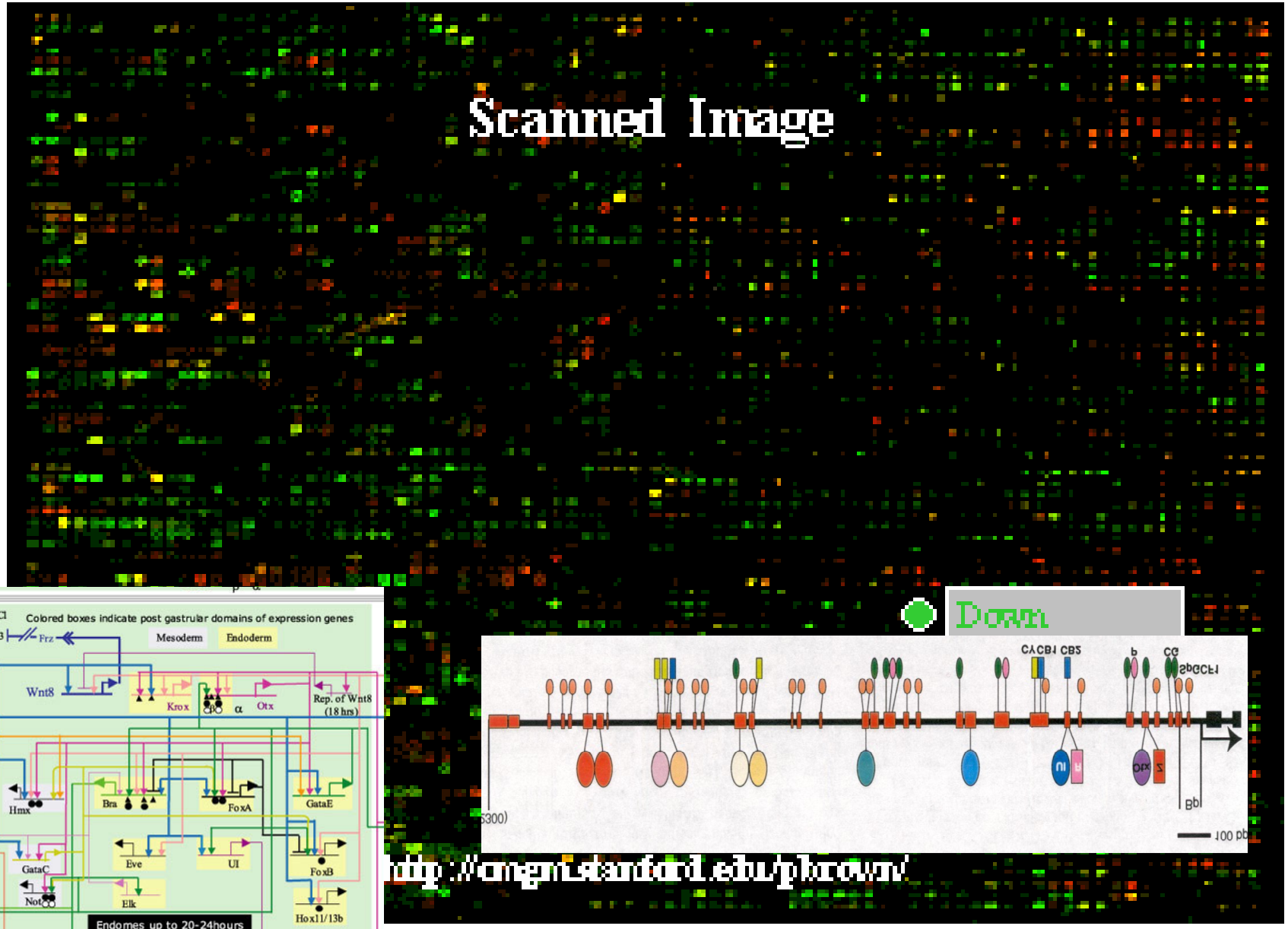

Scanned Image
LiCl
Colored boxes indicate post gastrular domains of expression genes
GSK-3
Frz
Mesoderm
Endoderm
nβ-TCF
Wnt8
Krox
Otx
Rep. of Wnt8 (18 hrs)
Su(H)+N
E(S) ?
Hmx
Bra
FoxA
GataE
Delta
Gcm
GataC
Eve
UI
FoxB
Notch
Not
Elk
Hox11/13b
Nrl
Endomes up to 20-24hours
Dorm
http://cmgm.stanford.edu/pbrown/

ECS 289A

- Prof. Vladimir Filkov
  3023 Engineering II
  filkov@cs.ucdavis.edu
- Office Hours: Thursday, 2:00pm-4:00pm

Administrativia

- ECS289A, 4 credits
- CRN 60478
- http://www.cs.ucdavis.edu~/filkov/289a/
- No text required, recommended reading is online
- Grading:
  - 50% project
  - 30% final exam
  - 20% presentation

