Les protéines et leur genèse à la vigne ?

D’où viennent les protéines ?

Quelles sont leurs fonctions ?

D’où viennent les protéines ?

MÉTABOLISME PRIMAIRE

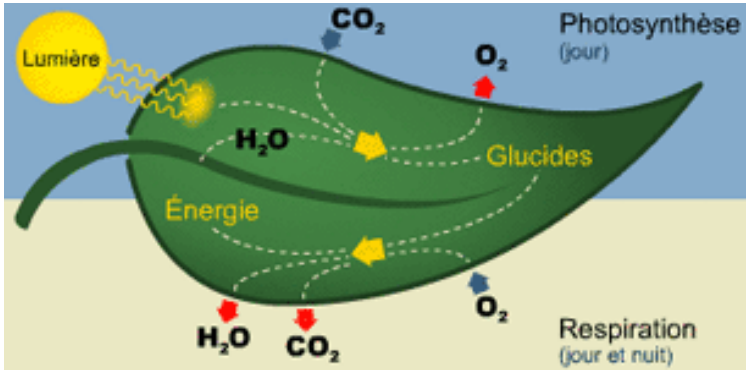
Influence directe sur la survie, la croissance et la reproduction.

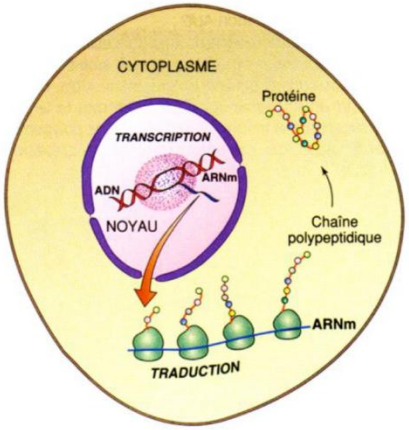
MÉTABOLISME SECONDAIRE

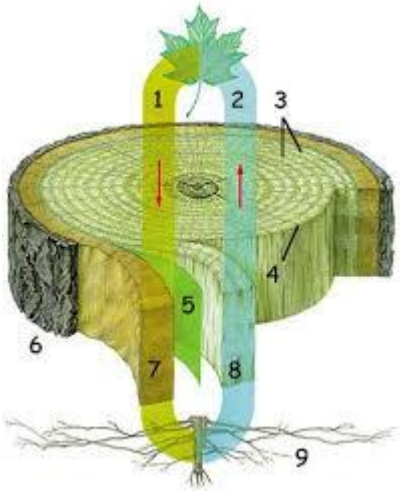
Non essentiel.
Qualité du raisin, arôme,…

D'où viennent les protéines ?

Le métabolisme primaire

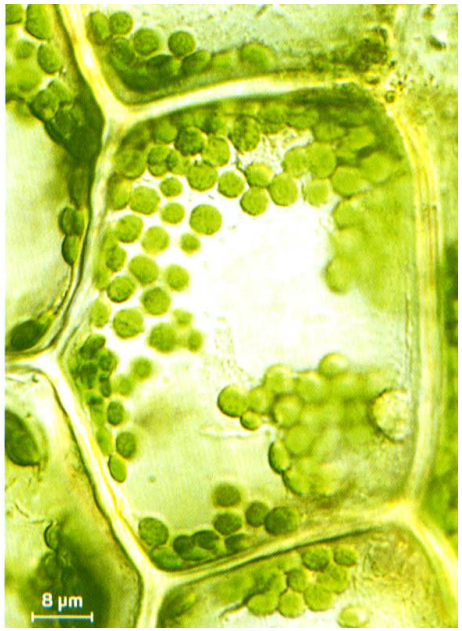




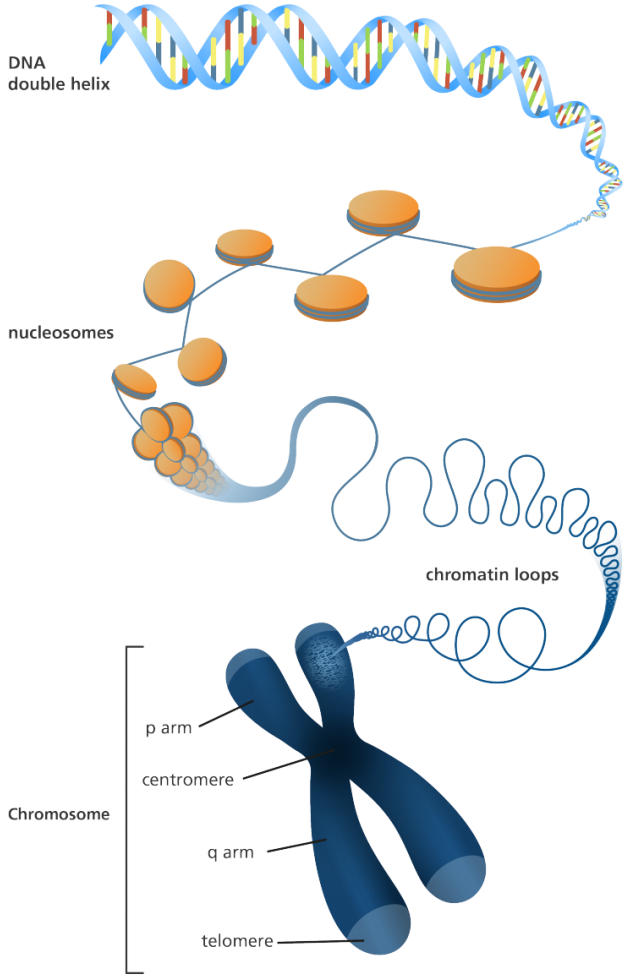


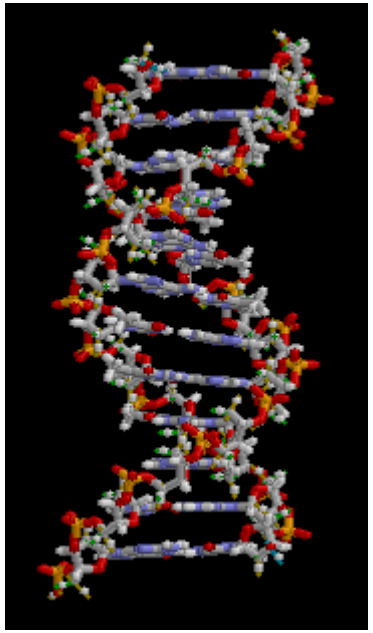
D’où viennent les protéines ?

