphorical responses discussed at the end of Part II. In many contexts,
that is, we feel that a certain musical gesture is developing relatively
freely immediately after its opening, then is becoming constrained by
stylistic syntax in connection with some goal toward which it is heading,
and finally is definitely in a stylistically tight approach pattern to
that goal. Our feelings, as discussed earlier, are typical of a certain
aesthetic characterizing European musical culture of the sixteenth
through nineteenth centuries.

The formal paradigms developed in Part III serve as a good point of
departure for investigating how a system of musical constraints can
successfully evoke such sorts of listener responses. The methodological
ground lying between formal systematics and psychological response is
very treacherous. The context of species counterpoint is particularly
useful here because it enables us to map the bogs, snares, and pitfalls
of this methodological terrain in a highly simplified and stylized
model.

To that end, let us attempt to construct and report an educated
listening to solution 18 for Example 13, pausing for critical introspection
along the way. The line is reproduced schematically as Figure 7.

36   Lewin, Species Counterpoint

Figure 7:

```
              G
                F
                  E
        D                D           D         D
                              C#
                         C
                              B
        A
        1   2   3   4   5   6   7   8   9   10  11
```
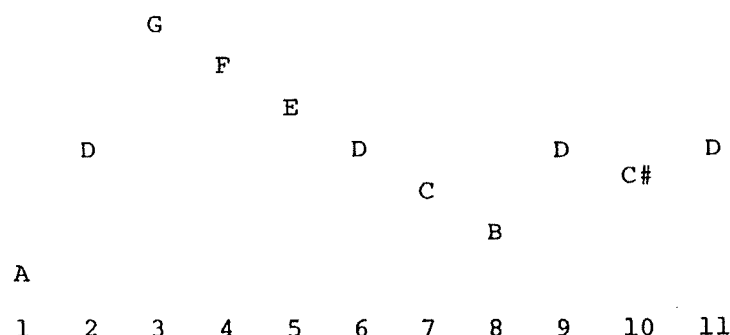
Notes 1 to 3 open up a big registral space which we know will have
to be filled in before we can cadence. Query: in what sense so we "know"
this? Do we believe in some innate faculty which demands this of our
listening to any succession of pitched sounds? To the extent we do not,
we shall probably admit the relevance of our being primed to listen "in
Palestrina Style." In that case, are we simply invoking abstract twentieth-
century criteria, such as the global rule, in judging a purported line "in
Palestrina Style" to be well-formed?

Perhaps so. Those who feel uncomfortable will probably take the
position that the meaning of the global rule involves to some degree a
statistical inference: most music which we will agree to call "in
Palestrina Style" tends to exhibit the pertinent property; what we "know,"
after notes 1 through 3 above, is to that extent a statistical inference
from our experience of pertinent sixteenth-century music. (Too often, this
means the experience of others!) Yet this position is also problematical.
We know very well that Figure 7 is not a composition by a sixteenth-century
master. It would be hard to argue that it might even be embedded in such
a composition, harder yet were it produced along with its cantus firmus.

Nevertheless, Figure 7 *is* a well-formed utterance in a certain
language. The language, called "Palestrina Style," was invented in the
eighteenth century by Fux; it has been developed and transmitted by a line
of subsequent theorists that includes Martini, Cherubini, Bellermann, and
Jeppesen. The speakers of this language are not Palestrina, Lassus,
Victoria, et al. but rather instructors and students in various classes
of counterpoint according to certain rules. (For the student they are
rules even if called guidelines or generalizations.) In this sense the
language is still alive. And it is in this language that the rules
reflect valid statistical inferences, in connection with Figure 7. We
"know" things about Figure 7, that is, because we know how good
counterpoint exercises in Palestrina Style have behaved in the past, and
infer similar behavior for the exercise we are in the midst of hearing.
But now our statistical inference has a completely tautological relation
to the governing rules: the rules obviously do summarize the statistical
behavior of good counterpoint exercises, simply because exercises that

In Theory Only 6/8   37

violate the rules are generally not "good counterpoint exercises." To
break out of this trap it is necessary to assert a significant relation
between the living artificial language of Palestrina Style on the one
hand, and on the other some more general aspects of human perception, if
only as implicitly manifest in the compositional practice of certain
long-gone masters.[7]

7. The latter idea is the rallying point of Jeppesen's approach.
    It is possible to write something like a decent imitation of a
    typical good work of sixteenth-century sacred music after
    studying his text. In contrast, one could hardly hope to
    produce a decent imitation of a typical good work of classical
    secular composition through the study of tonal species. The
    living language of "Tonal Species" must be justified by more
    complex and explicit appeals, to desiderata such as the analysis
    of tonal masterworks (Schenker) or composition in contemporary
    styles (Schoenberg). This makes it difficult to avoid
    considering functional harmonic and motivic matters in
    connection with tonal species, sooner or later. In contrast,
    studies in Palestrina Style are freer to concentrate on melody
    and rhythm pure and simple.

