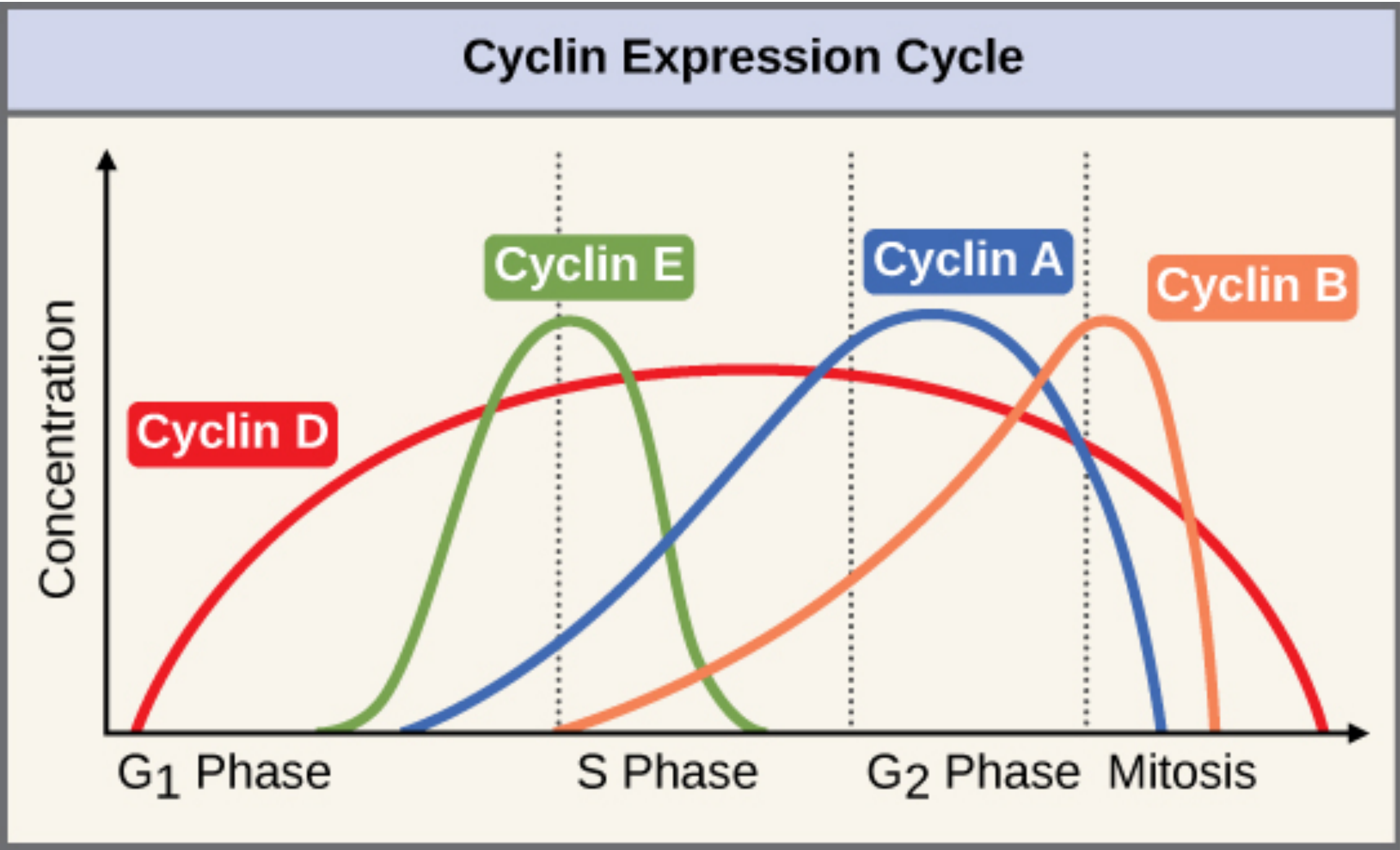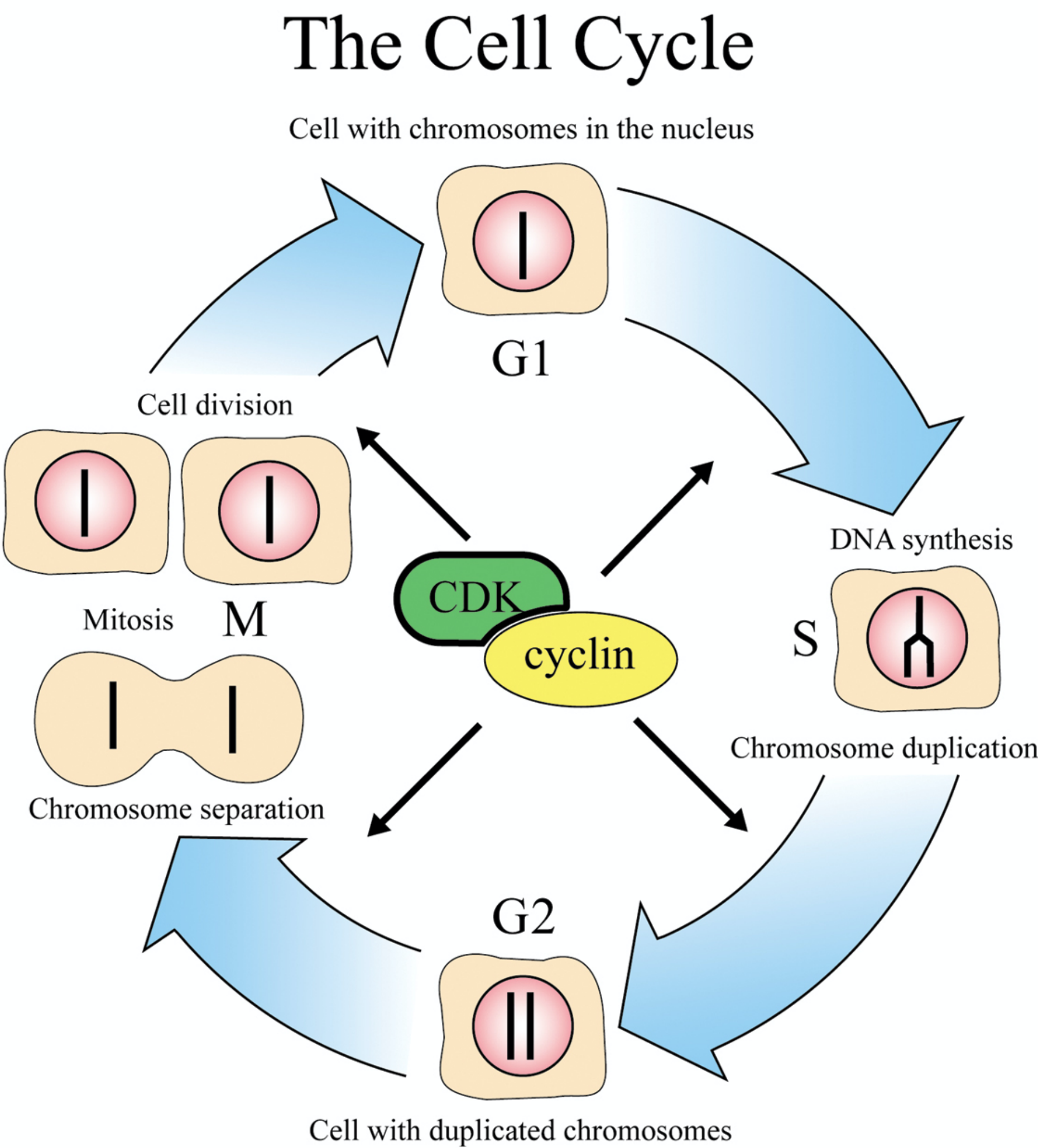# Eukaryotic cell cycles are regulated by cyclins and cyclin dependent kinases
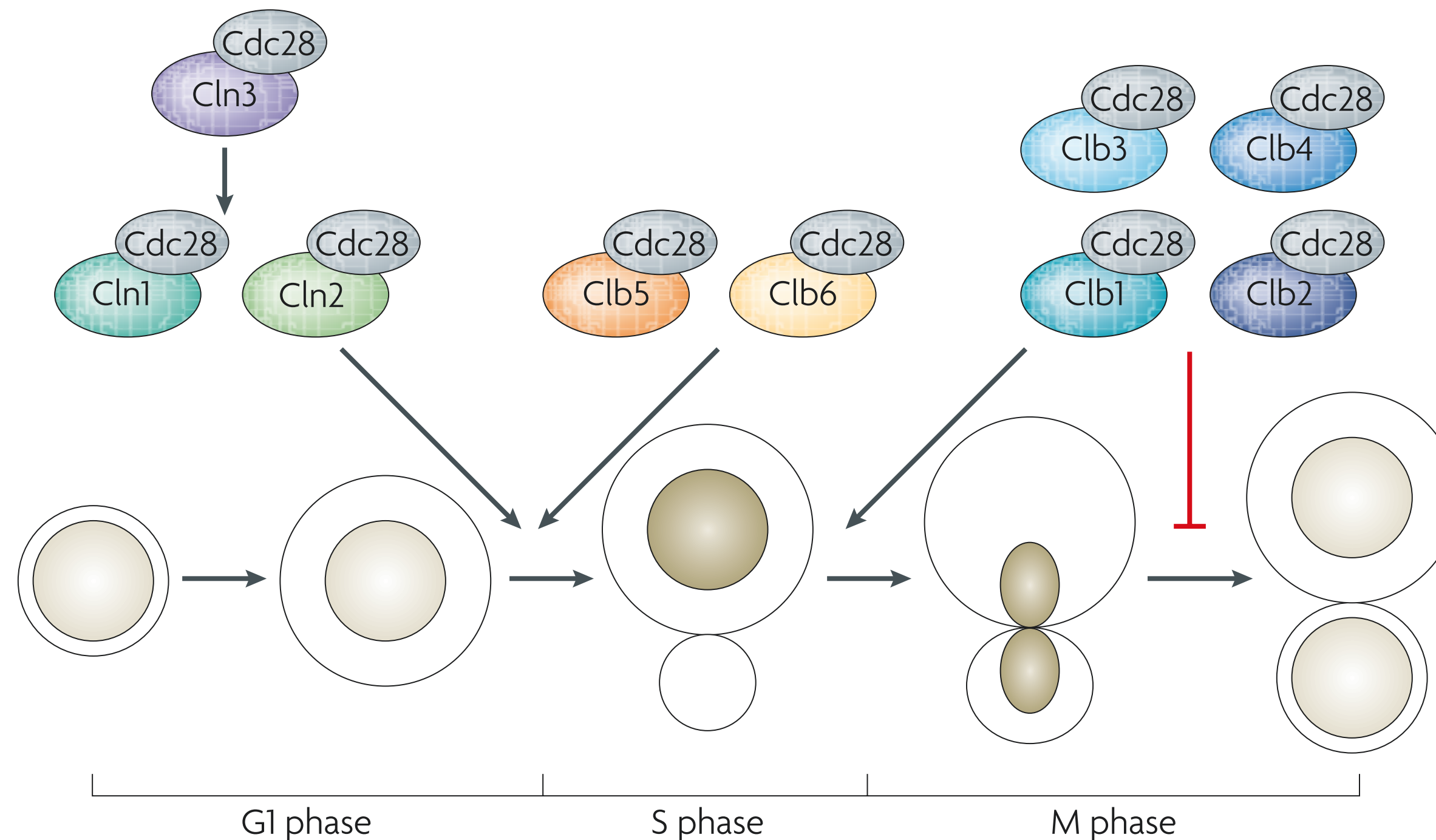
Yeast Cyclins/CDK

Figure 1 | **Cyclins in the budding yeast cell cycle.** Budding yeast cyclins activate a single cyclin-dependent kinase (Cdc28). The G1-phase cyclins (Cln1, Cln2 and Cln3) promote bud emergence, spindle pole body duplication (not shown) and activation of the B-type cyclins. The S-phase cyclins (Clb5, Clb6) advance DNA replication (shaded nucleus), and the M-phase cyclins (Clb1, Clb2, Clb3 and Clb4) promote spindle formation and the initiation of mitosis. Mitotic cyclins inhibit mitotic exit and cell division. Following cytokinesis, a mother and daughter cell are generated.