D’où viennent les protéines ?



D’où viennent les protéines ?





La transcription

- **ADN** → **ARNm**

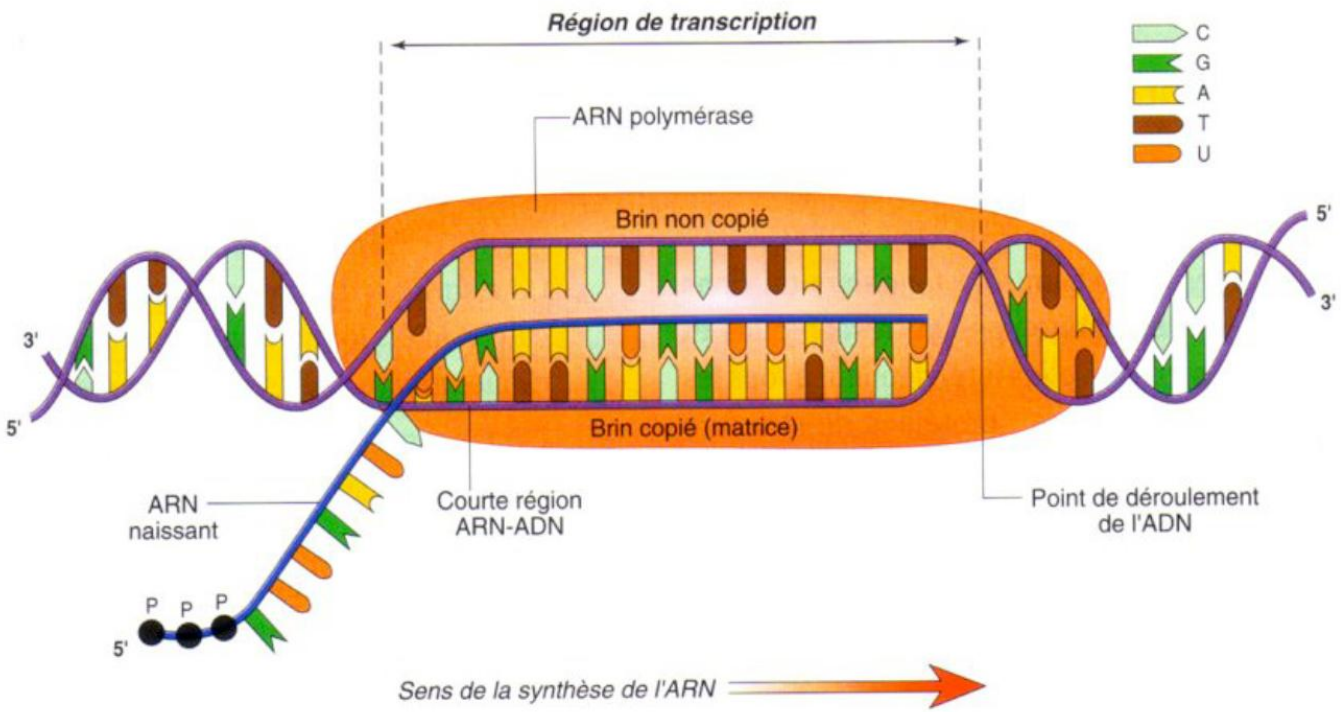
reste dans le noyau

sort du noyau

LALLEMAND
LALLEMAND PLANT CARE

La synthèse des protéines

La transcription



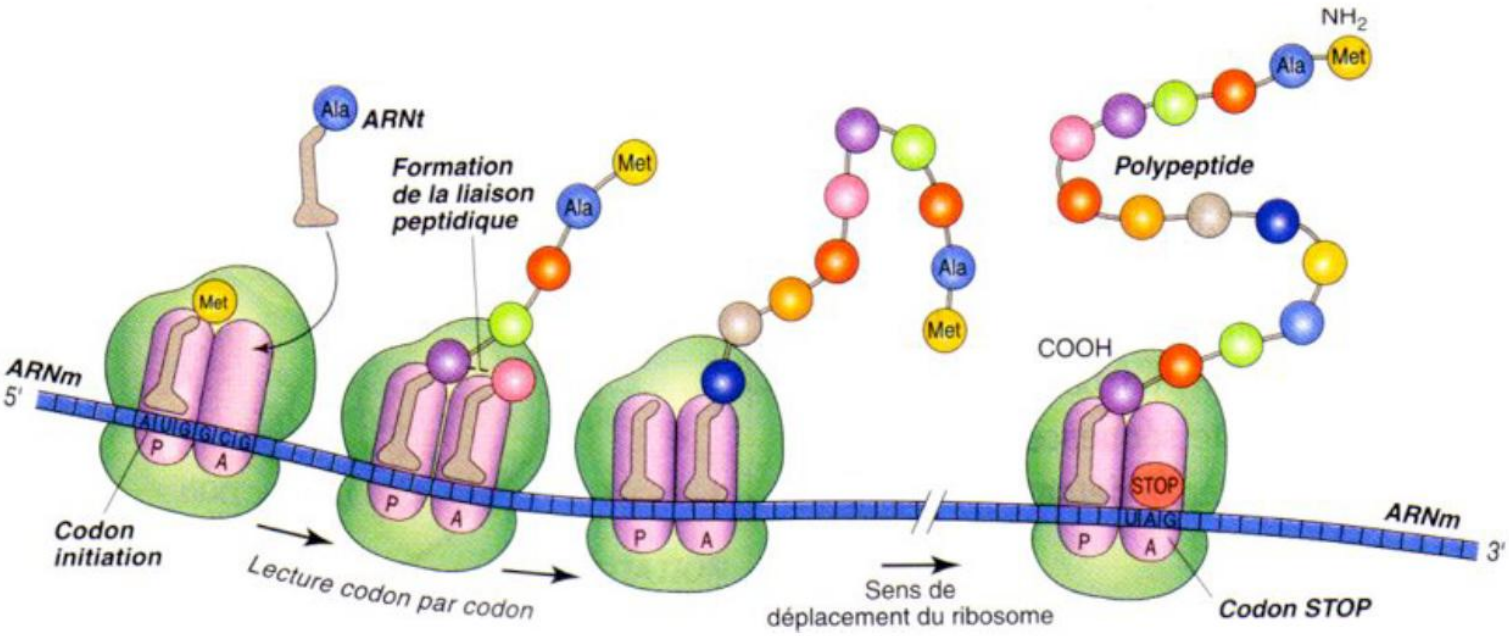
La traduction

- **ARNm → protéines**

LALLEMAND
LALLEMAND PLANT CARE

La synthèse des protéines

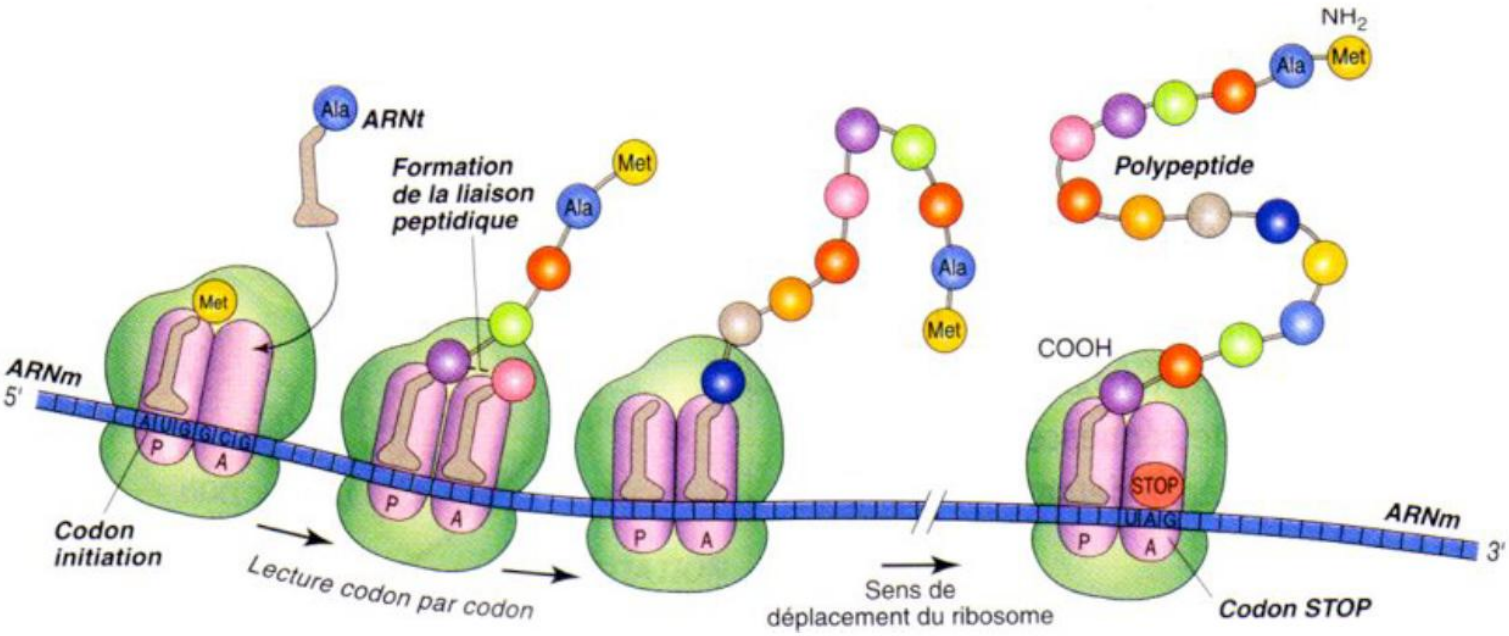