    Developing a student's ability to imitate great sixteenth-
    century music is certainly a positive feature of work in the
    Palestrina Style. But the appeal to a historical style can be
    overplayed. If the point is only, or even mainly, to be able
    to imitate successfully certain compositions, the rules serving
    only toward that end, then one must ask why developing the
    ability to imitate just those compositions, as opposed say to
    the organ works of Bach, the choral works of Bach, Notre Dame
    polyphony, isorhythmic motets, Monteverdi madrigals, etc. etc.
    should occupy the average college or conservatory music student
    in America in the 1980s. I think one must then return to
    criteria of general perception, arguing that certain musical
    sensibilities, still alive and important today, are best
    cultivated by studies in the artificial but living language of
    Palestrina Style, a language that lies somewhere between a
    formal set of rules which reflect those sensibilities on the
    one hand and, on the other, the magnificent but dead language of
    Palestrina and his contemporaries.

    Those who advocate tonal species and those who adopt a more
    historicist approach to Palestrina Style will find much to
    attack in the above footnote, but they will also have much to
    defend. These controversies are of course nothing new. As
    teachers, we should keep them alive if only to keep ourselves
    on our toes.

    Having noted this host of issues, let us return to Figure 7, knowing
in whatever sense we do that the space opened up by notes 1 through 3 is
to be filled in by the phrase. We listen to notes 4 through 8 in this
context. As the line moves downwards we experience the sense of growing

38   Lewin, Species Counterpoint

constraint characteristic of our response to the "middle section," notes
3 through 8. We begin to feel and continue to feel increasingly that the
line "knows where it is going." The line in fact closes on the B at note
8. But we do not hear a cadence on this B.

Query: why not? Answer: our rules of Palestrina Style tell us that
a first-species line in two parts which begins on A will cadence either on
A or on D. Does this reflect pertinent sixteenth-century practice? No.
There is no reason why an actual melodic phrase in a pertinent composition,
a phrase with the general contour of notes 1 through 8 in Figure 7, should
not proceed from a transposed Dorian opening to a transposed Phrygian
cadence.

Let us return again to Figure 7, knowing in some shaky sense that
note 8 is not a cadence, and that there will be a cadence on either A or D.
The line now has no more work to do except to execute that cadence
according to some suitable formula. If note 9 were an A, we would
understand that to be the cadence. Since note 9 is not A but D, we
therefore understand that the cadence is to be on D. But the B of note
8 now hangs and, since we "know" that cadence tones are to be approached
by step, we "know" that there must be a C(#) before the final D. In sum,
as soon as we hear the attack of note 9, we can infer what notes 10 and 11
must be, and that 11 will be the end. The feeling that the line has no
choice, once note 9 is attacked, is our characteristic response to the
formal articulation of the last three note-postions, in this solution-
family, as the "closing section."

We see how nicely the formalities of Part III interact with our
teleological responses to this line, given our knowledge of the stylistic
constraints in force. But we can also see how many difficulties remain in
trying to ascertain just what that "knowledge" is, and just what it has
to do with our response to actual music that might relate to our artificial
classroom language. As I mentioned earlier, it seems fruitful to discuss
issues such as style, syntax, finalism, expectation, and implication in
this very restricted context. There is plenty to dispute here without also
involving massive works of high art directly in the discussion.


PART V: A pedagogical postscript

The reader who plays at simulating the computer via the algorithm of
Part II will, as I said, soon discover how quickly and easily many
"musical" solutions for a given exercise can be generated. The question
arises, to what extent should beginning students be allowed or encouraged
to apply the second form of the global rule, composing backwards? There
is no universal answer; different instructors and different students will
respond with a large spectrum of reactions to the idea. Both the propriety
of working backwards, and the meaning of rules for constructing exercises,
are of course long-standing subjects of disputation in musical pedagogy. I
present here some of my own thoughts, not as prescriptions, but as
contributions to the ongoing discussion of these matters.

