Three Musical Forces: Gravity, Magnetism, and Inertia

In his article, "Modeling Melodic Expectation: Using Three 'Musical Forces' to Predict Melodic Continuations," Steve Larson discusses three principles that are relevant to melodic function. He describes these melodic tendencies as *musical forces*. These include *gravity*, *magnetism*, and *inertia*. He defines gravity as "The tendency of an unstable note to descend to a more stable note."[1] Magnetism is defined as "The tendency of an unstable note to move (up or down) to the *nearest* [his emphasis] stable pitch. Furthermore, magnetism is affected by distance—the closer we get to a goal, the more it attracts us."[2] Inertia is "The tendency of a pattern of musical motion to continue in the *same* [his emphasis] fashion. (What is meant by 'same' depends on how that musical pattern is represented in our internal hearing.)"[3] Larson also states, "Each of the musical forces acts on notes at all times. The less stable a note, the more that note will convey to the listener the effects of these forces."[4]

Gravity, for example, is a force that will pull a note back down to a stable pitch after it moves up from it. Magnetism explains why the half step tends to create a more powerful resolution than the whole step. As a pitch succession moves closer toward a point of stability, it is drawn more by the need to resolve to that point.[5] Magnetism appears to operate idiomatically in jazz with blue notes: half step resolutions that include sliding or bending upward to a resolution, as in a portamento. Inertia is related to the ideas of probability and good continuation; a pattern or process, once it is established, tends to continue in a similar manner. Larson includes a number of tables that show three and four note patterns, and the forces that operate to predict the third and fourth notes, respectively.

While Larson's principles describe the motion of a monophonic melodic line (they appear to operate in a tonal context, but not necessarily in a harmonic context), they also appropriately describe principles that apply to voice leading in a harmonic context. All of the principles apply to step relationships. For example, half step relationships, such as the (minor) seventh of a dominant (^4) moving to the major third of a tonic (^3), are much stronger than the same seventh (^4) moving upward to a perfect fifth of the tonic (^5). (Both notes—the major third and the perfect fifth of the tonic triad—represent roughly the same level of stability.) The principles of

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[1] Steve Larson, "Modeling Melodic Expectation: Using Three 'Musical Forces' to Predict Melodic Continuations," *Proceedings of the Fifteenth Annual Conference of the Cognitive Science Society* (Hillsdale, NJ: Lawrence Erlbaum Associates), 629.

[2] Ibid.

[3] Ibid., 630.

[4] Steve Larson, "Scale-Degree Function: A Theory of Expressive Meaning and Its Application to Aural-Skills Pedagogy," *Journal of Music Theory Pedagogy* 7 (1993): 73.

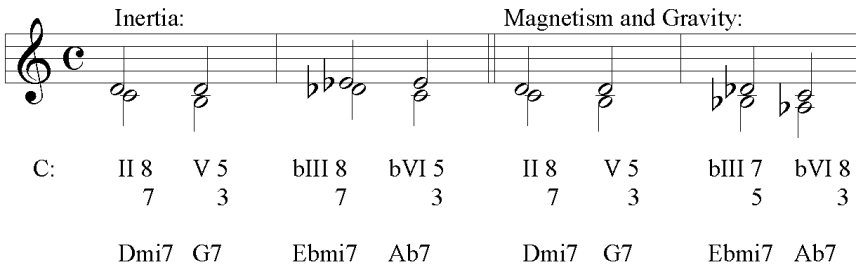
[5] This idea is similar to the temporal tension caused by the relationship of a theme or figure and its imitation. As the temporal distance of an imitation becomes closer and closer to its predecessor, the tension increases. See Wallace Berry, *Structural Functions in Music* (New York: Dover Publications, 1987), 216.

magnetism (the resolution to the closer stable note) and gravity (the resolution downward) seem to favor, in this case, a downward resolution.

In general, half step relationships do seem stronger than whole step relationships in voice leading. If a pitch is a whole step away from a stable tone, and it moves a half step closer, it is almost inevitable that it will move another half step and resolve to the stable tone. Magnetism, as well as inertia, seems to explain this.

Sometimes the two principles seem to work against each other. For example, the third of a dominant can move as easily downward to the (minor) seventh of a new dominant (e.g., *B* in G7 moving to *Bb* in C7) as to the root (C in C7), even though the root (of the new dominant) is a more stable chord member. Here, given that the "force" of magnetism is irrelevant (as the first note is a half step away from both potential second pitches); gravity explains the tendency of the pitch (the seventh, Bb) to move downward to compensate for the attraction upward to the more stable chord component (the root).

The example below presents two different voice leading scenarios (for two voices in the same chord progression) that exemplify these principles (Example 2). In the first case, the two voices create a voice leading pattern, and then the same pattern is repeated a half step higher. The repetition of the pattern maintains its tendency, which was created in the first measure. This is an example of inertia.



Example 1: Inertia, Magnetism, and Gravity

In the second case, both voices move to the nearest chord member from the first measure into the second; both voices move a half step, unlike the first scenario, where one moves a whole step. This suggests magnetism, between the last chord of the first measure to the first chord of the second. However, gravity is also present; it pulls the voices *downward*.

There does appear to be a tendency in voice leading for downward movement. For example, Schenker's fundamental lines typically descend. Although he doesn't mention gravity per se, Schenker writes,

> The fundamental line begins with ^8, ^5, or ^3 and moves [down] to ^1 via the descending leading tone ^2. To man is given the experience of ending, the cessation of all tensions and efforts. In this sense, we feel by nature that the fundamental line must lead downward until it reaches ^1, and that the bass must fall back to the fundamental.[6]

This descent from ^8, ^5, or ^3 is based on the horizontalization of the chord of nature: movement from one of the first five overtones of the fundamental (as a sounded pitch)

[6] Heinrich Schenker, *Free Composition*, vol. 3 of *New Musical Theories and Fantasies*, trans. and ed. Ernst Oster (New York: Longman, 1979), 13.

downward to the fundamental. Since overtones only appear *above* a tone, this implies a descent. In general, overtones seem to explain, at least in part, the gravity phenomenon. The term gravity, rather than being understood only as a force pulling downward, also suggests—in light of Schenker's statement—a slowing down, or a lessening of effort that is associated with downward movement.