**Poster I-37**

**Electrical Analogs as a Means to Understanding Biological Signaling Networks**

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The EGF pathway developed by Schoeberl et. al. (*Nature Biotechnology* **20**, pp 370–375, 2002) is an example of a complex signaling network made up of sixty molecular species and fifty-nine reaction steps (See Figure 1). One of the puzzles that confronts biology today is, what is all this complexity for? What are all the intermediate steps between the EGF input and MAPK-PP output doing? One assumes that some form of signal processing is occurring, perhaps some form of signal filtering and amplification of the signal. Unfortunately we only have a very vague idea of what these signaling networks do, the exact nature of the processing is still very open to question. From a technological point of view, reaction networks look nothing like the familiar signaling networks we find in electrical engineering and therefore it is difficult for us to bring to bear the insights offered by electrical engineering and control theory into biology. This might partly explain why we find it so difficult to precisely understand the nature of the processing that biological signaling networks carry out.

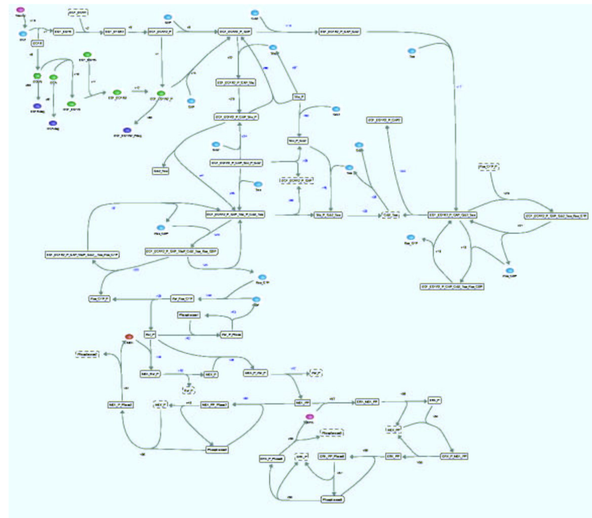

Figure 1: EGF model from Schoeberl et al. redrawn by Mino Eladdadi using JDesigner

One possible solution is to try and draw parallels between specific electrical circuits, such as filters, amplifiers, op-amps and so on and their biological equivalents. Once we have a selection of biological processing units we can compare these to real biological signaling networks in the hope that we will find similar structures. As a start, this poster will describe a small selection of reaction networks which can perform the function of transistor, logic gates, feedback amplifier, operational amplifier and frequency filter circuits.