

BICYCLE SRUTI ROTATIONS

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Bicycle is a 12 tone 13 limit scale discovered independently by David Canright, George Secor, Scott Dakota, and myself. It's made up of two 13-limit harmonic series on 1/1 and 3/2 and is notably a 12 tone Constant Structure, so it works on instruments like the piano. In addition, since it's made up of two seven-tone scales a 3/2 apart, it works on a hammered dulcimer with no modification apart from tuning.

The Bicycle Sruti Rotations are 22 tone scales that are made up of a tonic, a fifth, and ten tones that fit into a 12 tone Constant Structure framework but these ten tones come in two variations each. These are *not* 22 tone Constant Structures. The seven main modes of Bicycle used in the construction of the Bicycle Sruti Rotations are as follows:

$\frac{1}{1}$	$\frac{33}{32}$		$\frac{9}{8}$		$\frac{39}{32}$	$\frac{5}{4}$	$\frac{21}{16}$	$\frac{11}{8}$		$\frac{3}{2}$		$\frac{13}{8}$	$\frac{27}{16}$	$\frac{7}{4}$		$\frac{15}{8}$		$\frac{2}{1}$
$\frac{1}{1}$		$\frac{13}{12}$	$\frac{9}{8}$	$\frac{7}{6}$		$\frac{5}{4}$	$\frac{4}{3}$	$\frac{11}{8}$		$\frac{3}{2}$		$\frac{13}{8}$	$\frac{5}{3}$	$\frac{7}{4}$		$\frac{11}{6}$		$\frac{2}{1}$
$\frac{1}{1}$		$\frac{13}{12}$	$\frac{10}{9}$	$\frac{7}{6}$		$\frac{11}{9}$	$\frac{4}{3}$		$\frac{13}{9}$	$\frac{3}{2}$	$\frac{14}{9}$		$\frac{5}{3}$		$\frac{16}{9}$	$\frac{11}{6}$		$\frac{2}{1}$
$\frac{1}{1}$	$\frac{21}{20}$	$\frac{11}{10}$		$\frac{6}{5}$		$\frac{13}{10}$	$\frac{27}{20}$	$\frac{7}{5}$		$\frac{3}{2}$		$\frac{8}{5}$	$\frac{33}{20}$		$\frac{9}{5}$		$\frac{39}{20}$	$\frac{2}{1}$
$\frac{1}{1}$		$\frac{15}{14}$	$\frac{8}{7}$	$\frac{33}{28}$		$\frac{9}{7}$		$\frac{39}{28}$	$\frac{10}{7}$	$\frac{3}{2}$	$\frac{11}{7}$		$\frac{12}{7}$		$\frac{13}{7}$	$\frac{27}{14}$		$\frac{2}{1}$
$\frac{1}{1}$		$\frac{12}{11}$		$\frac{13}{11}$	$\frac{27}{22}$	$\frac{14}{11}$		$\frac{15}{11}$	$\frac{16}{11}$	$\frac{3}{2}$		$\frac{18}{11}$		$\frac{39}{22}$	$\frac{20}{11}$	$\frac{21}{11}$		$\frac{2}{1}$
$\frac{1}{1}$	$\frac{27}{26}$	$\frac{14}{13}$		$\frac{15}{13}$	$\frac{16}{13}$	$\frac{33}{26}$		$\frac{18}{13}$		$\frac{3}{2}$	$\frac{20}{13}$	$\frac{21}{13}$	$\frac{22}{13}$		$\frac{24}{13}$			$\frac{2}{1}$

A 22 tone scale is produced when any two of these are combined, with the exception of the first two, as well as the second and the third, which give rise to 17 tone scales. This means that all in all, there are 19 possible Bicycle Sruti Rotations.

When implementing these on certain instruments, such as guitars, certain notes may be omitted (e.g. if they're too close to other notes). The two harmonic series within Bicycle may also be expanded to higher prime limits.

