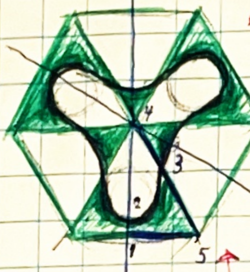
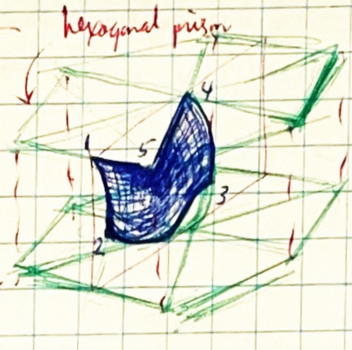
Sunday, July 7, 1974

Discovered (and produced soap-film — wire-frame model of) TREFOIL complement of Schwarz's H-surface: $\boxed{C_T(H)}$ $\boxed{\text{genus } 13}$

Fig. 1





$$\Sigma' \iota_K = \cancel{\tfrac{?\pi}{12}} \quad (2-n)\pi + \Sigma \iota_K = -3\pi + \cancel{\tfrac{?\pi}{12}} = \cancel{\tfrac{?\pi}{12}} = \iint_P K\,dA$$

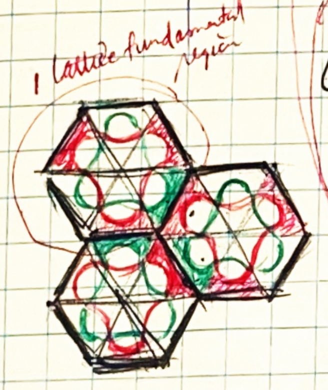
$$\iint_M K\,dA = (24)\left(-\tfrac{?\pi}{?}\right) = -24\pi = 2\pi\chi$$

$$\therefore \chi = -12$$

$$p = 1 - \frac{\chi}{2} = 7$$

1) 90°
2) 90°
3) 90°
4) ~~60~~ 30°
5) 60°

$\Sigma \iota_K = 3\cancel{6}0° = \cancel{\tfrac{25}{12}}\pi\ 2\pi$



One lattice unit cell includes the contents of $\cancel{4}^2$ complete hexagonal prisms.

This is equivalent to ~~96~~ 48 pentagonal modules ≡ 12345 (above)

$$\Sigma \iota_K = 2\pi.\ \therefore (2-n)\pi + \Sigma' \iota_K = -3\pi + 2\pi = -\pi$$

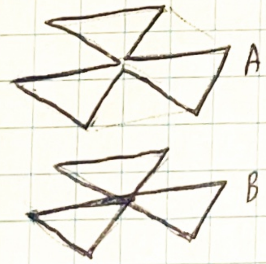
$$\therefore -\pi \equiv \iint_P K\,dA \quad \text{Hence} \iint_M K\,dA = (48)(-\pi) = -48\pi = 2\pi\chi$$

$$\therefore \chi = -24$$

$$p = 1 - \frac{\chi}{2} = \boxed{13}$$

This surface is about as easy to produce as a soap film model as the genus ~~9~~ 5  "dog-bone" complement of P.

Procedure:

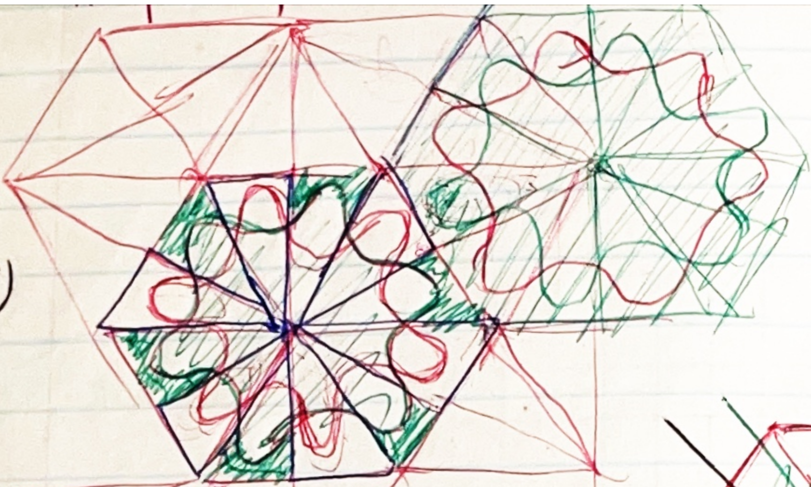


1) Place A on top of B
2) Separate A from B vertically
3) Break equatorial films
4) Blow — with straw — in here to produce rearrangement of ~~extra~~ "extra" vertical films.

5) Using narrow spike of twisted paper towel, puncture the 2 extra films at α & β.

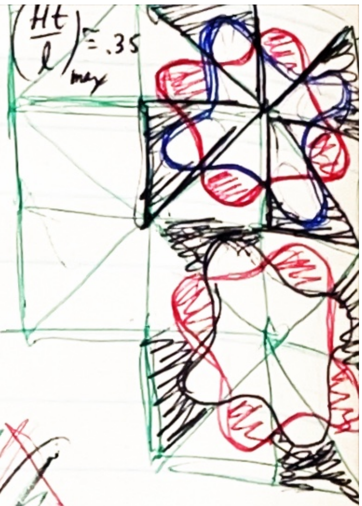
Note: This surface reaches limiting configuration shown in Fig. 1 above when separation of frames A and B is about = to ½ of triangle edge length.