In Theory Only 6/8   39

I have already pointed out the utility of a computer program in
checking that one's rules will in fact produce solutions one likes
and exclude those one dislikes. Beyond that, I find the existence of
a solution-listing program a pedagogical aid in another respect:
when a beginning student realizes that a machine can find in a fraction
of a second all the solutions that he or she must labor intensively for
some time to produce, that student will become very much less obsessed
by his or her own skill, or lack of skill, at the game-playing aspect of
counterpoint exercises. This forces both instructor and student to think
more deeply about the actual point of the exercises, focussing attention
on the aural and intellectual development which the experience of
solution-finding produces, particularly in connection with a student's
ongoing work in composition, history, and performance (including
improvisation). Species exercises bring the student into immediate
contact with the idea that two people can be harmoniously engaged in
different activities, even contrasting activities, and yet manage to
arrive effectively, each in their own way, at the same place at the
same time. That idea, with all its implications, is surely one of the
most radical and profound in Western thought, let alone Western music.
What seems crucial to me in this connection is that the student remain
fully alert and engaged at all times in the perception of how the
complementary gestures work out consistently in a variety of situations.
How far up or down does a line have to go to get between two particular
points it has to be? How much time does it have to get there? How
many turning points can it have? Must it have? How many arrow-closures
(in the sense of Part I) does it have? How do the points of turning
and/or closure relate in registral distance? In temporal distance?
What relations do these matters have to the activities of the other line?
And so on. As long as the ear and brain are concentrating on the
marvelous variety of dramatic rhythms that can be created by such simple
means, the actual manner in which a legal solution is eventually
found seems to me almost irrelevant. Mechanical procedures are to be
watched to the extent they may be dampening such concentration, but only
to that extent.

Such is my personal position. To put is in a more concrete
pedagogical context, I shall do an exercise as I would present it to a
beginning class. The exercise, for some relief, will be second species.
I am supposing the class to have completed first-species work using the
rules of the Appendix and the global rule. Example 14 is an exercise
annotated for the present purpose. The following discussion comments on
the annotations.

Example 14:
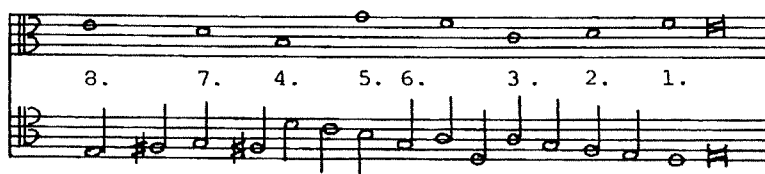
40   Lewin, Species Counterpoint

1) The cadence being chosen at the octave below, the whole note D is the only legal formula for approaching that cadence here.

2) B-C in half-notes is also legal here. But is is uncomfortable that the lines should be so far apart so long, expecially in light of the high G and F not so far back in the cantus firmus. The chosen F-E keeps the lines close together.

3) A-G continues to draw the lines closer together, so the counterpoint line will have more room to breathe, and suffer fewer constraints. A-G also extends the unidirectional scalar sweep to the penultimate tone. Such sweeps are always helpful. They prevent that alternate hopping to and fro (zigzagging) which is the occupational disease of second-species melodies. Also, as long as the line is moving conjunctly and unidirectionally, the student need not be distracted by obsessive worry about dissonance on the weak half-notes. In the latter respect, scalar sweeps are in fact idiomatic to good second species writing.

4) Now that we have worked back past the "closing section," so that we have some freedom of choice within the counterpoint line and between the two lines, it is time to plan the climax. The climax may either be the A of 3) above, or it may sound together with the first F of the cantus, or else it must sound before the G of the cantus. The A of 3) is not very far above the cadence tone of the counterpoint line, and it comes fairly late in the game. This is likely to inhibit the sweep of the counterpoint line, which otherwise might theoretically get as high as a tenth above the cantus firmus at times, other rules permitting. Given the segment of the line already written, there is no legal solution for a climax together with the medial F of the cantus except for Bb, which is bizarre as a climax in the E mode. And besides, one hears that the upper register of the counterpoint line would be severely constrained by a climax together with that F, just as it would be constrained by the A of 3) as a climax. The D labelled by 4) on Example 14 seems a good climax candidate: it gives the line some breathing space in the upper register, and it is not too high too soon before the A of 3). (If it were, hanging problems would likely arise.)