Rotation I

S	r		R		g	G		m	M		P		d	D		n		N		Š
<u>1</u>	<u>33</u>		<u>9</u>		<u>39</u>	<u>5</u>		<u>21</u>	<u>11</u>		<u>3</u>		<u>13</u>	<u>27</u>		<u>7</u>		<u>15</u>		<u>2</u>
1	32		8		32	4		16	8		2		8	16		4		8		1
<u>1</u>		<u>13</u>	<u>10</u>		<u>7</u>		<u>11</u>		<u>4</u>		<u>3</u>	<u>14</u>		<u>5</u>		<u>16</u>	<u>11</u>		<u>2</u>	
1		12	9		6		9		3		2	9		3		9	6		1	
S	r	R	g	G	m	M	P	d	D	n	N	Š								

Rotation II

S	r		R		g	G		m	M		P		d	D		n		N		Š
<u>1</u>	<u>33</u>		<u>9</u>		<u>39</u>	<u>5</u>		<u>21</u>	<u>11</u>		<u>3</u>		<u>13</u>	<u>27</u>		<u>7</u>		<u>15</u>		<u>2</u>
1	32		8		32	4		16	8		2		8	16		4		8		1
<u>1</u>		<u>21</u>	<u>11</u>		<u>6</u>		<u>13</u>	<u>27</u>	<u>7</u>		<u>3</u>		<u>8</u>	<u>33</u>		<u>9</u>		<u>39</u>	<u>20</u>	<u>2</u>
1		20	10		5		10	20	5		2		5	20		5		20	1	1
S	r	R	g	G	m	M	P	d	D	n	N	Š								

Rotation III

S	r		R		g	G		m	M		P		d	D		n		N		Š
<u>1</u>	<u>33</u>		<u>9</u>		<u>39</u>	<u>5</u>		<u>21</u>	<u>11</u>		<u>3</u>		<u>13</u>	<u>27</u>		<u>7</u>		<u>15</u>		<u>2</u>
1	32		8		32	4		16	8		2		8	16		4		8		1
<u>1</u>		<u>15</u>	<u>8</u>	<u>33</u>		<u>9</u>		<u>39</u>	<u>10</u>		<u>3</u>	<u>11</u>		<u>12</u>		<u>13</u>	<u>27</u>	<u>2</u>		
1		14	7	28		7		28	7		2	7		7		7	14	1	1	
S	r	R	g	G	m	M	P	d	D	n	N	Š								

Rotation IV

S	r		R		g	G		m	M		P		d	D		n		N		Š
<u>1</u>	<u>33</u>		<u>9</u>		<u>39</u>	<u>5</u>		<u>21</u>	<u>11</u>		<u>3</u>		<u>13</u>	<u>27</u>		<u>7</u>		<u>15</u>		<u>2</u>
1	32		8		32	4		16	8		2		8	16		4		8		1
<u>1</u>		<u>12</u>		<u>13</u>	<u>27</u>	<u>14</u>		<u>15</u>	<u>16</u>	<u>3</u>		<u>18</u>		<u>39</u>	<u>20</u>		<u>21</u>		<u>2</u>	
1		11		11	22	11		11	11	2		11		22	11		11		1	
S	r	R	g	G	m	M	P	d	D	n	N	Š								

Rotation V

S	r		R		g	G		m	M		P		d	D		n		N		Š
<u>1</u>	<u>33</u>		<u>9</u>		<u>39</u>	<u>5</u>		<u>21</u>	<u>11</u>		<u>3</u>		<u>13</u>	<u>27</u>		<u>7</u>		<u>15</u>		<u>2</u>
1	32		8		32	4		16	8		2		8	16		4		8		1
<u>1</u>		<u>27</u>	<u>14</u>		<u>15</u>		<u>16</u>	<u>33</u>	<u>18</u>		<u>3</u>	<u>20</u>	<u>21</u>	<u>22</u>		<u>24</u>		<u>2</u>		
1		26	13		13		13	26	13		2	13	13	13		13		1		
S	r	R	g	G	m	M	P	d	D	n	N	Š								

Rotation VI

S		r	R		g	G		m	M		P		d	D		n		N		Š
<u>1</u>		<u>13</u>	<u>9</u>		<u>7</u>		<u>5</u>		<u>4</u>	<u>11</u>		<u>3</u>		<u>13</u>	<u>5</u>		<u>7</u>		<u>11</u>	<u>2</u>
1		12	8		6		4		3	8		2		8	3		4		6	1
<u>1</u>		<u>21</u>	<u>11</u>		<u>6</u>		<u>13</u>	<u>27</u>	<u>7</u>		<u>3</u>		<u>8</u>	<u>33</u>		<u>9</u>		<u>39</u>	<u>2</u>	
1		20	10		5		10	20	5		2		5	20		5		20	1	1
S	r	R	g	G	m	M	P	d	D	n	N	Š								