- Projects will ideally combine biological knowledge and computational methods
- Presentations can be of papers or software
- Some projects and reading lists will be out next week
- Need volunteers to give first presentation (next week) on BioPerl and Genomic Databases (GenBank, SGD)

What This Course is About

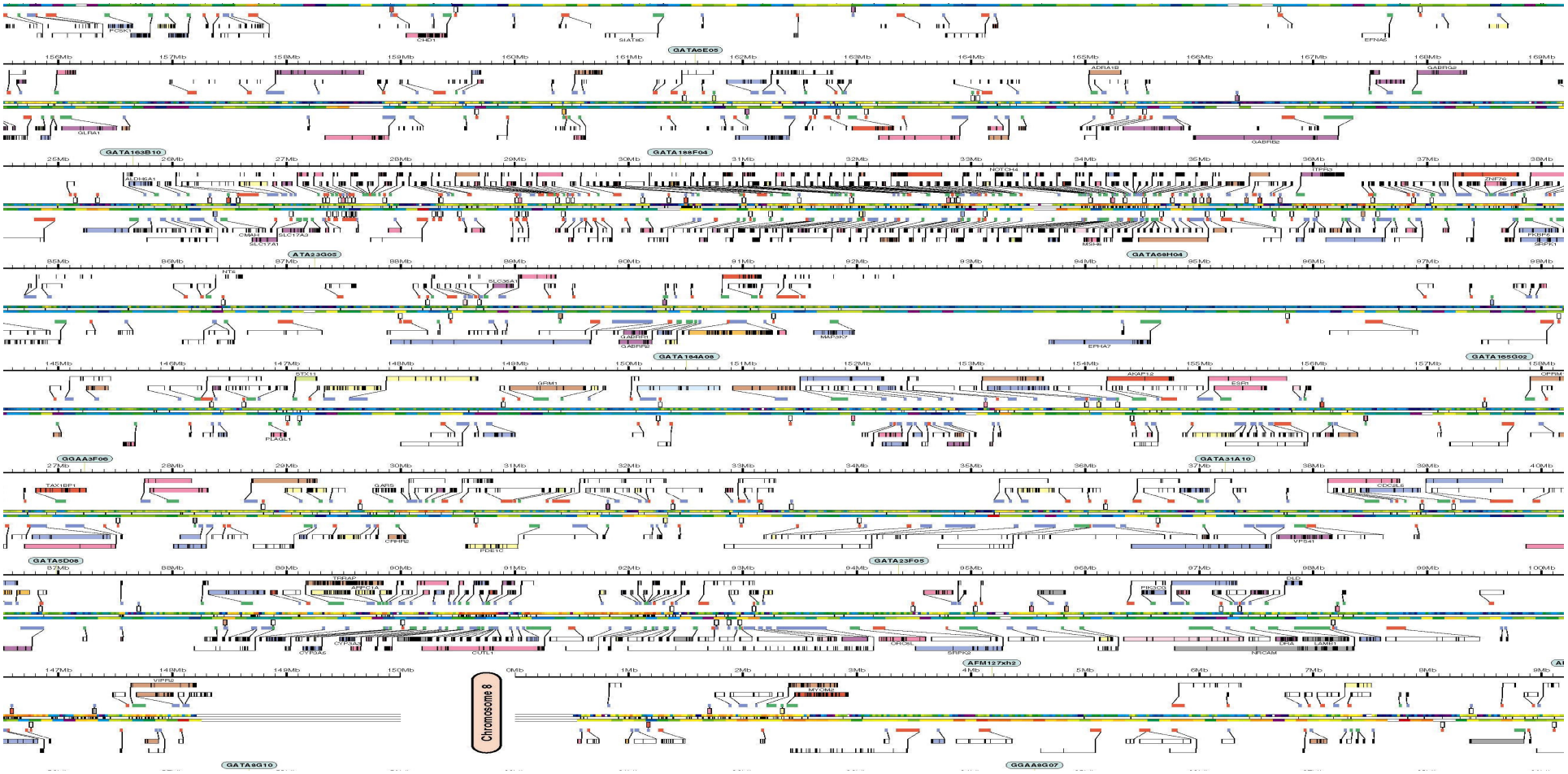
- Computational Models of Gene Regulation
  - Computational
  - Models
  - Gene Regulation

Computational Biology

- Computational Scientists working on Molecular Biology Problems
- Different Scientific Cultures: CS vs Biology vs Statistics

- No unique definition: bioinformatics, computational biology, etc.
- Sub-areas in Comp Biology:
  - Genomics
  - Functional Genomics
  - Proteomics
  - Phylogenetics
  - Etc.

What good is Comp. Bio?