Global control of cell-cycle transcription by coupled CDK and network oscillators

David A. Orlando[1,2], Charles Y. Lin[1], Allister Bernard[3], Jean Y. Wang[1], Joshua E. S. Socolar[4], Edwin S. Iversen[5], Alexander J. Hartemink[3] & Steven B. Haase[1]
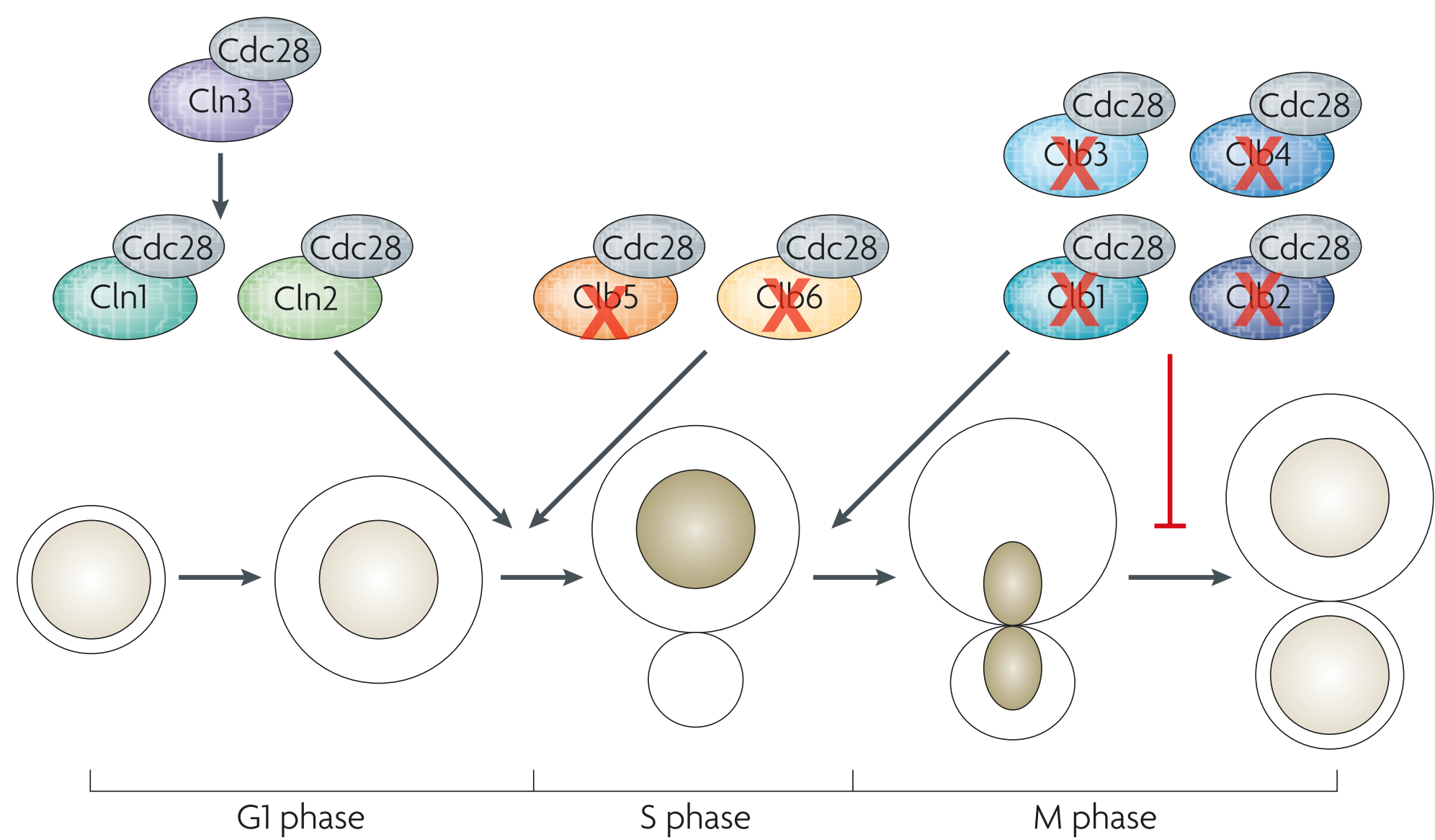
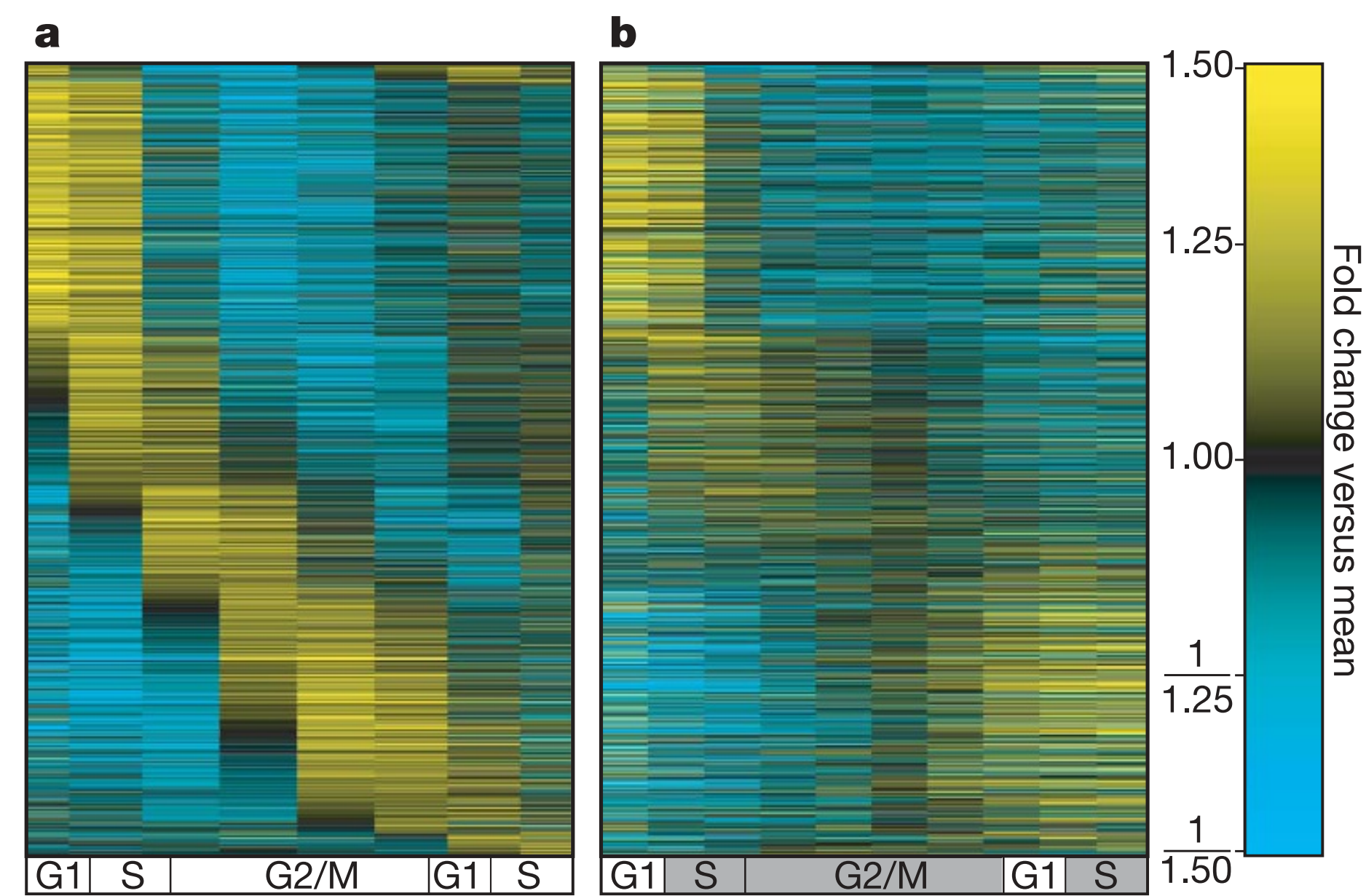Image from Bloom and Cross, doi:10.1038/nrm2105

Figure 1 | Dynamics of periodic transcripts in wild-type and cyclin-mutant cells. Heat maps depicting mRNA levels of periodic genes for wild-type (**a**) and cyclin-mutant (**b**) cells. Each row in **a** and **b** represents data for the same gene (Supplementary Table 1). Transcript levels are expressed as a $\log_2$-fold change relative to mean expression. Transcript levels at each point in the time series were mapped onto a cell-cycle timeline (see Methods). The S and G2/M phases of the cyclin-mutant timeline are shaded, indicating that, by conventional definitions, cyclin-mutant cells arrest at the G1/S-phase border.