Rotation VII

S		r	R		g	G		m	M		P		d	D		n		N		Š
<u>1</u>		<u>13</u>	<u>9</u>		<u>7</u>		<u>5</u>		<u>4</u>	<u>11</u>		<u>3</u>		<u>13</u>	<u>5</u>		<u>7</u>		<u>11</u>	<u>2</u>
1		12	8		6		4		3	8		2		8	3		4		6	1
<u>1</u>		<u>15</u>	<u>8</u>	<u>33</u>		<u>9</u>		<u>39</u>	<u>10</u>		<u>3</u>	<u>11</u>		<u>12</u>		<u>13</u>	<u>27</u>	<u>2</u>		
1		14	7	28		7		28	7		2	7		7		7	14	1	1	
S	r	R	g	G	m	M	P	d	D	n	N	Š								

Rotation VIII

S	r	R	g	G	m	M	P	d	D	n	N	Š
<u>1</u>	<u>13</u>	<u>9</u>	<u>7</u>	<u>5</u>	<u>4</u>	<u>11</u>	<u>3</u>	<u>13</u>	<u>5</u>	<u>7</u>	<u>11</u>	<u>2</u>
1	12	8	6	4	3	8	2	8	3	4	6	1
<u>1</u>	<u>12</u>		<u>13</u>	<u>27</u>	<u>14</u>	<u>15</u>	<u>3</u>	<u>18</u>		<u>39</u>	<u>20</u>	<u>21</u>
1	11		11	22	11	11	2	11		22	11	11
S	r	R	g	G	m	M	P	d	D	n	N	Š

Rotation IX

S	r	R	g	G	m	M	P	d	D	n	N	Š
<u>1</u>	<u>13</u>	<u>9</u>	<u>7</u>	<u>5</u>	<u>4</u>	<u>11</u>	<u>3</u>	<u>13</u>	<u>5</u>	<u>7</u>	<u>11</u>	<u>2</u>
1	12	8	6	4	3	8	2	8	3	4	6	1
<u>1</u>	<u>27</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>33</u>	<u>18</u>	<u>3</u>	<u>20</u>	<u>21</u>	<u>22</u>	<u>24</u>	<u>2</u>
1	26	13	13	13	26	13	2	13	13	13	13	1
S	r	R	g	G	m	M	P	d	D	n	N	Š

Rotation X

S	r	R	g	G	m	M	P	d	D	n	N	Š
<u>1</u>	<u>13</u>	<u>10</u>	<u>7</u>	<u>11</u>	<u>4</u>	<u>13</u>	<u>3</u>	<u>14</u>	<u>5</u>	<u>16</u>	<u>11</u>	<u>2</u>
1	12	9	6	9	3	9	2	9	3	9	6	1
<u>1</u>	<u>21</u>	<u>11</u>	<u>6</u>	<u>13</u>	<u>27</u>	<u>7</u>	<u>3</u>	<u>8</u>	<u>33</u>	<u>9</u>		<u>39</u>
1	20	10	5	10	20	5	2	5	20	5		20
S	r	R	g	G	m	M	P	d	D	n	N	Š

Rotation XI

S	r	R	g	G	m	M	P	d	D	n	N	Š
<u>1</u>	<u>13</u>	<u>10</u>	<u>7</u>	<u>11</u>	<u>4</u>	<u>13</u>	<u>3</u>	<u>14</u>	<u>5</u>	<u>16</u>	<u>11</u>	<u>2</u>
1	12	9	6	9	3	9	2	9	3	9	6	1
<u>1</u>	<u>15</u>		<u>8</u>	<u>33</u>	<u>9</u>	<u>39</u>	<u>10</u>	<u>11</u>		<u>12</u>	<u>13</u>	<u>27</u>
1	14		7	28	7	28	7	7		7	7	14
S	r	R	g	G	m	M	P	d	D	n	N	Š

