Can we define the basic building blocks of networks?

- Generalize the notion of MOTIFS, widely used in sequence analysis, to the level of networks.
- Sequence motif: a sequence that appears much more frequently than in randomized sequences.
- **'Network motif':** a pattern that appear much more frequently than in randomized networks.

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Complex networks are found throughout biology







The thirteen 3-node connected subgraphs







The feed-forward loop is a filter for transient signals allowing fast shutdown













Grow strains under same conditions and measure reporter fluorescence or luminescence

Each well reports for a different promoter

A



Commercial fluorimeter/luminometer shakes, temperature control, imjectors. ¹³ Measure at the same time cell optical density.













































Negative Feedback can show over-damping, damped or un-damped oscillations, depending on parameters



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Food webs represent predatory interactions between species



Skipwith pond (25 nodes), primarily invertebrates Little Rock Lake (92 nodes), pelagic and benthic species Bridge Brook Lake (25 nodes), pelagic lake species Chesapeake Bay (31 nodes), emphasizing larger fishes Ythan Estuary (78 nodes) birds, fishes, invertebrates 42 Coachella Valley (29 nodes), diverse desert taxa St. Martin Island (42 nodes), lizards

Source: Williams & Martinez, 2000



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COMBIO 2005

P53 dynamics in living cells Experiments and modelling

Uri Alon Weizmann Institute



















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M. Elowitz, Caltech S. Leibler, Rockefeller M.G. Surette, Calgary H. Margalit, Jerusalem Summary -network motifs

Network motifs, significant patterns in networks

Three motifs in transcription networks and their functions

High-accuracy promoter activity measurements from living cells

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