1

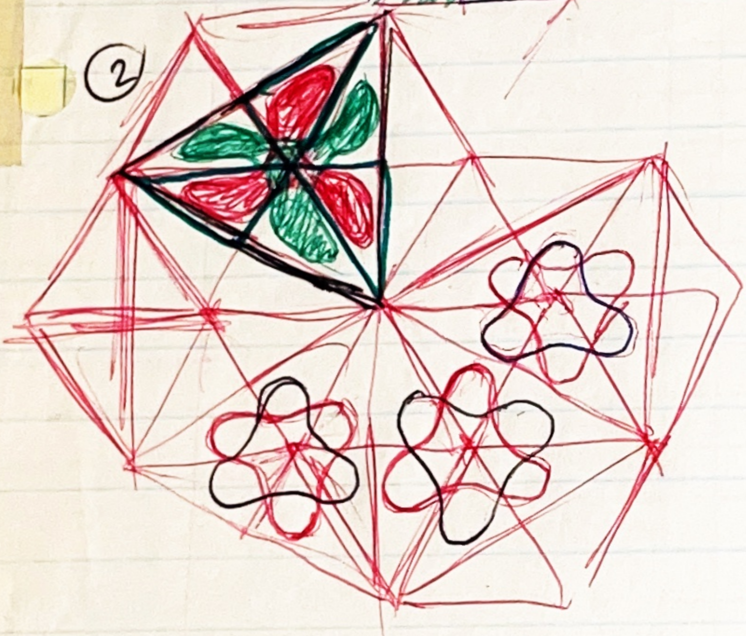


$\left(\frac{Ht}{l}\right)_{max} \cong .35$

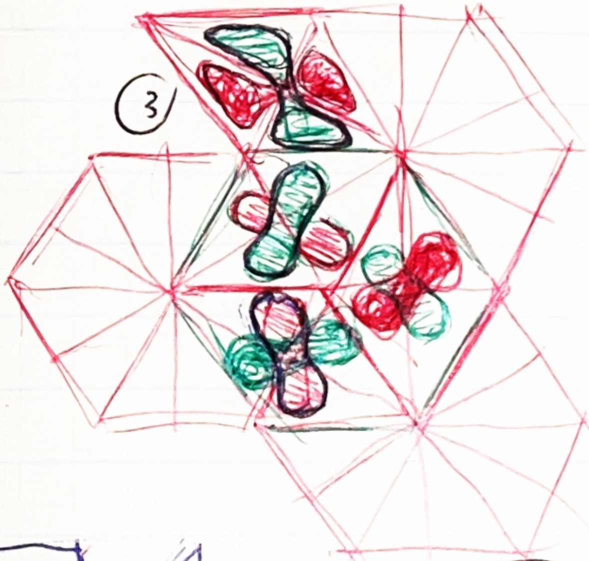
4



2

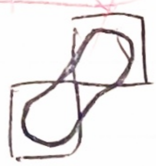


3

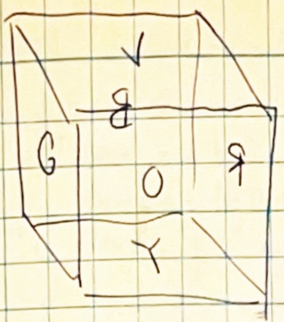


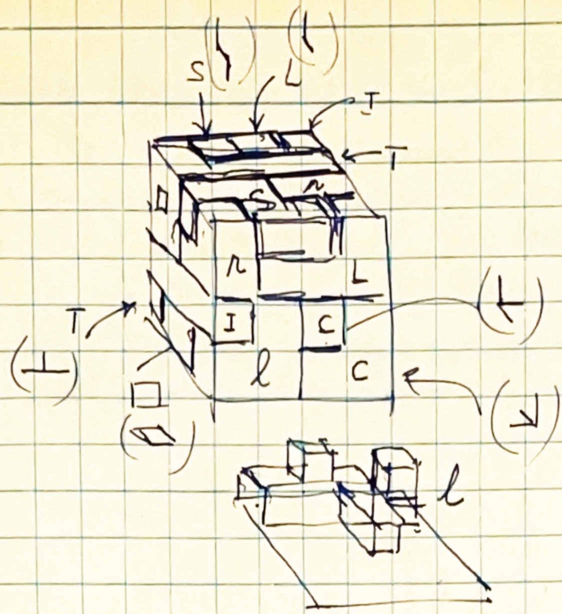
evening of Sunday, 7/7/74:

4 more new surfaces !!

