The Diaphonic Cycles are a set of scales originally conceived to be implemented on a string instrument with pairs of strings tuned a 3/2 apart and equally-spaced frets to play sections of the subharmonic series. Like the HelixSongs, the Diaphonic Cycles are conjoined at two nodal points, but unlike the former, tetrachordal or pentachordal segments are used instead of intertwined octave-spanning segments. While Wilson provides classic subset examples of scales derived from these sets, their use is still wide open and he encouraged larger subsets to be used. While the strings are tuned to a simple 3/2 or 4/3 away from each other, the nodal points are quite often at surprisingly unusual intervals which give each series its own unique flavour beyond the subharmonic sections combined.
DIAPHRAGM CYCLES IN TETRACHORDAL POSITION

TETRACHORD

DISJUNCTION

TETRACHORD

DIAPHONIC CONJUNCTIONS

Issued by Ev Wilson Apr 1, 1963
LETTER WILSON TO CHALMERS 13 SEP 1963

--- DIAPHONIC CYCLES, SUBHARMONIC SPECIES,

CONJUNCTIVE POSITION.
SUBHARMONIC SPECIES, & DIAPHONIC CYCLES (CONSTRUCTED FROM 2 EQUALLY-DIVIDED STRINGS)
Issued 19 Jan 65 by Ervin M. Wilson 651 Huntley Dr., Los Angeles, California 90069
THE FAMILY OF DIAPHONIC CYCLES, SUBHARMONIC SPECIES
These can be constructed on 2 fretted strings using the aliquot divisions indicated, and tuned to each other as shown by the bracket. These integrate the Schlesinger species with the related, ancient tetrachordal species. 28 tones per 8ve required for entire group. see next 2 sheets for comparative plotting.
<table>
<thead>
<tr>
<th>22 23 24 25 26 27 28 29 30 31 32</th>
<th>19-tone Major Diaphonic</th>
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</thead>
<tbody>
<tr>
<td>24 25 26 27 28 29 30 31 32</td>
<td>19-tone Major Involute Diaphonic</td>
</tr>
<tr>
<td>22 23 24 25 26 27 28 29 30 31 32</td>
<td>19-tone Minor Diaphonic</td>
</tr>
<tr>
<td>32 31 30 29 28 27 26 25 24 23 22</td>
<td>19-tone Minor Involute Diaphonic</td>
</tr>
</tbody>
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See Page 40-41 Volume 3
### Scales with modes a 4:3 apart:

<table>
<thead>
<tr>
<th>6 - 9</th>
<th>26 - 39 = 22</th>
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<tbody>
<tr>
<td>6 - 8</td>
<td>27 - 36 = 32</td>
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<td>8 - 12</td>
<td>28 - 42 = 24</td>
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<td>9 - 12</td>
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<td>30 - 45 = 25</td>
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<td>33 - 44 = 31</td>
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<td>30 - 45 = 25</td>
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<td>15 - 20</td>
<td>30 - 40 = 33</td>
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<tr>
<td>16 - 24</td>
<td>32 - 48 = 42</td>
</tr>
<tr>
<td>18 - 24</td>
<td>26 - 48 = 22</td>
</tr>
</tbody>
</table>

### Scales with modes a 7:5 apart:

| 15 - 21 | 30 - 42 = 22 |
| 14 - 20 | 28 - 40 = 22 |
| 20 - 28 | 35 - 49 = 29 * unique |
| 21 - 30 | 35 - 50 = 29 |

### Scales with modes a 11:8 apart:

| 24 - 33 | 32 - 44 = 27 |
| 22 - 32 | 33 - 48 = 27 |
Scales with nodes a 13:9 apart.

\[
\begin{align*}
27 - 39 &= 22 \\
26 - 36 &= 23 \\
36 - 52 &= 31 \\
39 - 54 &= 33
\end{align*}
\]

Scales with nodes a 15:11 apart

\[
\begin{align*}
33 - 45 &= 24 \\
30 - 44 &= 34
\end{align*}
\]

Scales with nodes a 17:12 apart

\[
\begin{align*}
36 - 51 &= 29 \\
34 - 48 &= 34
\end{align*}
\]