Rotation XII

S	r	R	g	G	m	M	P	d	D	n	N	Š
<u>1</u>	<u>13</u>	<u>10</u>	<u>7</u>	<u>11</u>	<u>4</u>	<u>13</u>	<u>3</u>	<u>14</u>	<u>5</u>	<u>16</u>	<u>11</u>	<u>2</u>
1	12	9	6	9	3	9	2	9	3	9	6	1
<u>1</u>	<u>12</u>		<u>13</u>	<u>27</u>	<u>14</u>	<u>15</u>	<u>3</u>		<u>18</u>	<u>39</u>	<u>20</u>	<u>21</u>
1	11		11	22	11	11	2		11	22	11	11
S	r	R	g	G	m	M	P	d	D	n	N	Š

Rotation XIII

S	r	R	g	G	m	M	P	d	D	n	N	Š
<u>1</u>	<u>13</u>	<u>10</u>	<u>7</u>	<u>11</u>	<u>4</u>	<u>13</u>	<u>3</u>	<u>14</u>	<u>5</u>	<u>16</u>	<u>11</u>	<u>2</u>
1	12	9	6	9	3	9	2	9	3	9	6	1
<u>1</u>	<u>27</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>33</u>	<u>18</u>	<u>3</u>	<u>20</u>	<u>21</u>	<u>22</u>	<u>24</u>	<u>2</u>
1	26	13	13	13	26	13	2	13	13	13	13	1
S	r	R	g	G	m	M	P	d	D	n	N	Š

Rotation XIV

S	r	R	g	G	m	M	P	d	D	n	N	\$	
<u>1</u>	<u>21</u>	<u>11</u>	<u>6</u>	<u>13</u>	<u>27</u>	<u>7</u>	<u>3</u>	<u>8</u>	<u>33</u>	<u>9</u>	<u>39</u>	<u>2</u>	
1	20	10	5	10	20	5	2	5	20	5	20	1	
<u>1</u>	<u>15</u>		<u>8</u>	<u>33</u>	<u>9</u>	<u>39</u>	<u>10</u>	<u>3</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>27</u>	<u>2</u>
1	14		7	28	7	28	7	2	7	7	7	14	1
S	r	R	g	G	m	M	P	d	D	n	N	\$	

Rotation XV

S	r	R	g	G	m	M	P	d	D	n	N	\$	
<u>1</u>	<u>21</u>	<u>11</u>	<u>6</u>	<u>13</u>	<u>27</u>	<u>7</u>	<u>3</u>	<u>8</u>	<u>33</u>	<u>9</u>	<u>39</u>	<u>2</u>	
1	20	10	5	10	20	5	2	5	20	5	20	1	
<u>1</u>		<u>12</u>	<u>13</u>	<u>27</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>3</u>	<u>18</u>	<u>39</u>	<u>20</u>	<u>21</u>	<u>2</u>
1		11	11	22	11	11	11	2	11	22	11	11	1

Rotation XVI

S	r	R	g	G	m	M	P	d	D	n	N	\$
<u>1</u>	<u>21</u>	<u>11</u>	<u>6</u>	<u>13</u>	<u>27</u>	<u>7</u>	<u>3</u>	<u>8</u>	<u>33</u>	<u>9</u>	<u>39</u>	<u>2</u>
1	20	10	5	10	20	5	2	5	20	5	20	1
<u>1</u>	<u>27</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>33</u>	<u>18</u>	<u>3</u>	<u>20</u>	<u>21</u>	<u>22</u>	<u>24</u>	<u>2</u>
1	26	13	13	13	26	13	2	13	13	13	13	1
S	r	R	g	G	m	M	P	d	D	n	N	\$

Rotation XVII

S	r	R	g	G	m	M	P	d	D	n	N	\$	
<u>1</u>	<u>15</u>	<u>8</u>	<u>33</u>	<u>9</u>	<u>39</u>	<u>10</u>	<u>3</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>27</u>	<u>2</u>	
1	14	7	28	7	28	7	2	7	7	7	14	1	
<u>1</u>		<u>12</u>	<u>13</u>	<u>27</u>	<u>14</u>	<u>15</u>	<u>3</u>		<u>18</u>	<u>39</u>	<u>20</u>	<u>21</u>	<u>2</u>
1		11	11	22	11	11	2		11	22	11	11	1
S	r	R	g	G	m	M	P	d	D	n	N	\$	