La traduction

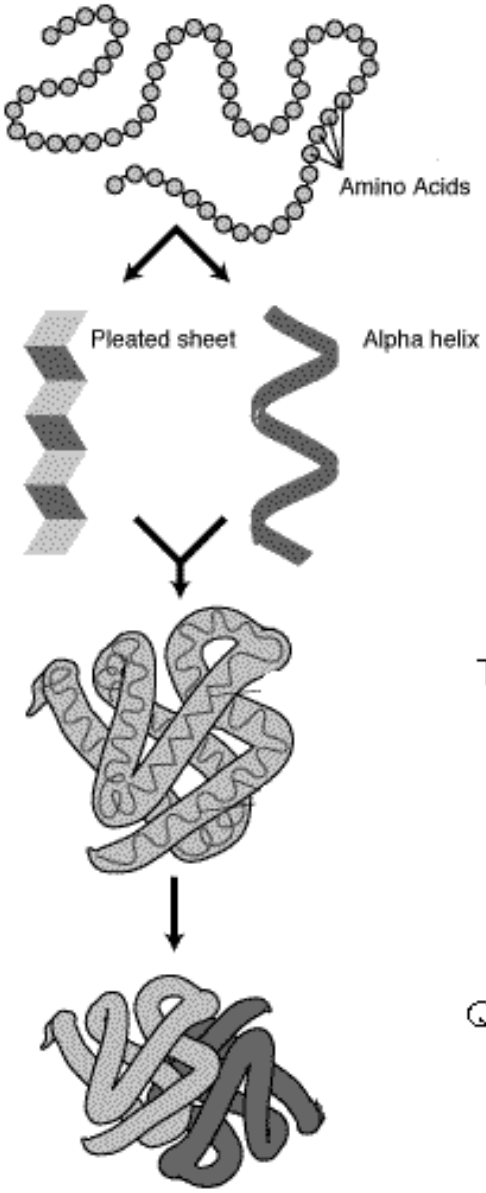


1re position (début du codon)	2e position ↓ U	C	A	G	3e position (fin du codon) ↓
U	Phe	Ser	Tyr	Cys	U
	Phe	Ser	Tyr	Cys	C
	Leu	Ser	STOP	STOP	A
	Leu	Ser	STOP	Trp	G
C	Leu	Pro	His	Arg	U
	Leu	Pro	His	Arg	C
	Leu	Prp	Gln	Arg	A
	Leu	Pro	Gln	Arg	G
A	Ile	Thr	Asn	Ser	U
	Ile	Thr	Asn	Ser	C
	Ile	Thr	Lys	Arg	A
	Met	Thr	Lys	Arg	G
G	Val	Ala	Asp	Gly	U
	Val	Ala	Asp	Gly	C