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This Course

Intro to Computational Functional Genomics

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Biological Preliminaries

- Life is survival of information
- Properties of life:
  - Information exchange (communication)
  - Procreation (passing on information)
  - Evolution (change)

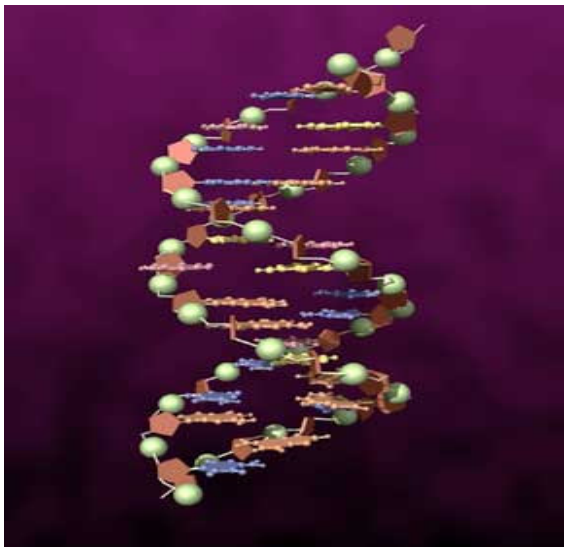
- A machine that's set in motion and never stops

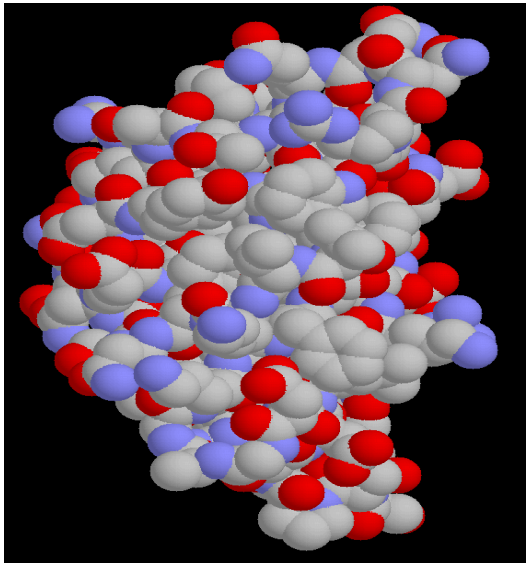
Preliminaries

- Top-down Organization of life
  - Social groups etc.
  - Organisms
  - Species, etc.
  - Organs, Tissues
  - Cells: units of life

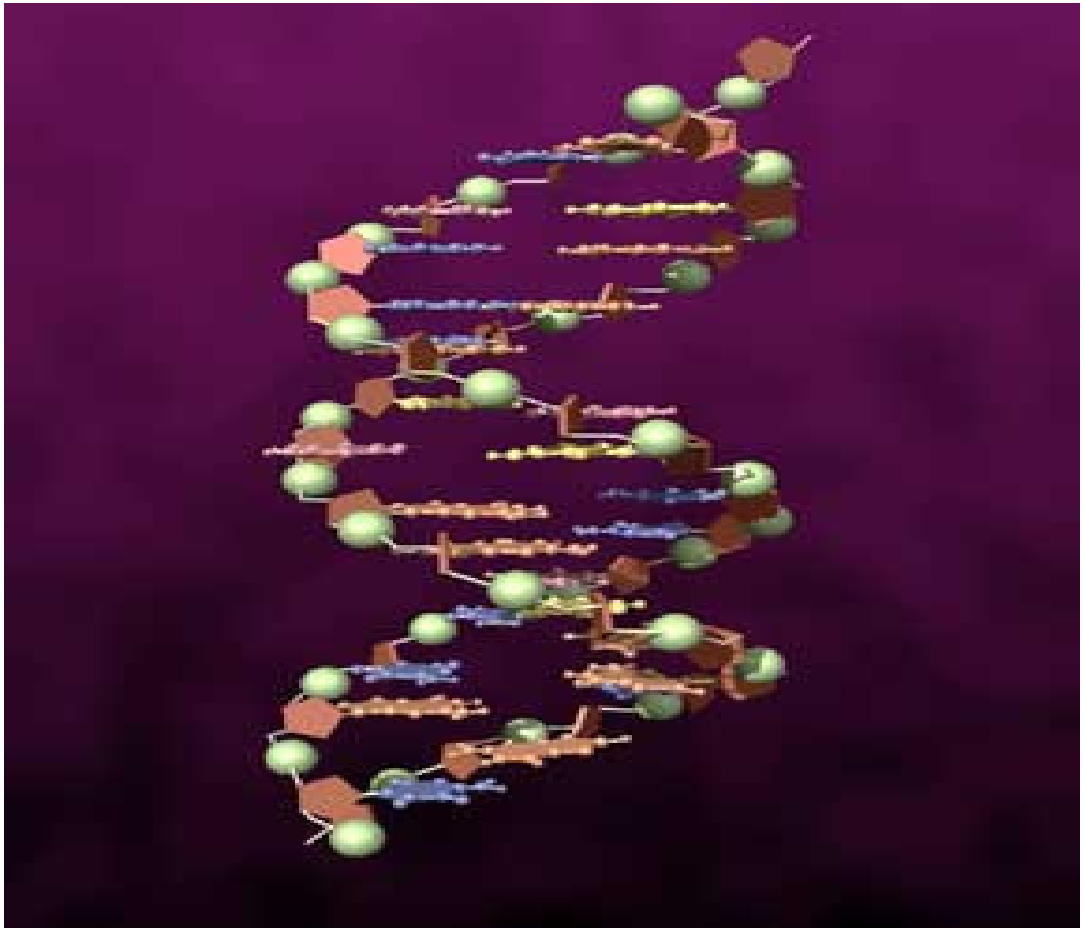
Preliminaries

- Inheritable information: Chromosomes (DNA)
- Day-to-day footwork: Proteins
- Both are complex polymer molecules