Proposed transcriptional oscillator and Boolean model

c
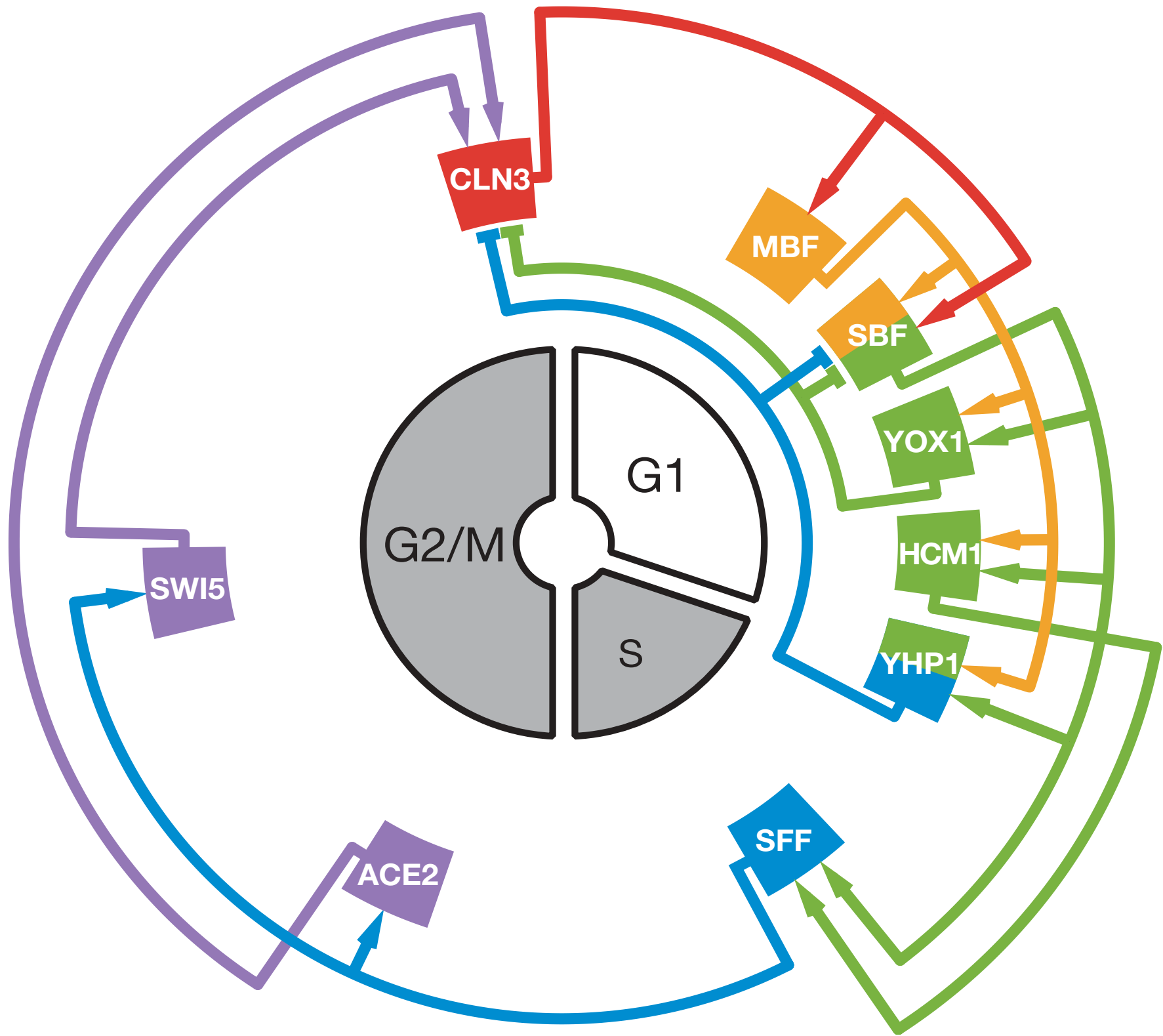
a Initial Regulatory Logic Choice

TF	Activation Rule
MBF	CLN3
SBF	(CLN3 ∨ MBF) ∧ ¬(YOX1 ∧ YHP1)
YOX1	MBF ∧ SBF
HCM1	MBF ∧ SBF
YHP1	MBF ∨ SBF
SFF	SBF ∧ HCM1
ACE2	SFF
SWI5	SFF
CLN3	(SWI5 ∧ ACE2) ∧ ¬(YOX1 ∧ YHP1)