	Val	Ala	Glu	Gly	A
	Val	Ala	Glu	Gly	G

La synthèse des protéines

La traduction



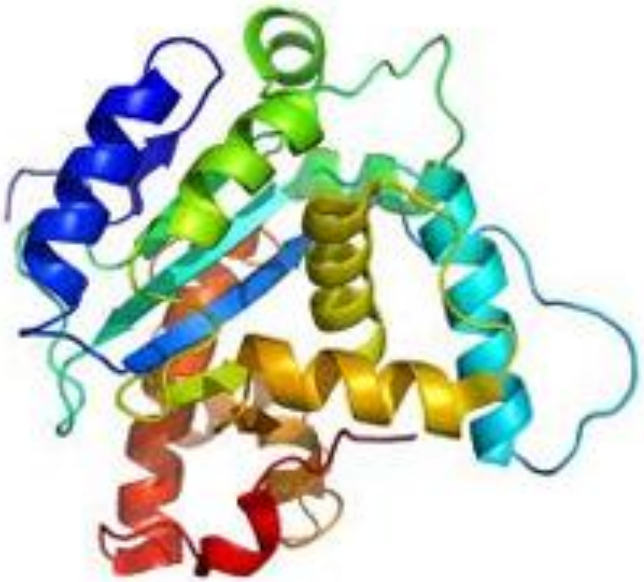


Primary Structure

Secondary Structure

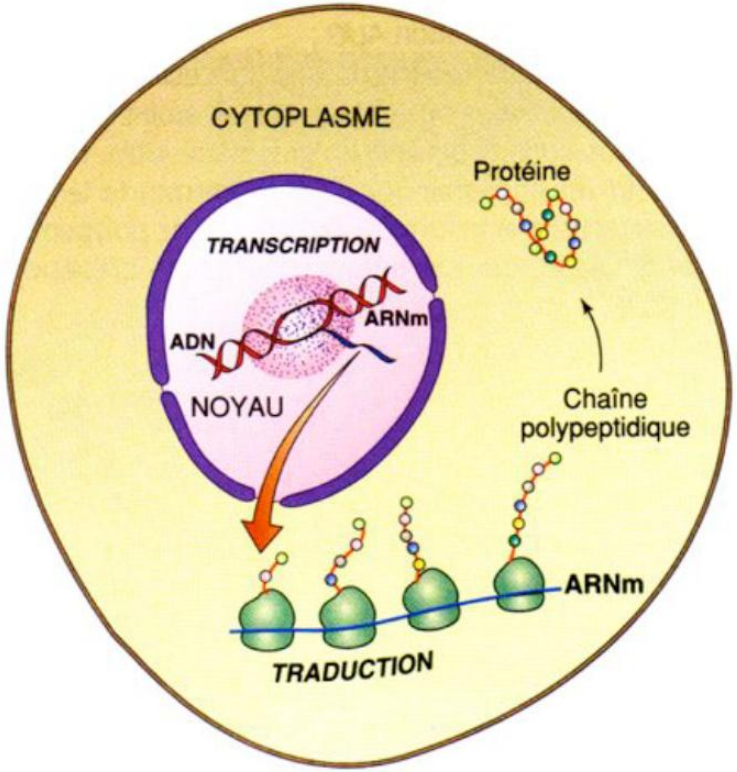
Tertiary Structure

Quaternary Structure



La synthèse des protéines

Bilan



D'où viennent les protéines ?

Quelle est l'influence du milieu ?

MAGNÉSIUM

SOUFRE

T°C

LUMIÈRE

H2O

Quelles sont leurs fonctions ?