DNA



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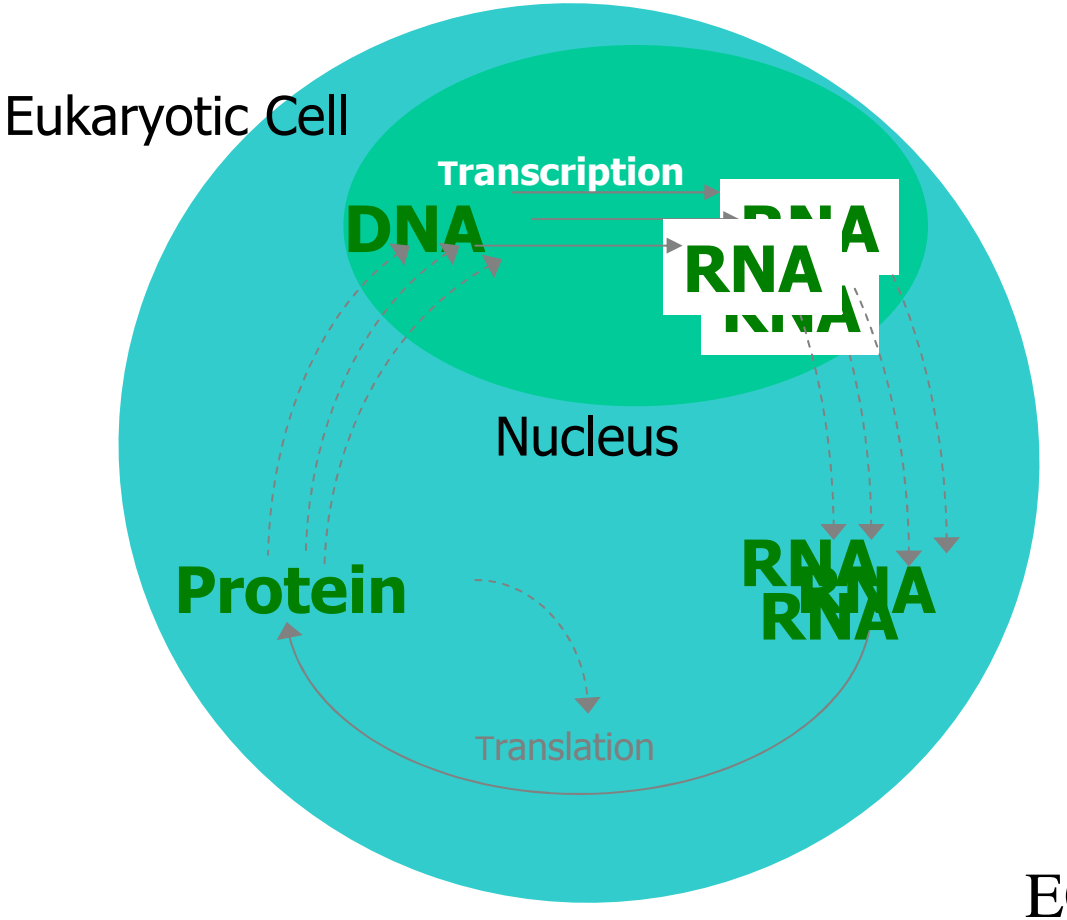
- DNA: String over the alphabet {A,C,G,T}
- A,T and C,G are complementary bases
- DNA codes for genes (proteins): genomics
- DNA codes for regulation: functional genomics

Genes and Proteins

- Nucleodtides, i.e. bases, A, C, G, and T
- Genes: units of inheritability
- Genes code for proteins!