Scales with nodes a 9:7 apart (imperfect)

\[
\begin{align*}
21 - 27 &= 16 \\
18 - 28 &= 23 \\
28 - 36 &= 23 \\
27 - 42 &= 23
\end{align*}
\]

Scales with nodes a 13:10 apart (imperfect)

\[
\begin{align*}
30 - 39 &= 23 \\
26 - 40 &= 23 \\
52 - 40 &= 32 \\
60 - 39 &= 33
\end{align*}
\]

Scales with nodes a 14:11 apart (imperfect)

\[
\begin{align*}
33 - 42 &= 25 \\
28 - 44 &= 25
\end{align*}
\]
Additional page compiled by Grady showing the guitar fretting to the corresponding Diaphonic Cycle.
ERVIN M WILSON
651 HUNTLEY
LOS ANGELES, CALIF 90069
OCT 6, 1963

JOHN CHALMERS
UNIVERSITY OF CALIFORNIA, SAN DIEGO
LA JOLLA, CALIFORNIA, 92038

DEAR JOHN CHALMERS,

RECEIVED YOUR TRANSLATION OF THE KITAB AL-ABDWAR, FOR WHICH I EXPRESS MY APPRECIATION.

THE ARABS DID FORM 8VE SPECIES BY SUPERIMPOSING THE MOST 'CONSONANT FORMS' OF THESE TETRACHORDS, THE DISJUNCT INTERVAL 9/8 BEING AT THE TOP OR THE BOTTOM FOR 'ROOT' POSITION, DEPENDING ON THE THEORIST, BUT NOT IN THE CENTER. LET A B C AND C B A REPRESENT THE CONSECUTIVE INTERVALS OF THE CONSONANT TETRACHORDS; WHEN THESE ARE SUPERIMPOSED THE REMAINING DISSONANT FORMS APPEAR IN THE 8VE SPECIES:

\[
\begin{align*}
B & C & A & B & C & A & B & C \\
C & A & B & A & C & B & A & B \\
\end{align*}
\]

THEY ENTERTAINED ALL 7 MODES OF THE RESULTANT SPECIES BUT I DONT THINK THEY REGARDED THEM ALL AS EQUALLY CONSONANT.

I WILL HAVE MORE TO SAY ABOUT MIXED TETRACHORDAL SPECIES, LATER.

THE PENTACHORD WAS COMPLETED BY A TETRACHORD OF SIMILAR CONSTRUCTION. (MY CAR WAS DESTROYED THE MORNING AFTER YOU WERE HERE, AND I WILL HAVE TO GET EXACT DETAILS LATER). IN THE SAME MANNER THAT THE TETRACHORDS WERE PERMUTED INTO 3X2X1=6 VARIANTS, THE PENTACHORDS WERE PERMUTED INTO 4X3X2X1=24 VARIANTS. FOLLOWING THIS SAME LOGIC WE MIGHT PERMUTATE THE INTERVALS OF SCHLESINGER'S MIXOLYDIAN INTO 7X6X5X4X3X2X1=5040 VARIANTS. WHETHER OR NOT THESE WOULD REMAIN AESTHETICALLY VALID, OR EVEN COMPREHENSIBLE, IS SOMETHING THAT PAT MATHMATICAL LOGIC CANNOT TELL US.

"....THAT IS A HELL OF A LOT OF SCALES."


\[
\begin{align*}
B/D \times A/\bar{C} &= 2/1 \text{ DIACYCLE, TETRACHORDAL POSITION} \\
A/\bar{C} \times B/\bar{D} &= 2/1 \text{ DIACYCLE, CONJUNCTIVE POSITION} \\
B/\bar{C} \times A/\bar{D} &= 2/1 \text{ INVOLUTE DIACYCLE, TETRACHORDAL POSITION} \\
A/\bar{D} \times B/\bar{C} &= 2/1 \text{ INVOLUTE DIACYCLE, PENTACHORDAL POSITION} \\
\end{align*}
\]

IT SHOULD BE OBSERVED THAT B/\bar{D} A/\bar{C} AND A/\bar{C} X B/\bar{D} ARE DIFFERENT MODES OF THE SAME, ACOUSTICALLY IDENTICAL CYCLE. LIKewise, THAT B/\bar{C} A/\bar{D} AND A/\bar{D} B/\bar{C} ARE MODES OF THE SAME CYCLE.