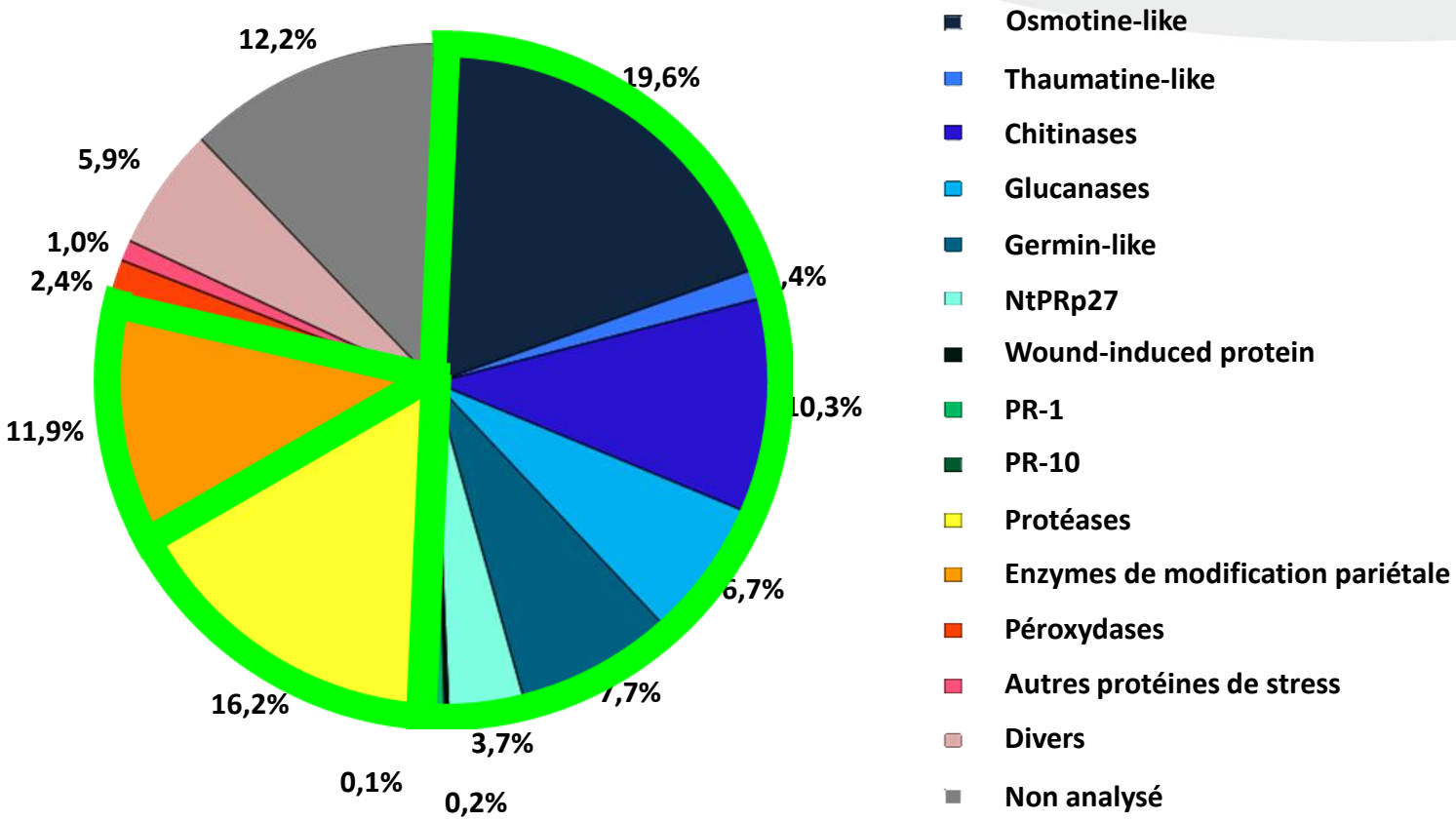
- Les protéines :
  - Membranaires
  - Fibreuses

  } Protéines Structurelles

  - Globulaires → Enzymes

Quelles sont leurs fonctions ?

Répartition des protéines de feuilles de vigne



Majoritairement des protéines PR, des protéases et des enzymes

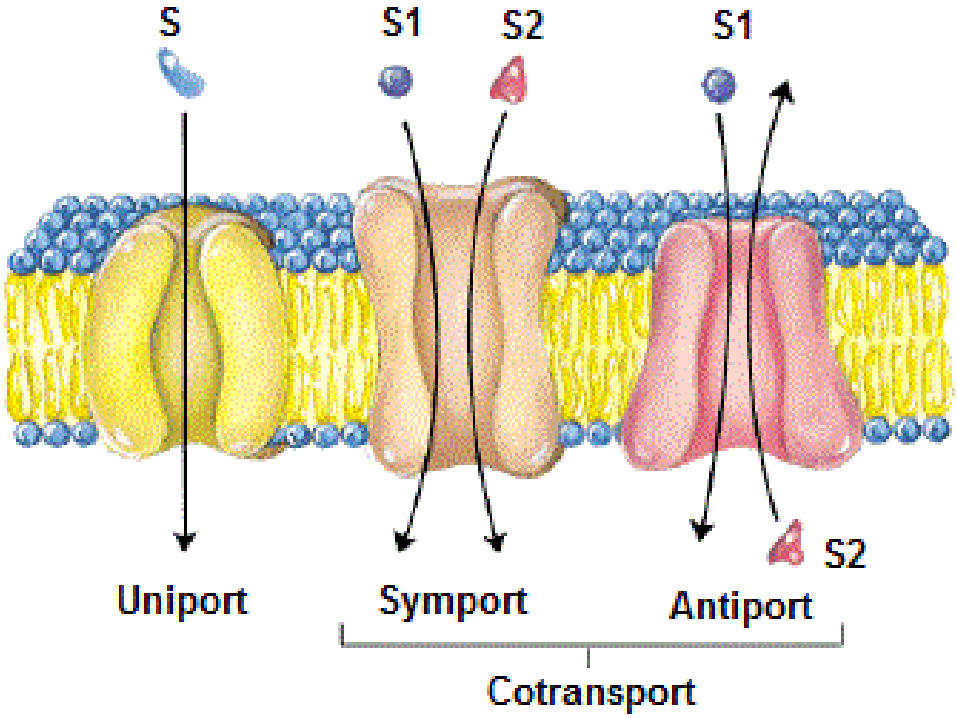
Delaunois *et al.*, soumis à *Proteomics* + base de données world2DPAGE

Quelles sont leurs fonctions ?

