Jednadžba školjke

Školjke možemo nacrtati u 3D-prostoru pomoću parametarske jednadžbe. Ovdje ćemo dati jedan takav model.

Matematički model

Svaka točka na površini predstavljena je pomoću (x, y, z) trojke. Ako su zadovoljene jednakosti

$$x = D\left(A\sin\beta\cos\Theta + R\cos(s+\phi)\cos(\Theta+\Omega) - R\sin\mu\sin(s+\phi)\sin(\Theta+\Omega)\right)e^{\Theta\,\mathrm{ctg}\,\alpha}$$
$$y = \left(-A\sin\beta\sin\Theta - R\cos(s+\phi)\sin(\Theta+\Omega) - R\sin\mu\sin(s+\phi)\cos(\Theta+\Omega)\right)e^{\Theta\,\mathrm{ctg}\,\alpha}$$
$$z = \left(-A\cos\beta + R\sin(s+\phi)\cos\mu\right)e^{\Theta\,\mathrm{ctg}\,\alpha}$$

možemo dobiti zanimljive oblike. Ovaj oblik prvi je otkrio **A. Cortie**, a zasniva se na mnogim simetrijama (osnim, centralnim, plošnim...)

Čitateljima ovi mnogi parametri možda ništa ne znače. Svaki od njih ima svoje značenje koje sad nećemo navoditi. Uz pomoć računala *udahnut* ćemo im život.

Upis u računalo

Upišimo proceduru u MAPLE-u za izračun radijana, te koordinate (x, y, z).

```
> rad:=proc(aa) aa/360*2*Pi end:
> x:=D*(A*sin(beta)*cos(Theta)+R*cos(s+phi)*cos(Theta+Omega)-R*sin(mu)*
sin(s+phi)*sin(Theta+Omega))*exp(Theta*cot(alpha)):
y:=(-A*sin(beta)*sin(Theta)-R*cos(s+phi)*sin(Theta+Omega)-R*sin(mu)*si
n(s+phi)*cos(Theta+Omega))*exp(Theta*cot(alpha)):
z:=(-A*cos(beta)+R*sin(s+phi)*cos(mu))*exp(Theta*cot(alpha)):
```

Sada ćemo uvesti još neke parametre.

```
> SR:=R=RE+k:
SRE:=RE=1/sqrt(cos(s)^2/a^2+sin(s)^2/b^2):
Sk:=k=L*exp(-(2*(s-P)/W[1])^2)*exp(-(2*g/W[2])^2):
Sg:=g=2*Pi/N*(Theta*N/2/Pi-round(Theta*N/2/Pi)):
```

Nitko nije rekao da su školjke jednostavni oblici!

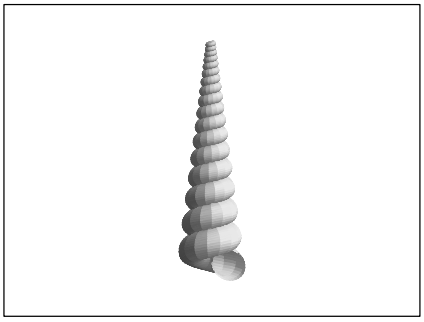
Turritella

Evo i naše prve školjke!

```
> S:={D=1,alpha=rad(88.9),beta=rad(4),phi=rad(55),mu=rad(1),
Omega=rad(-2),smM=rad(-267)..rad(39),A=22.2,a=1.3,b=1.5,P=0,L=0};
R1:=subs(S,subs(SR,SRE,Sk,Sg,[x,y,z])):
```

$$S := \{\mathrm{D} = 1,\ \mu = \frac{\pi}{180},\ \Omega = -\frac{\pi}{90},\ P = 0,\ L = 0,\ \phi = \frac{11\,\pi}{36},\ A = 22.2,\ a = 1.3,\ b = 1.5,$$
$$\alpha = 0.4938888889\,\pi,\ \beta = \frac{\pi}{45},\ smM = -\frac{89\,\pi}{60}..\frac{13\,\pi}{60}\}$$

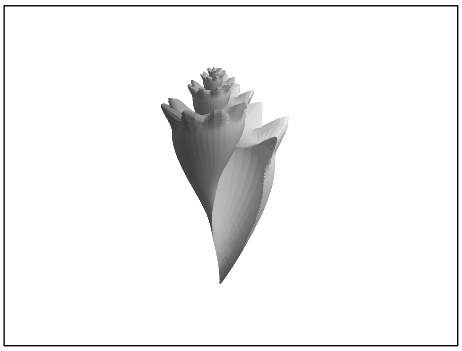
```
> plot3d(R1,s=subs(S,smM),Theta=-30*Pi..4*Pi,grid=[30,250],orientation=
[-83,89],style=patchnogrid,scaling=constrained,lightmodel=light2,shadi
ng=xy);
```



Lyria

Promjenom parametara dobivamo našu drugu školjku.

```
> S:={D=1,alpha=rad(83.9),beta=rad(-19),phi=rad(45),mu=rad(1),
Omega=rad(-2),smM=rad(-51)..rad(9),A=50,a=40,b=14,P=0,L=8,W[1]=rad(6),
W[2]=rad(27),N=8}:
R1:=subs(S,subs(SR,SRE,Sk,Sg,[x,y,z])):
> plot3d(R1,s=subs(S,smM),Theta=-4*Pi..4*Pi,grid=[80,150],style=patchno
grid,scaling=constrained,lightmodel=light2,shading=xyz,orientation=[-4
8,75]);
```



Natalina

```
> S:={D=1,alpha=rad(80),beta=rad(40),phi=rad(55),mu=rad(10),
Omega=rad(30),smM=rad(-270)..rad(80),A=25,a=12,b=16,P=0,L=0}:
R1:=subs(S,subs(SR,SRE,Sk,Sg,[x,y,z])):
> plot3d(R1,s=subs(S,smM),Theta=-2*Pi..4*Pi,grid=[100,100],style=patchn
ogrid,scaling=constrained,orientation=[-68,80],lightmodel=light2,shadi
ng=xy);
```