Recall 

&  $\left(\frac{Ht}{l}\right)_{max} \cong 0.7$



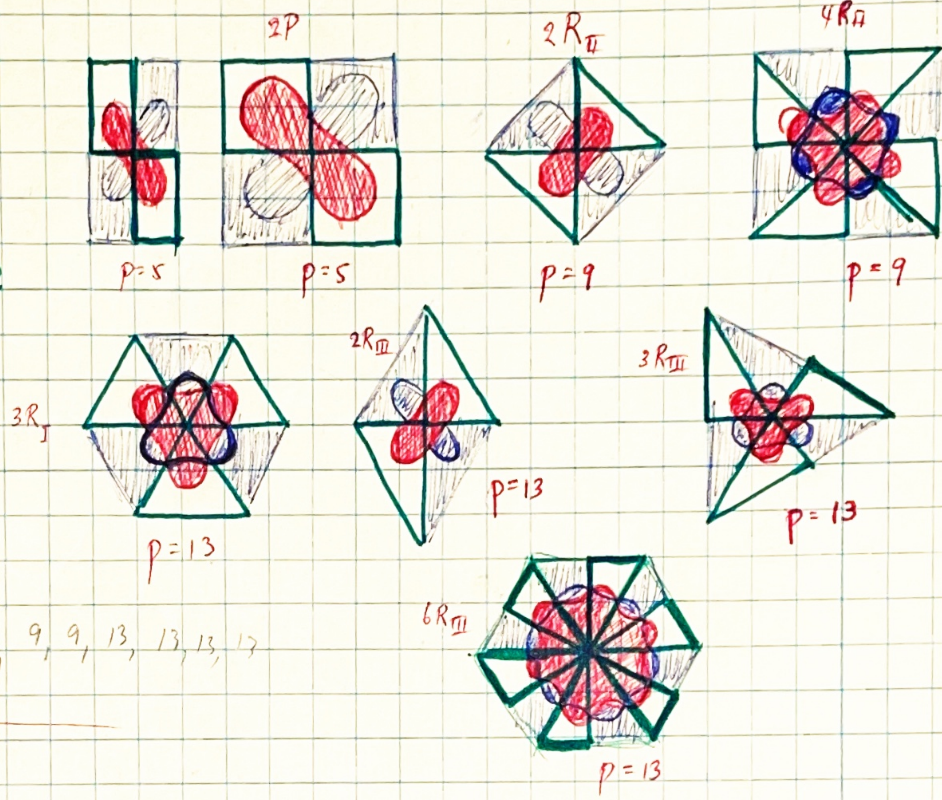


Monday, 7/8/74

Summary:

8 surfaces

of ~~star~~ crossed-ring type



5, 5, 9, 9, 13, 13, 13, 13

		p
	P	3
333	R_I	3
244	R_{II}	9
236	R_{III}	13
	2P	5
	$3R_I$	13
	$2R_{II}$	9
	$4R_{II}$	
	$2R_{III}$	13
	$3R_{III}$	
	$6R_{III}$	13

Dec. 18, 2002. I sent Ken Brakke adjoint data a week ago for 1972 complements of D and of C(D). He mounted the solutions on his TPMS website and I discovered them there yesterday.

Now I will soon send him Mathematica notebooks containing adjoint data for additional cases — first the successor to the $p = 35$ surface he solved for. This case is $p = 51$:

$\sum^{8} \iota_k = \frac{14\pi}{3} + 2\frac{\pi}{2} = \frac{28\pi}{6} + \frac{6\pi}{6} = \frac{34\pi}{6}$ $\iint_M K\,dA = (2-16)\pi + \frac{34\pi}{6} = (-14 + \frac{34}{6})\frac{\pi}{1} = (-84+34)\frac{\pi}{6} = -\frac{50\pi}{6}$. $\iint_P K\,dA = 24(\frac{50\pi}{6}) = -200\pi$

$-200\pi = 2\pi\chi \therefore \chi = -100 = 2 - 2p \Rightarrow \boxed{p = 51}$ (16 sides inside tetragonal disphenoid; the "filigrees" ( ) are on the 111 edges.

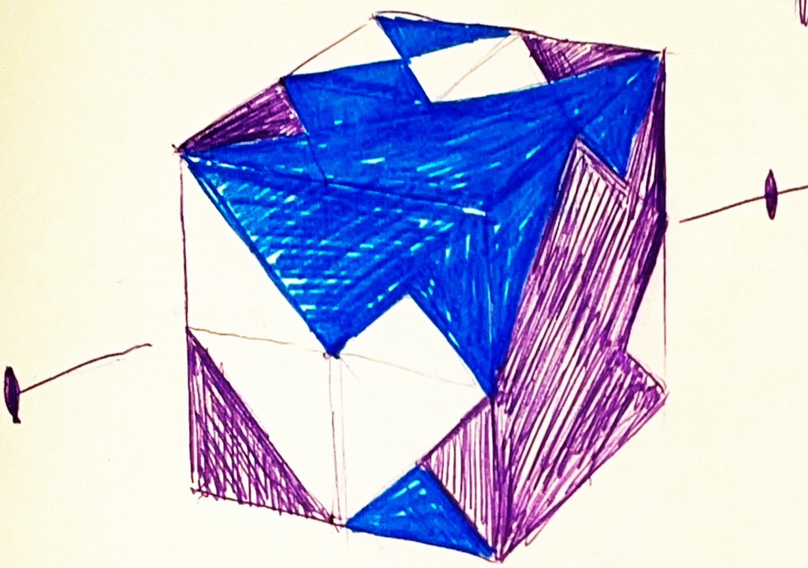
Later: Now I have sent Ken (by e-mail) the Mathematica notebooks for both the $p = 51$ & $p = 67$ adjoints.

Solution of Burke's cube

(Barry Sullivan,
October, 1973)

Red (!)

Blue (!!)



2 $\frac{1}{2}$-turn about this (110)-axis will bring the cube into the position shown in Burke's drawing.