Les Protéines de structure

- Fibre : rôle structurel et constitutif

- Transporteur : transport actif ou passif de molécules ou de signaux à travers la membrane (ex : hormones, ….)



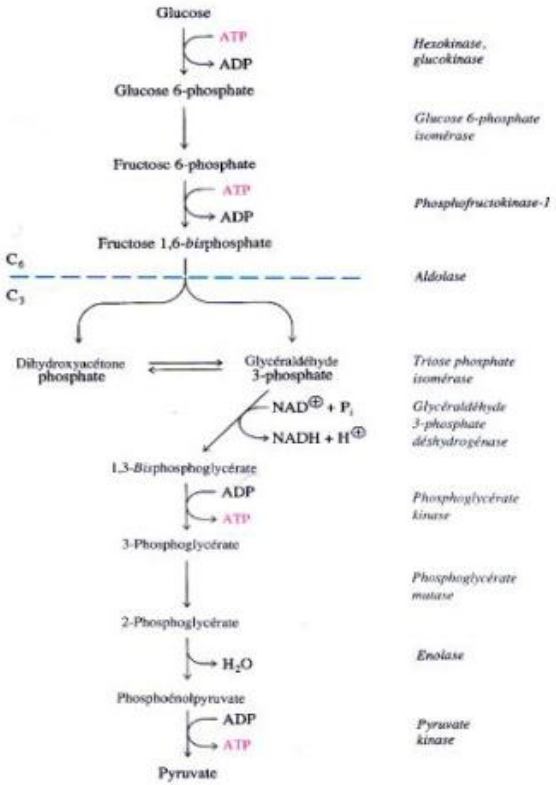
Quelles sont leurs fonctions ?