Genes to Proteins

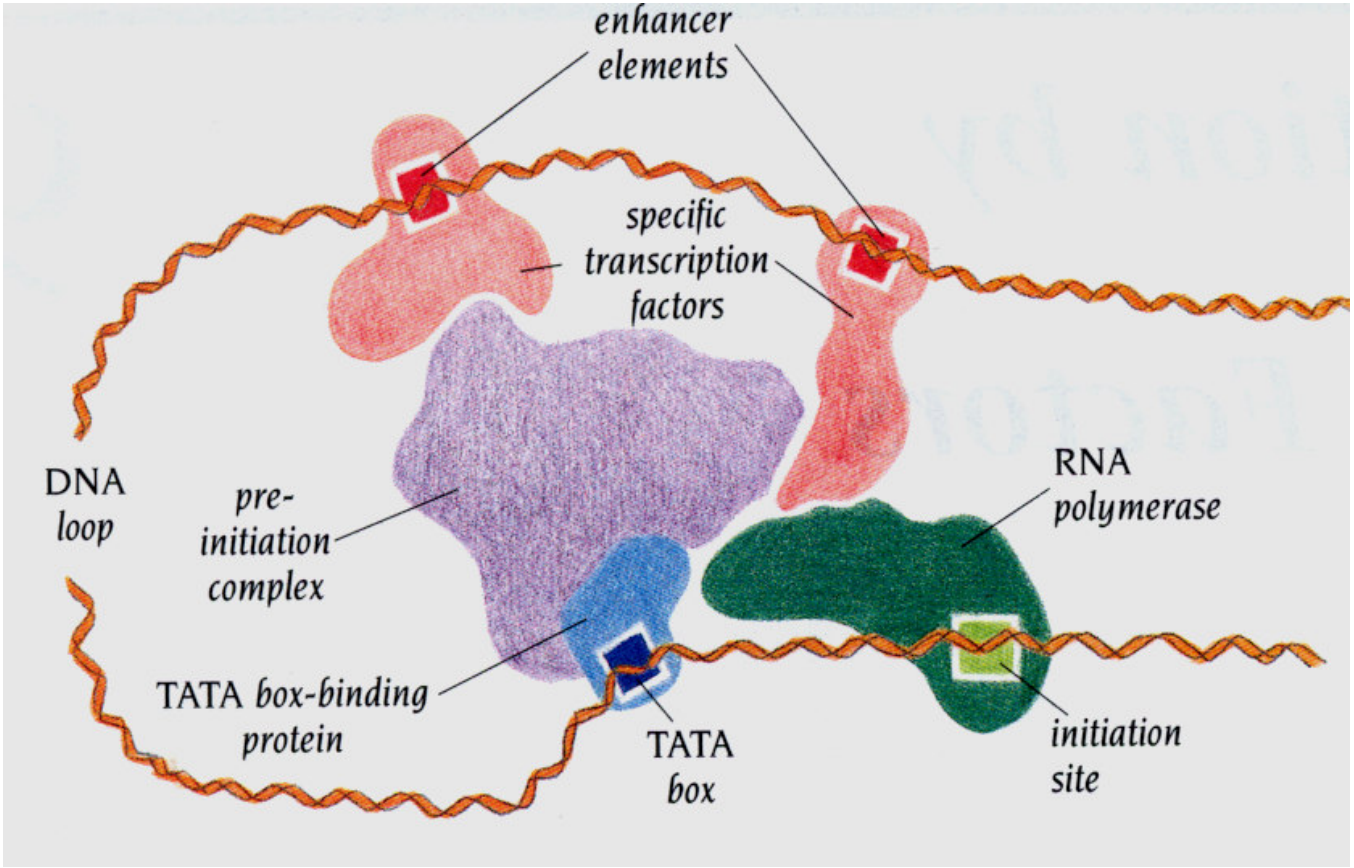
Standard Dogma: DNA ⇒ RNA ⇒ Proteins



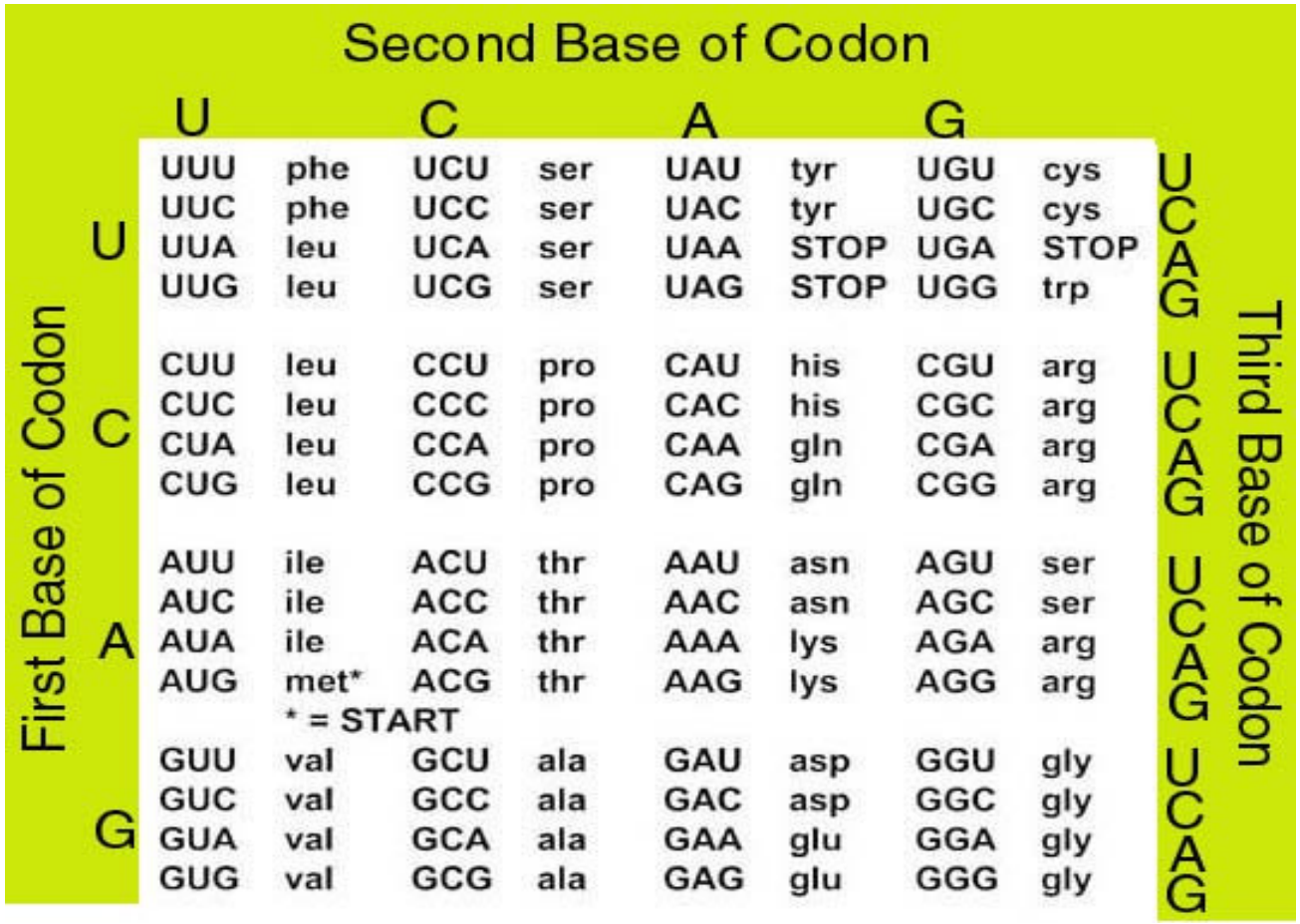
Transcription

- Protein Binding
- Initiation
- Elongation
- Copying
- Termination

Regulating Gene Expression

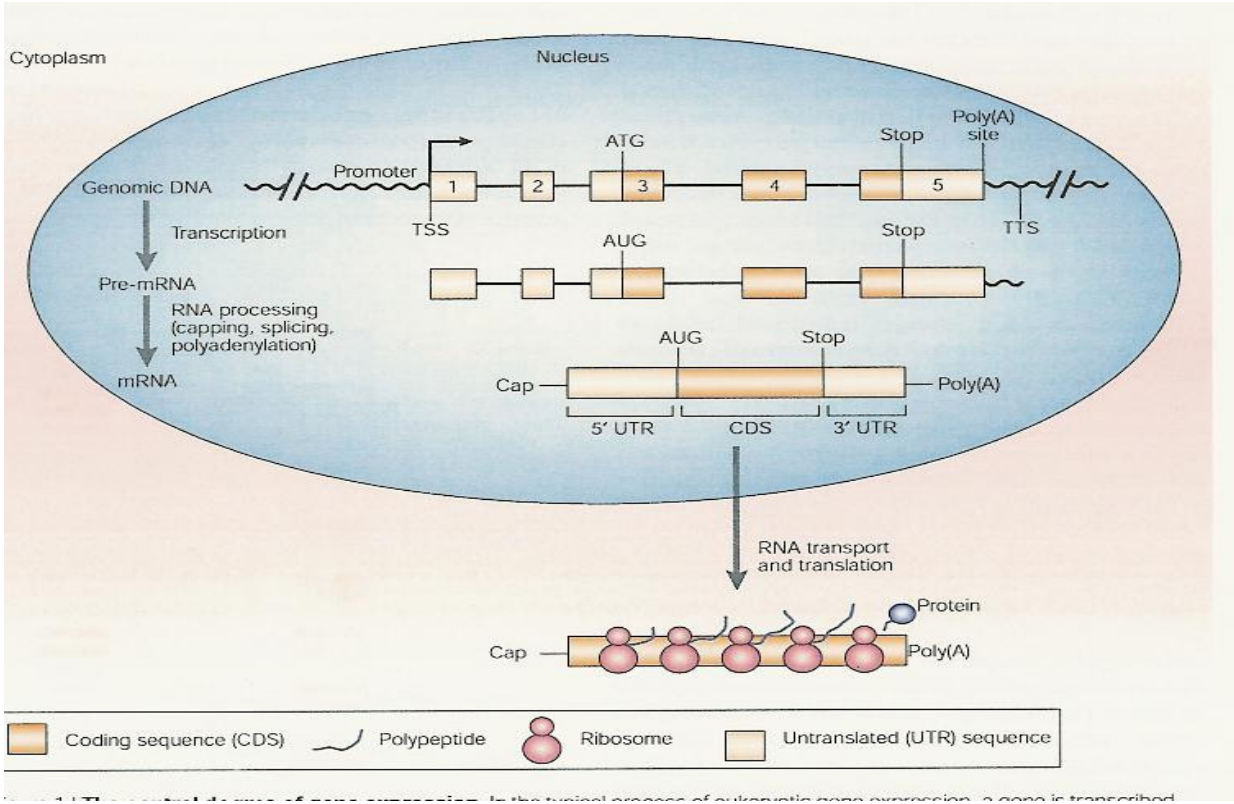


Translation

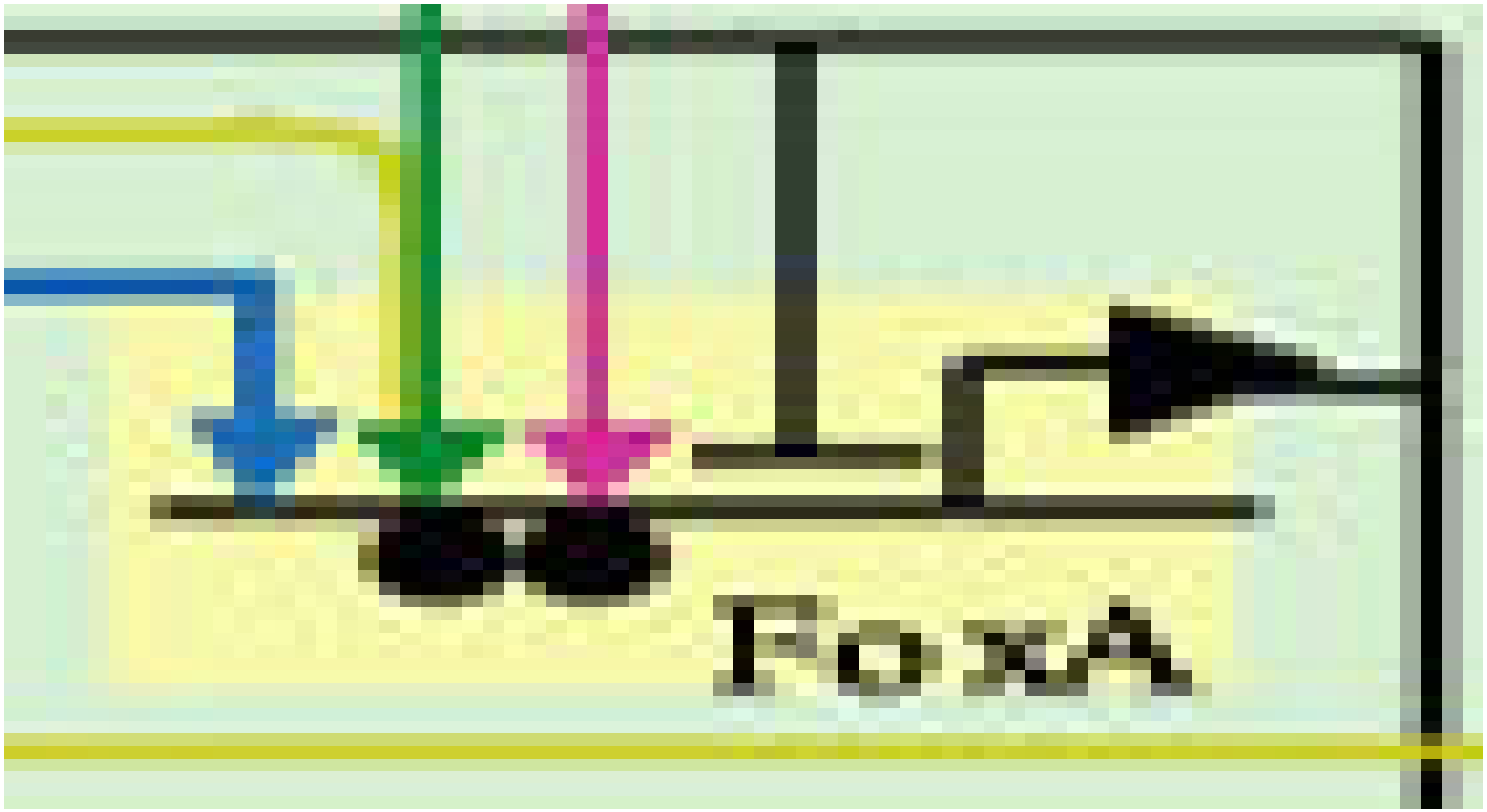