5) The global rule tells us to listen for C and B, after the D of 4), . so we can get down to the A of 3) without hanging. One notes that it is possible to lead the D down at once by D-C-B in half-notes. This is a good idea: it creates a unidirectional scalar segment, avoiding the likely metric thumping and melodic zigzagging that would ensue from D, C, and B on alternate half-notes. As it turns out, there is no other legal way to get a last C and a last B into the exercise at this point anyway.

6) This is a good way to use up time, after the last high B, until the A of 3) arrives. The low D is the lowest note of the line so far; it will hang nicely below until the cadence ties it into the line. The low D activates the low register for the listener, while the upper register is becoming less active.

In Theory Only 6/8   41

7) This is an effective approach to the climax. F# is used because the rules allow a minor, but not a major, sixth leap up. Now that we are in the "opening section," a lot of choice is possible. B-C is possible here, but was ruled out because the opening low E would create a fifth-relation with the B of that B-C, a relation with which the later melodic fifth A-D-A would associate, thus over-articulating the line. The F#, after 7), is a nice temporary hanging tone with a tendency to boot: it pushes on effectively to the G at 6).

8) Of course. The vertical fifth at 7) and the avoidance of zigzagging dictate the opening at this point. F# is used because with F# after 7), an F after 8) would sound lowered, hence bizarre as an upwards passing tone.

One could also begin the exercise on the high E, followed by -G-F-E-D- etc., but then the D is no longer the climax. The same is true of the opening rest-E-F-E-D- etc. That opening is inferior anyway because of the motivic antecedent/consequent structure it imposes on the line as a whole: the later -D-A-G-F-E-D would "answer" it.

In general, I find the approach exemplified above a good way to maintain beginning students' aural concentration while rewarding them with a relatively painless gradual acquisition of skills. The approach can be summarized as follows. First, work back from the selected cadence more or less mechanically, paying special attention to the global rule in its second form, until you are free of the tight constraints of the closing section and launched into the end of the middle section. Second, find a provisional effective and legal climax. Third, work out the connection of the climax to the closing section. Pay special attention to the global rule here as it affects each note between the climax and the highest note of the closing section, in descending order of appearance (and disappearance). If this does not work out, try another climax. Fourth, plan an effective approach to the climax and find an effective opening.

For some students early on in a course, a more mechanical approach to the second and third stages above is helpful for a time: having fixed a closing section, suppose its highest note is X. If X is not the climax, at what point preceding the passage already written will the mode degree above X make its last appearance? If that event is not the climax, at what point before that will the next highest mode degree make *its* last appearance? And so on. One can sketch back systematically in this way until a suitable climax tone is found. The material intervening between the mode degrees at issue can be worked out one step at a time. Special attention must be paid, when using this technique, to avoid zigzagging and an over-motivic texture.

In all this work, the global rule is helpful not just negatively, to avoid hanging tones, but also positively, to create temporary hanging tones that will be picked up by some later tone in the line to good effect. At a certain stage in a course, I allow students to relax the global rule slightly as they become more familiar with tones that can idiomatically be left hanging in various modal situations.

42   Lewin, Species Counterpoint

Let me repeat: I do not mean to recommend the procedure just discussed for all instructors in all curricula, or even for all students in my own courses. I have, rather, attempted to demonstrate how the global rule and the theoretical ideas of "closing section," "middle section," and "opening section" can be used effectively and smoothly, in conjunction with traditional techniques and considerations, in teaching the species.

APPENDIX: Rules for the program of Part II, other than the global rule

Certain rules are marked with an asterisk. I use these in a class, but I did not build them into the program of Part II. It did not seem worth the amount of time it would take to implement them, to exclude the relatively few solutions they would catch beyond those already excluded, particularly in first species. A few of the solutions listed in Examples 12 and 13 suffer from these defects. The theoretical ideas of Part III are not affected by that consideration, however.

Some traditional rules are not found here, e.g. avoid too many leaps, tend to reverse direction in stepwise motion after a leap, etc. The desired bahavior by and large results from application of the other listed rules, in first species.

NOTES AND MELODIC INTERVALS WITHIN THE COUNTERPOINT LINE

1. Subject to other rules, any "white note" is available. So are C#, Eb, F#, G#, and Bb.

2. The counterpoint line must end with a rising minor second up to the tonic note of the mode, except in the E-mode, in which it must end with a rising major second from D to E.