IT SHOULD BE FURTHER OBSERVED (REF THE CHART OF 'POLY-PENTACHORDS') THAT IN EVERY 4TH SPECIES A AND B ARE IDENTICAL, AND THAT IN EVERY 3RD SPECIES C AND D (C, C, AND D) ARE IDENTICAL. WHEN EITHER OF THIS 2 CONDITIONS OCCUR THE RESULTANT INVOLUTE DIACYCLE IS ACOUSTICALLY IDENTICAL TO THE EQUIVALENT DIACYCLE. I.E. THE 12, 17, 19, AND 22-TONE ARE, FOR EXAMPLE, THE FIRST 4 SPECIES WHERE THE INVOLUTE DIACYCLE IS ACOUSTICALLY DISTINCT FROM THE DIACYCLE.
THE SPECTRUM MEMBERS OF THE ORDINARY CYCLES, IN EACH CASE, (AND THIS IS ARBITRARY DELIMITATION ON MY PART) SPAN THE 3/2. IN TRIANGLES △ ARE IDENTIFIED TWO EXTRA-ORDINARY SPECIES WHOSE SPECTRUM MEMBERS SPAN THE 10/7: 50/35 X 49/35 AND 70/50 X 70/49 WITH 29 AND 41 TONES RESPECTIVELY.

THERE ARE, THEN, ONLY TWO 'FORMS' OF MANY OF THE DIACYCLES (WITH REDUNDANT FORMULAE), FOUR FORMS OF THE REMAINING EXCEPT 29 AND 41 WHICH HAVE SIX FORMS. TO WHAT DEGREE THE MODAL PERMUTATIONS ARE TONALLY VALID REMAINS TO BE EXPLORED. CERTAINLY SOME OF THE MOST UNEXPECTED TURN OUT VERY GOOD.

STILL A HELL OF A LOT OF SCALES FROM THE ANALYTIC APPROACH. WHICH, HOWEVER, FROM A SYNTHETIC VIEWPOINT ARE THE ARRESTED MOMENTS OF THE CHANGING SPECTRUM OF A SINGLE ORGANIZED SYSTEM. I CONCEIVE THE SCALE AS BEING INDEFINITELY VARIABLE, BOTH IN NUMBER AND POSITION OF TONES. THERE IS NO REASON WHY WE MAY NOT CONCEIVE A GAMUT OF, FOR EXAMPLE, (9-TONE SCALES AS ELABORATE AS THE GREEK TETRACHORDAL SYSTEM, IF THESE SATISFY OUR PRESENT MUSICAL NEEDS, STIMULATE OUR CREATIVE FANTASY.

YES! THAT'S VERY INTERESTING. I, TOO, HAVE FOUND I PREFER SCHLEISINGER'S SUBHARMONIC MODES TO THE HARMONIC EQUIVALENTS. THERE IS MUCH MORE TO IT THO; FOR MELODY OR FOR HARMONY? I WILL HAVE MORE TO SAY ABOUT THE INTEGRATION OF THE 2 GENERA FOR MUSICAL PURPOSES. PARTCH'S DIAMOND CONCEPT IS PERTINENT, MOST PERTINENT, IN FACT. IN THE THOUSAND YEARS TO COME PARTCH'S DIAMOND CONCEPT (IN A MORE OR LESS AMPLIFIED FORM) WILL BE CONSIDERED THE MOST SIGNIFICANT CONTRIBUTION TO THE HARMONIC ART THAT THIS LULL-IN-BETWEEN-CREATIVE-PERIODS OFFERED.

THE TRI-CHROMATIC;
WELL, IF MODES: 11 12 13 14 15 16 17 18 19 20 21 ARE DIATONIC
    AND MODES: 22 24 26 28 30 32 34 36 38 40 42 ARE 'CHROMATIC'
THEN MODES: 33 36 39 42 45 48 51 54 57 60 63 ARE TRI-CHROMATIC
    AND MODES: 44 48 52 56 60 64 68 72 ets ARE ENHARMONIC
    AND MODES: 55 60 65 70 ets ARE PENTA-ENHARMONIC

A THIRD CONCEPT WHICH MAY PROVE QUITE MEANINGFUL IS THAT WHICH (FOR LACK OF A TERM) I CALL UNIT-PROPORTION. THIS I HAVE DEMONSTRATED (B I HOPE) ON A THIRD ENCLOSED SHEET IN CONJUNCTION WITH A VERY SPECIFIC TYPE OF VARIATION OF THE TETRACHORD 11 10 9 8, INSPIRED BY THE JAVANESE PELOG.

