The Rössler attractor is a very simple system of coupled non-linear differential equations
It was designed with the idea of modeling chemical kinetic behavior but has been applied to macromolecular oscillations. In earlier work we showed how the Rössler system, if coupled by diffusion to other Rössler elements ,a , would for certain spatio-temporal arrangements become nearly periodic even though the starting point for the individual oscillating elements was chaotic (1 and 2).

dx / dt = - y - z
dy / dt = x + a y
dz / dt = b + z (x - c)

(3)

Here we have modified the Rossler equations to put the oscillation in the positive quadrant and to rotate the phase of maximum level of the three variables.

$Tpt := 10000$

Given

$a := .2 \qquad c := 3.75 \qquad A := 15 \qquad B := 15 \qquad m := 3.2$

$y0(0) = 10 \qquad y1(0) = 10 \qquad y2(0) = 0$

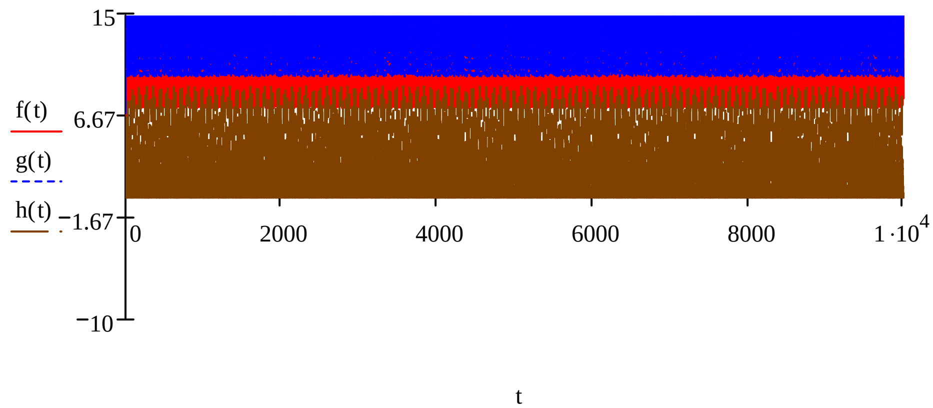
$$\frac{d}{du}y0(u) = -(y1(u) - B)\cdot(1 + a\cdot\cos(m)\cdot\sin(m)) + a\cdot(y0(u) - A)\cdot\sin(m)\cdot\sin(m) - y2(u)\cdot\cos(m)$$

$$\frac{d}{du}y1(u) = (y0(u) - A)\cdot(1 - a\cdot\cos(m)\cdot\sin(m)) + a\cdot(y1(u) - B)\cdot\cos(m)\cdot\cos(m) - (y2(u)\cdot\sin(m))$$

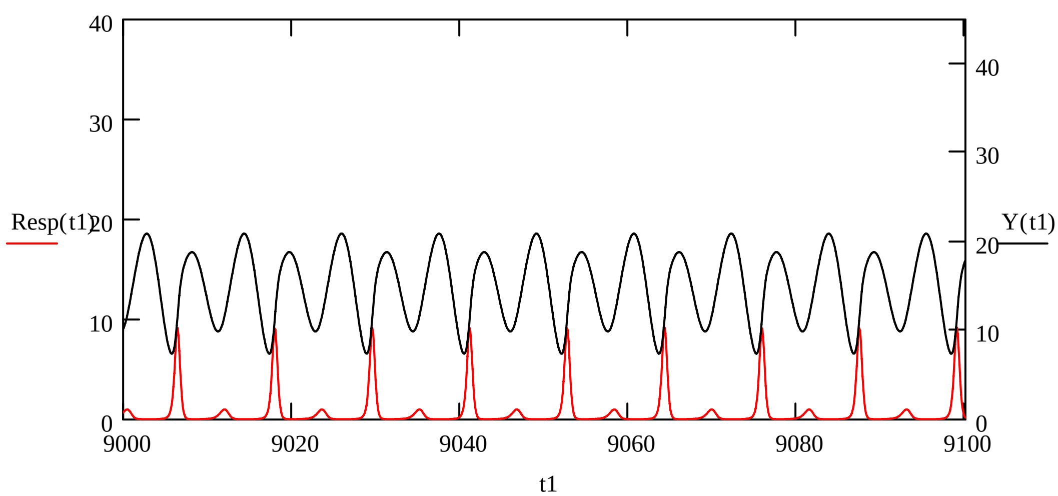
$$\frac{d}{du}y2(u) = a + y2(u)[(y0(u) - A)\cdot\cos(m) + (y1(u) - B)\cdot\sin(m) - c]$$

$$\begin{pmatrix} f \\ g \\ h \end{pmatrix} := \text{Odesolve}\left[\begin{pmatrix} y0 \\ y1 \\ y2 \end{pmatrix}, u, Tpt, 100000\right]$$

$$t := 0, \frac{Tpt}{10000} .. 10000$$

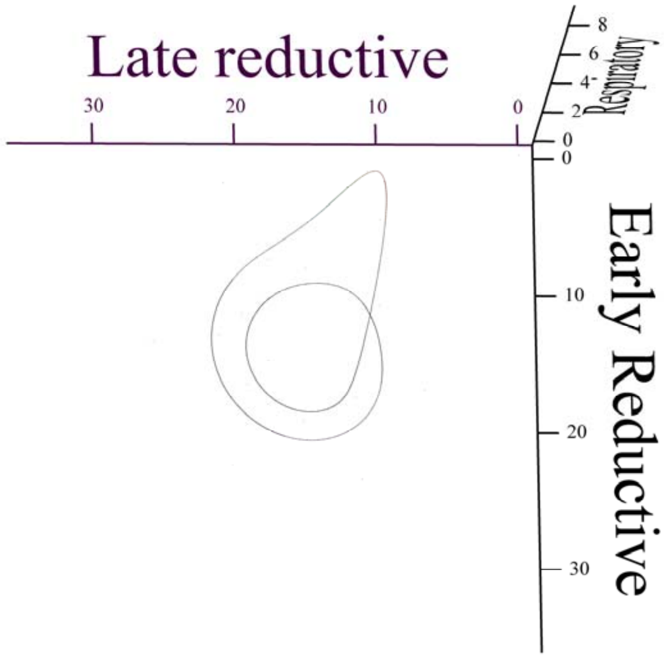


$Resp := h \qquad Y := f$



$$j := 1 .. 10000 \qquad i_0 := 0 \qquad i_j := i_{j-1} + \frac{Tpt}{10000}$$

$F_j := f(i_j) \qquad G_j := g(i_j) \qquad H_j := h(i_j)$



References

1. Klevecz RR, Bolen JL, Duran O (1992) *Int J Bifurcation Chaos* 2:941-953.
2. Bolen JL, Duran O, Klevecz RR (1993) *Physica D* 67:245-256.
3. Rssler, OE (1976) *Phys Lett* 35A:397-398.