3. The following melodic intervals (MIs) are allowed within the counterpoint line: (a) m2, M2, m3, M3, p4, p5, 8v, all either up or down.
(b) m6 up (but not m6 down or any M6).
(c) perfect unison (creating a sustained or repeated note), but only once per exercise.

4. Succession of Intervals Rule: (a) When two successive MIs are both rising, the larger (if any) should come first (in the lower register). When two successive MIs are both falling, the larger (if any) should come second (in the lower register). In this context, m and M seconds are considered the same size; so are m and M thirds.
(b) The strict form of (a) above may be violated in first species by one diatonic degree. Thus a rising third may be followed by a rising fourth (which is only one diatonic degree larger than the third). Similarly, a falling third may be followed by a falling step; a rising fourth may be followed by a rising fifth.
(c) The rule applies across a sustained or repeated note. Thus a falling fourth, followed by a unison, followed by a falling step, is forbidden.[8]

In Theory Only 6/8　　　43

8.　It is remarkably easy for students to remember this important
　　rule using "the larger interval in the lower register" as a
　　mnemonic.　I think that the rule in fact really reflects an
　　attitude toward the division of register, rather than toward the
　　serial arrangement of intervals:　when a large register is
　　subdivided into unequal subregisters, such a subdivision is more
　　"natural" with the larger subregister lower, because that
　　subdivision better approximates the harmonic, rather than
　　arithmetic, division of the big register.　A few remarks in
　　class about superparticular ratios and the senario, together with
　　some discussion of the overtone series and its relations to such
　　ideas, make both the historical and the perceptual contexts for
　　this rule come alive for students.

　　5.　Successive melodic minor seconds (e.g., C#-D-Eb) are forbidden.
(NB:　augmented primes are already forbidden by (3).)

THE RESOLUTION OF MELODIC CHROMATICISM

　　6.　When a raised or lowered ("black") note is used, an appropriate
tone of resolution must appear in the line at some point thereafter
(though not necessarily immediately).　Bb resolves to A, Eb to D, C# to
D, G# to A, F# to G or G#.　The tone of resolution must appear in register.

　　7.　When a raised or lowered tone is used, its unaltered form may
not be used in the line until after the tone of resolution has appeared.
E.g., once Bb has beed used, B-natural may not appear in the line until
some A has first appeared in the line (in register).

　　*8.　Use chromaticism, for the time being, only to avoid violating
some rule.　Do not use it for fun.　An overuse of F#, for instance, may
sound interesting, but it may well make the F# sound diatonic in some
·transposed mode; the next F-natural will then sound "altered" and raise
special problems.　Avoid such problems at present, when you can.

THE LARGE SHAPE OF THE LINE, BEYOND THE GLOBAL RULE

　　9.　(a) The line must contain one unique highest tone, the "climax."
　　　　(b) The climax may not be the last note.
　　　　(c) The climax may not sound together with the climax of the
　　　　　　cantus firmus.
　　　　(d) The climax may not occur on a sustained or repeated tone.

　　*10.　Avoid "bad" local outlines of augmented and diminished intervals.

　　*11.　Avoid repetitious motive structure or other interruptive
articulation of the line (into antecedent/consequent, ABA, etc.).

　　*12.　Avoid returning too frequently to any one note, especially the
tonic.

RESTRICTIONS ON VERTICAL INTERVALS

　　13.　The counterpoint must end either 8v above, at unison with, or
8v below the cantus firmus.

44   Lewin, Species Counterpoint

14. The counterpoint must open either 8v above, 5th above, at unison with, or 8v below the cantus.

15. The vertical interval between the two voices must never exceed a major tenth.

16. The following vertical intervals are allowed: 8v or unison at the beginning and end only; otherwise m or M third, p fifth, m or M sixth, m or M tenth.

RULES RESTRICTING DIRECT MOTION

17. A vertical fifth may not be approached in direct motion.

18. "Overlap" of the voices is forbidden. ("Overlap" is defined in the usual way; this idea, like the succession of intervals rule, can fruitfully be regarded as an idea about registers.)

19. The two voices may not move in consecutive vertical thirds for more than three consecutive notes. Similarly for consecutive vertical sixths and vertical tenths.

*20. The voices may not leap simultaneously in direct motion more than once per exercise.

<div align="center">(Yale University)</div>

<div align="center">*****</div>