“Best of Gershwin”
The Beauty of Mathematics in Gershwin’s Classical Jazz

AMATYC 2015
New Orleans “City of Jazz”
S074 - Rhythm II
Paula Wilhite
George Gershwin
(Jacob Gershvin)

Born: September 26, 1898
Brooklyn, New York

Died: July 11, 1937
Hollywood, California
George Gershwin “Rhapsody in Blue”
Musical Preparation

- Gershwin first piano - 1910
- Charles Hambitzer – Classical piano teacher
- Edward Kilenyi – Musical theory teacher
- Joseph Schillinger – Mathematical System of Composition Instructor
Famous Musical Compositions

“Swanee” 1918
“Rhapsody in Blue” 1924
“Concerto in F” 1925
“An American in Paris” 1928
“I’ve Got Rhythm” 1930
Famous Broadway Shows

Oh, Kay! 1927
Strike Up the Band 1930
Girl Crazy 1930
Of Thee I Sing 1931
Porgy and Bess 1935
Time
July 20, 1925

The first American composer to reach this notoriety.
Impact of Gershwin’s Life

- Popularized musical jazz compositions
- Wrote over 12 Broadway shows
- Congressional Gold Medal – 1985
- Pulitzer Prize Awarded Posthumously – 1998
- The George and Ira Gershwin Lifetime Musical Achievement Award
Gershwin & Rolling Stone

“Someone to Watch Over Me”
Sting

“Summertime”
Ella Fitzgerald

“S Wonderful”
Diana Krall

“Embraceable You”
Nat King Cole

“They Can’t Take That Away From Me”
Rob Stewart & Michael Buble
Nat King Cole “Embraceable You”
Ella Fitzgerald “Summertime”
Sting “Someone To Watch Over Me”
Rod Stewart & Michael Buble
“They Can’t Take That Away From Me”
George Gershwin
“I’ve Got Rhythm”
George Gershwin
“Variations on I’ve Got Rhythm”
Schillinger System of Musical Composition

I. Rhythmic and Melodic Design
   Permutation; Coordination Time Structures;
   Geometrical Projections

II. Pitch-Organization

III. Elaboration of a Melodic Line
George Gershwin
“Variations on I’ve Got Rhythm”
Gershwin’s *Variations on “I Got Rhythm”*

Expansion of Initial Motive

<table>
<thead>
<tr>
<th>mm. #</th>
<th>coefficient</th>
<th>1&lt;sup&gt;st&lt;/sup&gt; int.</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt; int.</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt; int.</th>
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<tbody>
<tr>
<td>1-2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>3-4</td>
<td>2 Whole-tone color</td>
<td>4</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>5-6</td>
<td>3 Octatonic color</td>
<td>6</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>7-8</td>
<td>5 Chromatic Element</td>
<td>10</td>
<td>15</td>
<td>10</td>
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</table>
Ex. 1 Geometric expansion in G. Gershwin's "Variations on I Got Rhythm" mm. 1-8
Ex. 2: Allusions to scales by geometrical expansion.

a) [Musical notation]

b) a whole-tone scale

[Musical notation]

c) [Musical notation]

d) an octatonic scale

[Musical notation]

e) [Musical notation]

f) a chromatic scale

[Musical notation]

A second and more innovative instance of Gershwin's application of Schillinger's technique of geometrical expansion is found in the opening of Act II, Scene 3 of *Porgy and Bess*, R 170 + 11-14 (see Example 3a). The overall shape of the phrase seems to hint at the technique of geometrical expansion. The initial phrase (m. 11) unfolds as follows: Maj. 2, min. 2, min. 2, Maj. 2, and
Maj. 2. If we multiply these intervals by 2 then 3 respectively, resulting melody would be as appears in Ex. 3b. However, Gershwin modified the technique somewhat resulting in the melody shown in Ex. 3a.

Ex. 3 a) geometric expansion in G. Gershwin, Porgy and Bess, Act II, Scene 3, R 170+11-14; b) systematic geometric expansion of R. 170 m. 11.
Porgy and Bess
“Act III Scene 3 Introduction”

https://www.youtube.com/watch?v=1YGavxuQlOY
Geometrical Inversion of a Melody A

Retrograde Inversion

Retrograde Inversion
Melody Line Constructed From Geometric Projections of Melody A
Motives
Porgy & Bess

< P, I(P) >
Motives
a, b, c, d, e
Motives
Porgy & Bess
Act III Scene 3
R 125 3 – 5
< a, b, c >

R 126 1 – 2
< I(a), I(b), c >

R 126 3 – 5
< a, b >

R 126 6 - R 127 1
< I(b), I(a) >

R 127 2-3
< a, b >
<table>
<thead>
<tr>
<th>Act III, Scene 3, R. 92-127.</th>
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<tr>
<td><strong>Act 3, Sc. 3 - R 92</strong></td>
<td>symmetrical scales; permutation of the pitches in the scale</td>
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<td><strong>Orchestra</strong></td>
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<tr>
<td><strong>R 93 - R 97</strong></td>
<td>coordination of time-structures; symmetrical scales; coupling</td>
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<tr>
<td><strong>R 98 - R 100</strong></td>
<td>symmetrical scales (initial pitches of the theme)</td>
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<tr>
<td><strong>R 101-103</strong></td>
<td>symmetrical scales and coupling</td>
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<tr>
<td><strong>Orchestra</strong></td>
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<tr>
<td><strong>R 104-108</strong></td>
<td>symmetrical scales; permutation of the motives a, b, c, d; variations of music by means of geometrical projection (inversion)</td>
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<tr>
<td><strong>Orchestra</strong></td>
<td></td>
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<tr>
<td>R 109-110</td>
<td>Choir</td>
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<tr>
<td>R 111-115</td>
<td>Choir</td>
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<tr>
<td>R 116-117</td>
<td>Orchestra</td>
</tr>
<tr>
<td>R 118-121</td>
<td>Orchestra</td>
</tr>
<tr>
<td>R 122-124</td>
<td>Choir</td>
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<tr>
<td>R 125-127</td>
<td>Orchestra</td>
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Jazz It Up at AMATYC 2015!

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Works Cited


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http://gershwin.com/gershwin-timeline/

http://nationalhumanitiescenter.org/tserve/freedom/1917beyond/essays/jazz.htm

Music Downloaded

Best of Gershwin

https://www.youtube.com/watch?v=5cLZBeQEqq8
“Embraceable You”
https://www.youtube.com/watch?v=Eo5X54WXvNM&list=RDCbTcBGPeIrE&index=4
“I’ve Got Rhythm”
https://www.youtube.com/watch?v=1bKstQNsQKc
“Rhapsody in Blue”
https://www.youtube.com/watch?v=eFHdRkeEnpM
Music Downloaded

“S Wonderful”
https://www.youtube.com/watch?v=P1s6Fc0E9oc

“Someone to Watch Over Me”
https://www.youtube.com/watch?v=v19QY6natR4

“Summertime”
https://www.youtube.com/watch?v=XivELBdxVRM

“They Can’t Take That Away From Me”
https://www.youtube.com/watch?v=EPdnWa4PNTs
Music Downloaded

Porgy & Bess “Act III Scene 3 Introduction”
https://www.youtube.com/watch?v=1YGavxuQIOY

“Variations on I’ve Got Rhythm”
https://www.youtube.com/watch?v=mR5Uy8hU1iE