EXPANSION AND CONTRACTION. THE HARMONIC CHORD 8 10 12 16 MAY BE EXPANDED TO 7 9 11 15, OR CONTRACTED TO 9 11 13 17. THE UNIT-PROPORTION REMAINING IN EACH CASE 2-2-4. THIS TECHNIQUE HAS VAST UNEXPLOITED POSSIBILITIES; COMBINED WITH STANDARD COMMON-TONE TECHNIQUES WE GET A SERIES OF SUBTLY BEAUTIFUL CHORD PROGRESSIONS OR MODULATIONS. BUT HERE AGAIN WE ARE RUNNING ACROSS THE PARTCH DIAMOND. MORE ANOTHER TIME.

MOST SINCERELY YOURS,
LETTER TO JOHN CHALMERS
OCT 6, 1963
SUBHARMONIC POLYCHORDS ON THE 3/2
\( \triangle \circ \) - CONJUNCTIVE NODES FOR THE 8VE SPECIES
(INVERT SHEET AND FORMULAE ACCORDINGLY FOR THE HARMONIC GENERA)
DIATONIC, CHROMATIC, TRI-CHROMATIC, AND ENHARMONIC FORMS OF MIXOLYDIAN (MODE /14)

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This tetrachordal species in this permutation & inversion is most delightful. It is notable for the appearance twice of the 13/9 which makes some nice turns against the 3/2's they are associated with. In root position (with disj. on 4/3 & 3/2) the scale is, or loses its reason for being.

I'm sure you've got this in your tables, but it's one probably of many I've slighted because I evaluated them only in root position.

Yours Ever
This occurs in 19 tonal diatonic cycle:

\[
\begin{array}{cccccccccc}
32 & 31 & 30 & 29 & 28 & 27 & 26 & 25 & 24 & 23 & 22 \\
\hline
33 & 32 & 31 & 30 & 29 & 28 & 27 & 26 & 25 & 24 & \text{Tonic}
\end{array}
\]

A derivative pentatonic:

\[
\begin{array}{cccccc}
\frac{1}{1} & \frac{27}{26} & \frac{4}{3} & \frac{18}{13} & \frac{27}{16} & \frac{2}{1} \\
\frac{27}{26} & \frac{104}{81} & \frac{27}{26} & \frac{39}{32} & \frac{32}{27}
\end{array}
\]

but by employing the $\frac{22}{33}$ conjunction we could have:

\[
\begin{array}{cccccc}
\frac{1}{1} & \frac{27}{26} & \frac{4}{3} & \frac{18}{13} & \frac{18}{11} & \frac{2}{1} \\
\frac{27}{26} & \frac{104}{81} & \frac{27}{26} & \frac{13}{11} & \frac{11}{9}
\end{array}
\]

which is quite a bit more credible, but not classic theory covers it. In this case the top 3 tones are the $\frac{13}{11} \frac{11}{9}$ triad. To avoid $104/81$ would be to avoid the obvious! 

$\exists$
another derivative pentatonic. Here we have a situation which works (To my ear) in spite of the fact the 4/3 appears once as a unit and twice as a “dinit”. That is to say, it is not the situation the “constant structure” is made of. It works because the ear by melodic means is persuaded the 4/3 is an altered B function (B+) and not an A+B function. And D absorbs the difference (D-). This is characteristic, again of a whole category of non-classical constructs my ear will accept.
The cycle of dints for this pentatonic is:

\[
\begin{array}{cccccc}
\frac{1}{3} & \frac{4}{3} & \frac{3}{2} & / & \frac{27}{26} & \frac{18}{13} & \frac{3}{1}
\end{array}
\]

\[
\begin{array}{cccc}
& \frac{4}{3} & \frac{9}{8} & \frac{18}{13} & \frac{4}{3} & \frac{13}{9}
\end{array}
\]