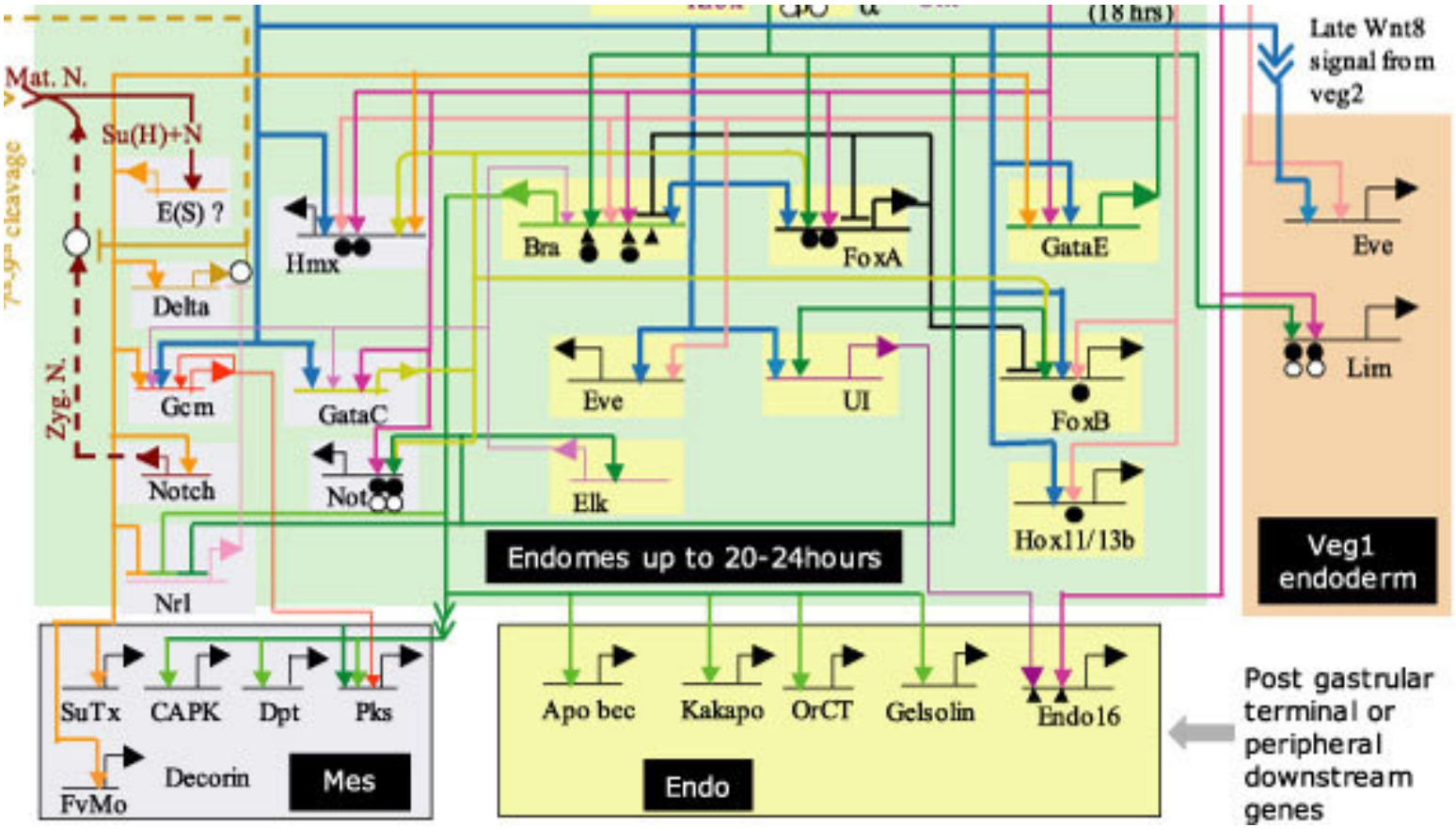
First Base of Codon	Second Base of Codon: U		C		A		G		Third Base of Codon
U	UUU	phe	UCU	ser	UAU	tyr	UGU	cys	U
	UUC	phe	UCC	ser	UAC	tyr	UGC	cys	C
	UUA	leu	UCA	ser	UAA	STOP	UGA	STOP	A
	UUG	leu	UCG	ser	UAG	STOP	UGG	trp	G
C	CUU	leu	CCU	pro	CAU	his	CGU	arg	U
	CUC	leu	CCC	pro	CAC	his	CGC	arg	C
	CUA	leu	CCA	pro	CAA	gln	CGA	arg	A
	CUG	leu	CCG	pro	CAG	gln	CGG	arg	G
A	AUU	ile	ACU	thr	AAU	asn	AGU	ser	U
	AUC	ile	ACC	thr	AAC	asn	AGC	ser	C
	AUA	ile	ACA	thr	AAA	lys	AGA	arg	A
	AUG	met*	ACG	thr	AAG	lys	AGG	arg	G
	* = START								
G	GUU	val	GCU	ala	GAU	asp	GGU	gly	U
	GUC	val	GCC	ala	GAC	asp	GGC	gly	C
	GUA	val	GCA	ala	GAA	glu	GGA	gly	A
	GUG	val	GCG	ala	GAG	glu	GGG	gly	G

Standard Dogma



Gene Regulation Simplified




Mat. N.
Su(H)+N
E(S) ?
Delta
Zyg. N.
Gcm
Notch
Nrl
Hmx
GataC
Not
Bra
FoxA
Eve
Ul
Elk
GataE
FoxB
Hox11/13b
(18 hrs)
Late Wnt8 signal from veg2
Eve
Lim
Veg1 endoderm
Endomes up to 20-24hours
SuTx
CAPK
Dpt
Pks
Decorin
FvMo
Mes
Apo bec
Kakapo
OrCT
Gelsolin
Endo16
Endo
Post gastrular terminal or peripheral downstream genes

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