Rotation XVIII

S	r	R	g	G	m	M	P	d	D	n	N	\$
<u>1</u>	<u>15</u>	<u>8</u>	<u>33</u>	<u>9</u>	<u>39</u>	<u>10</u>	<u>3</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>27</u>	<u>2</u>
1	14	7	28	7	28	7	2	7	7	7	14	1
<u>1</u>	<u>27</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>33</u>	<u>18</u>	<u>3</u>	<u>20</u>	<u>21</u>	<u>22</u>	<u>24</u>	<u>2</u>
1	26	13	13	13	26	13	2	13	13	13	13	1
S	r	R	g	G	m	M	P	d	D	n	N	\$

Rotation XIX

S	r	R	g	G	m	M	P	d	D	n	N	\$
<u>1</u>	<u>12</u>	<u>13</u>	<u>27</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>3</u>	<u>18</u>	<u>39</u>	<u>20</u>	<u>21</u>	<u>2</u>
1	11	11	22	11	11	11	2	11	22	11	11	1
<u>1</u>	<u>27</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>33</u>	<u>18</u>	<u>3</u>	<u>20</u>	<u>21</u>	<u>22</u>	<u>24</u>	<u>2</u>
1	26	13	13	13	26	13	2	13	13	13	13	1
S	r	R	g	G	m	M	P	d	D	n	N	\$

TETRACHORDS CONTAINED IN BICYCLE, WITH REFERENCE TO THE MELAKARTA SYSTEM

In the 3/2 - 1/1 Tetrachord:

S	<u>R</u>	R	<u>G</u>	G	M	(Ṁ)
1/1	13/12	9/8			4/3	(11/8)
1/1	13/12		7/6		4/3	
1/1	13/12			5/4	4/3	
1/1		9/8	7/6		4/3	
1/1		9/8		5/4	4/3	
1/1			7/6	5/4	4/3	

In the 9/8 - 3/2 Tetrachord:

S	<u>R</u>	R	<u>G</u>	G	M	(Ṁ)
1/1	13/12	10/9			4/3	(13/9)
1/1	13/12		7/6		4/3	
1/1	13/12			11/9	4/3	
1/1		10/9	7/6		4/3	
1/1		10/9		11/9	4/3	
1/1			7/6	11/9	4/3	

In the 27/16 - 9/8 Tetrachord:

S	<u>R</u>	R	<u>G</u>	G	M	(Ṁ)
1/1	28/27	10/9			4/3	(13/9)
1/1	28/27		32/27		4/3	
1/1	28/27			11/9	4/3	
1/1		10/9	32/27		4/3	
1/1		10/9		11/9	4/3	
1/1			32/27	11/9	4/3	

In the 15/8 - 5/4 Tetrachord:

S	<u>R</u>	R	<u>G</u>	G	M	(Ṁ)
1/1	16/15	11/10			4/3	(7/5)
1/1	16/15		6/5		4/3	
1/1	16/15			13/10	4/3	
1/1		11/10	6/5		4/3	
1/1		11/10		13/10	4/3	
1/1			6/5	13/10	4/3	

In the 33/32 - 11/8 Tetrachord:

S	<u>R</u>	R	<u>G</u>	G	M	(Ṁ)
1/1	12/11	13/11			4/3	(16/11)
1/1	12/11		40/33		4/3	
1/1	12/11			14/11	4/3	
1/1		13/11	40/33		4/3	
1/1		13/11		14/11	4/3	
1/1			40/33	14/11	4/3	

In the 39/32 - 13/8 Tetrachord:

S	<u>R</u>	R	<u>G</u>	G	M	(<u>M</u>)
1/1	40/39	14/13			4/3	(18/13)
1/1	40/39		44/39		4/3	
1/1	40/39			16/13	4/3	
1/1		14/13	44/39		4/3	
1/1		14/13		16/13	4/3	
1/1			44/39	16/13	4/3	

In the 21/16 - 7/4 Tetrachord:

S	<u>R</u>	R	<u>G</u>	G	M	(<u>M</u>)
1/1	22/21	8/7			4/3	(10/7)
1/1	22/21		26/21		4/3	
1/1	22/21			9/7	4/3	
1/1		8/7	26/21		4/3	
1/1		8/7		9/7	4/3	
1/1			26/21	9/7	4/3	