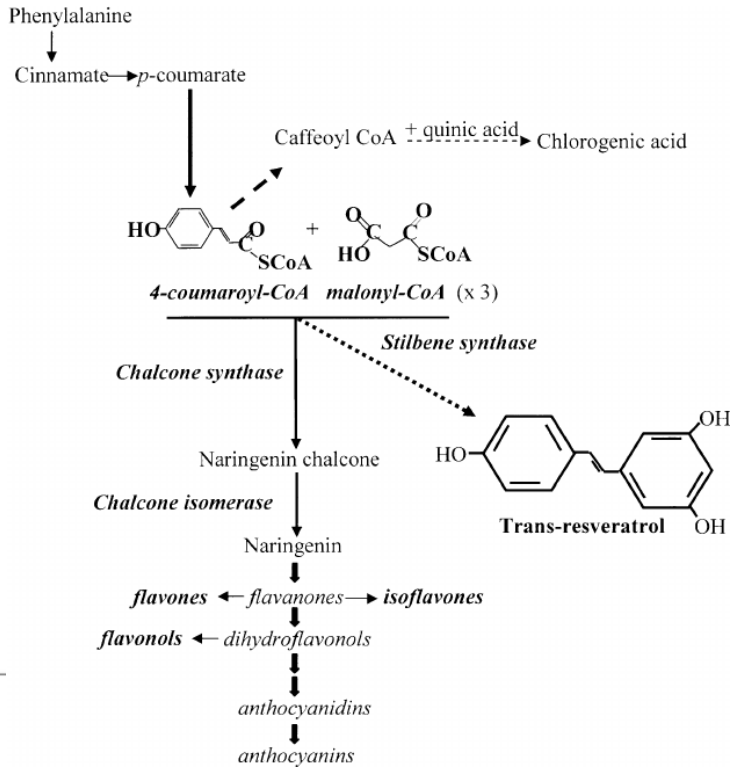
Les Enzymes

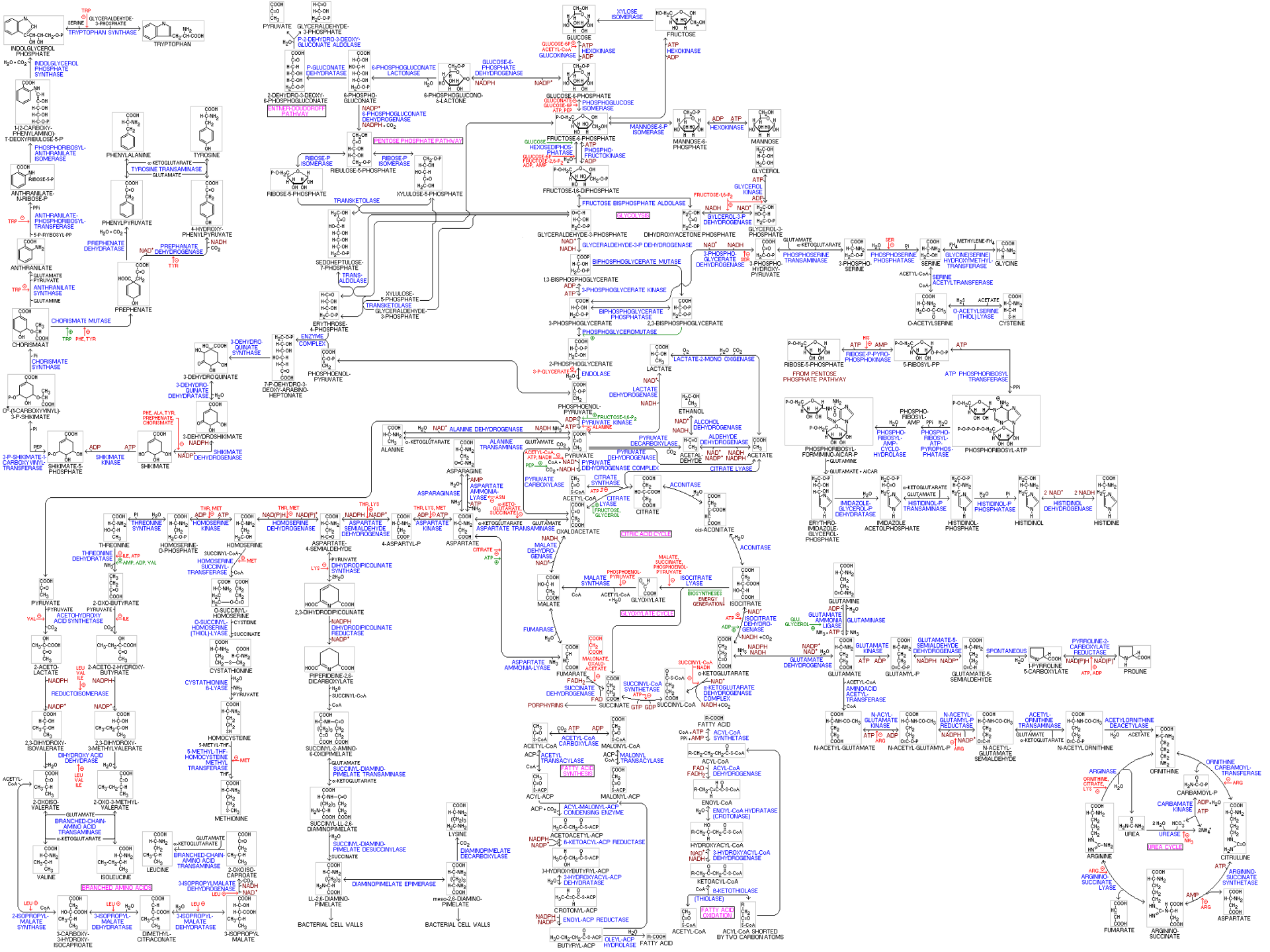
Protéines capables de catalyser les réactions chimiques dans les cellules