This reveals the situation where both 13/9 and its recip 18/13 are used as dints. Again, of course, it's a matter of function.
There are, of course, also, mixed Trichordal Pentatonics. One of my favorite pentatonics can only be explained as an altered pentatonic:

<table>
<thead>
<tr>
<th>0</th>
<th>5</th>
<th>12, 13</th>
<th>18, 22</th>
</tr>
</thead>
</table>
| 1/1 | 1/6 | 3/24 | 2/7 | 1/4 | 2/1

Here B is altered, in the lower Trichord, from 8/4 to 5/4. The disjunction absorbs the consequence. B+ = 6/5 is another well-integrated possibility.

Another melodically equivalent scale is:

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<th>0</th>
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<th>12, 13</th>
<th>18, 22</th>
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<tbody>
<tr>
<td>1</td>
<td>3/2</td>
<td>13/11</td>
<td>15/8</td>
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You can do this in 24T on: 0, 6, 13, 14, 20, 24.
The lower triplet of this scale has the proportional sequence:

\[
\frac{1}{32} \rightarrow \frac{1}{27} \rightarrow \frac{1}{22}
\]

which gives it a simple trillike flow, in spite of its higher numbers. This scale occurs in the 19-Tone diaphonic cycle:

![Diagram of 19-Tone Diaphonic Cycle]

as does this beautiful 7-Tone scale illustrating mix and/or altered tetradikords.
On the 22-tone Diaphonic Cycle

when the tetrachord 10/9, 16/15, 9/8 is put in the simplest harmonic context the following situation occurs:

\[
\begin{array}{c|c|c}
27 & 28 & 29 \\
30 & 31 & 32 \\
33 & 34 & 35 \\
36 & & \\
10/9 & 16/15 & 9/8
\end{array}
\]

The 10/9 is divided in 3 parts; the 16/15 is divided in 2 parts; and the 9/8 is divided in 4 parts. (This corresponds to the Sutra requirements of old Kafi.)

When the tetrachord is duplicated with the disjunction in the center the 7 tone scale is \(\underbrace{10/9 \ 16/15 \ 9/8 \ 9/8 \ 10/9 \ 16/15 \ 9/8}\) disjunction

Placing both tetrachords in their simplest harmonic context gives this result:

\[
\begin{array}{c|c|c|c|c|c|c|c|c}
27 & 28 & 29 & 30 & 31 & 32 & 33 & 34 & 35 \\
36 & & & & & & & & \\
\end{array}
\]

old Kafi

The 2 harmonic series intersect at tonic & octave \((27, 36)\). Also if the series are extended into the area of the disjunction they intersect again at \((39, 26)\). This forms a cycle of superparticulars having 22 tones.

There are other tetrachords in the same harmonic context. This suggest one organizing vehicle for combining tetrachords. (There are others but, that is another story.)
<table>
<thead>
<tr>
<th>28/27</th>
<th>15/14</th>
<th>6/5</th>
<th>(9/8)</th>
<th>28/27</th>
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<td>5/4</td>
<td>36/35</td>
<td>(9/8)</td>
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<td>5/4</td>
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<td>15/14</td>
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<td>7/2</td>
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<td>(9/8)</td>
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9 10 11 12 13 14 15 16 17 18 Harmonic series 9 thru 18

28/27 | 15/14 | 13/10 | 27/26 | 15/14 | 6/5 |
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<td>6/5</td>
<td>13/12</td>
<td>14/13</td>
<td>15/14</td>
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</tbody>
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raised 4th
Natural form
lowered 5th
Diphonic Cycle

Mode

52  51  50  49  48  47  46  45  44  43  42  41  40  39  38  37  36

13  12  11  10  9  8  7  6  5  4  3  2  1

Mode

13  12  11  10  9  8

Mode

13  12  11  10  9  8

Mode

13  12  11  10  9  8

Mode

13  12  11  10  9  8

Mode

13  12  11  10  9  8

Mode

13  12  11  10  9  8

Mode

13  12  11  10  9  8

Mode

13  12  11  10  9  8

Mode

13  12  11  10  9  8

Mode

13  12  11  10  9  8

Mode

13  12  11  10  9  8
Pentatonic alterations