Catabolisme : dégradation moléculaire ≠ Anabolisme : synthèse moléculaire

catabolisme + anabolisme = métabolisme






INDOLGLYCEROL PHOSPHATE
TRYPTOPHAN SYNTHASE
TRYPTOPHAN
INDOLGLYCEROL PHOSPHATE SYNTHASE
1-(2-CARBOXY-PHENYLAMINO)-1-DEOXYRIBULOSE-5-P
PHOSPHORIBOSYL-ANTHRANILATE ISOMERASE
ANTHRANILATE-N-RIBOSE-P
ANTHRANILATE-PHOSPHORIBOSYL-TRANSFERASE
5-P-RYBOSYL-PP
ANTHRANILATE
ANTHRANILATE SYNTHASE
CHORISMATE MUTASE
CHORISMAT
CHORISMATE SYNTHASE
O-(1-CARBOXYVINYL)-3-P-SHIKIMATE
3-P-SHIKIMATE-1-CARBOXYVINYL-TRANSFERASE
SHIKIMATE-5-PHOSPHATE
SHIKIMATE KINASE
SHIKIMATE
SHIKIMATE DEHYDROGENASE
3-DEHYDROSHIKIMATE
3-DEHYDRO-QUINATE DEHYDRATASE
3-DEHYDRO-QUINATE SYNTHASE
3-DEHYDROQUINATE
PHENYLALANINE
TYROSINE
TYROSINE TRANSAMINASE
PHENYLPYRUVATE
4-HYDROXY-PHENYLPYRUVATE
PREPHANATE DEHYDRATASE
PREPHANATE DEHYDROGENASE
PREPHENATE
PHE, ALA, TYR, PREPHENATE, CHORISMATE
PYRUVATE
GLYCERALDEHYDE-3-PHOSPHATE
P-2-DEHYDRO-3-DEOXY-GLUCONATE ALDOLASE
2-DEHYDRO-3-DEOXY-6-PHOSPHOGLUCONATE
ENTNER-DOUDOROFF PATHWAY
P-GLUCONATE DEHYDRATASE
6-PHOSPHO-GLUCONATE
6-PHOSPHOGLUCONATE LACTONASE
6-PHOSPHOGLUCONO-δ-LACTONE
GLUCOSE-6-PHOSPHATE DEHYDROGENASE
NADPH
NADP+
6-PHOSPHOGLUCONATE DEHYDROGENASE
NADPH + CO2
PENTOSE PHOSPHATE PATHWAY
RIBOSE-P ISOMERASE
RIBULOSE-5-PHOSPHATE
RIBOSE-5-PHOSPHATE
XYLULOSE-5-PHOSPHATE
TRANSKETOLASE
SEDOHEPTULOSE-7-PHOSPHATE
TRANS-ALDOLASE
ERYTHROSE-4-PHOSPHATE
ENZYME COMPLEX
7-P-DEHYDRO-3-DEOXY-ARABINO-HEPTONATE
PHOSPHOENOL-PYRUVATE
GLUCOSE
XYLOSE ISOMERASE
FRUCTOSE
HEXOKINASE
GLUCOSE-6-PHOSPHATE
PHOSPHOGLUCOSE ISOMERASE
FRUCTOSE-6-PHOSPHATE
MANNOSE-6-P ISOMERASE
MANNOSE-6-PHOSPHATE
MANNOSE
GLYCEROL
GLYCEROL KINASE
FRUCTOSE-6-DIPHOSPHATE
HEXOSEDIPHOS-PHATASE
PHOSPHO-FRUCTOKINASE
FRUCTOSE BISPHOSPHATE ALDOLASE
GLYCOLYSIS
GLYCERALDEHYDE-3-PHOSPHATE
DIHYDROXYACETONE PHOSPHATE
GLYCEROL-3-P DEHYDROGENASE
GLYCEROL-3-PHOSPHATE
GLYCERALDEHYDE-3-P DEHYDROGENASE
1,3-BISPHOSPHOGLYCERATE
BIPHOSPHOGLYCERATE MUTASE
3-PHOSPHOGLYCERATE KINASE
3-PHOSPHOGLYCERATE
BIPHOSPHOGLYCERATE PHOSPHATASE
2,3-BISPHOSPHOGLYCERATE
PHOSPHOGLYCEROMUTASE
2-PHOSPHOGLYCERATE
ENDOLASE
3-P-GLYCERATE
PHOSPHOENOL-PYRUVATE
PYRUVATE KINASE
ALANINE
ALANINE DEHYDROGENASE
α-KETOGLUTARATE
ALANINE TRANSAMINASE
ASPARAGINE
ASPARAGINASE
AMP
ASPARTATE AMMONIA-LYASE
ASPARTATE
α-KETOGLUTARATE ASPARTATE TRANSAMINASE
OXALOACETATE
CITRIC ACID CYCLE
CITRATE
CITRATE SYNTHASE
CITRATE LYASE
ACETYL-CoA
PYRUVATE CARBOXYLASE
PYRUVATE DEHYDROGENASE
PYRUVATE DEHYDROGENASE COMPLEX
ACETATE
ACETAL-DEHYDE
ALDEHYDE DEHYDROGENASE
ETHANOL
ALCOHOL DEHYDROGENASE
LACTATE
LACTATE DEHYDROGENASE
LACTATE-2-MONO OXIGENASE
ACONITATE
ACONITASE
cis-ACONITATE
ISOCITRATE
ISOCITRATE LYASE
GLYOXYLATE
GLYOXYLATE CYCLE
MALATE
MALATE SYNTHASE
MALATE DEHYDRO-GENASE
FUMARATE
FUMARASE
α-KETOGLUTARATE
α-KETOGLUTARATE DEHYDRO-GENASE
α-KETOGLUTARATE DEHYDROGENASE COMPLEX
SUCCINYL-CoA
SUCCINYL-CoA SYNTHETASE
SUCCINATE
SUCCINATE DEHYDROGENASE
PORPHYRINS
GLUTAMATE
GLUTAMINE
GLUTAMINASE
GLUTAMATE AMMONIA LIGASE
GLUTAMATE DEHYDROGENASE
GLUTAMATE KINASE
GLUTAMATE-5-SEMIALDEHYDE DEHYDROGENASE
GLUTAMATE-5-SEMIALDEHYDE
GLUTAMYL-P
PYRROLINE-2-CARBOXYLATE REDUCTASE
5-CARBOXYLATE
PROLINE
SPONTANEOUS
N-ACETYL-GLUTAMATE
N-ACETYL-GLUTAMATE KINASE
N-ACETYL-GLUTAMYL-P
N-ACETYL-GLUTAMYL-P REDUCTASE
N-ACETYL-GLUTAMATE SEMIALDEHYDE
ACETYL-ORNITHINE TRANSAMINASE
N-ACETYLORNITHINE
ACETYLORNITHINE DEACETYLASE
ACETATE
ORNITHINE
ORNITHINE CARBAMOYL-TRANSFERASE
CARBAMOYL-P
CARBAMATE KINASE
ARGINASE
UREASE
UREA
UREA CYCLE
ARGININE
CITRULLINE
ARGININO-SUCCINATE SYNTHETASE
ARGININO-SUCCINATE LYASE
ARGININO-SUCCINATE
ASPARTATE
FUMARATE
ACETYL-CoA
ACETYL-CoA CARBOXYLASE
MALONYL-CoA
MALONYL-CoA TRANSACYLASE
ACETYL TRANSACYLASE
ACYL-ACP
MALONYL-ACP
FATTY ACID SYNTHESIS
ACYL-MALONYL-ACP CONDENSING ENZYME
ACETOACETYL-ACP
β-KETOACYL-ACP REDUCTASE
3-HYDROXYBUTYRYL-ACP
3-HYDROXYACYL-ACP DEHYDRATASE
CROTONYL-ACP
ENOYL-ACP REDUCTASE
BUTYRYL-ACP
OLEYL-ACP HYDROLASE
FATTY ACID
FATTY ACID
ACYL-CoA SYNTHETASE
ACYL-CoA
ACYL-CoA DEHYDROGENASE
ENOYL-CoA
ENOYL-CoA HYDRATASE (CROTONASE)
HYDROXYACYL-CoA
3-HYDROXYACYL-CoA DEHYDROGENASE
KETOACYL-CoA
β-KETOTHIOLASE (THIOLASE)
FATTY ACID OXIDATION
ACYL-CoA SHORTED BY TWO CARBON ATOMS
ASPARTATE
ASPARTATE-4-SEMIALDEHYDE
ASPARTATE SEMIALDEHYDE DEHYDROGENASE
4-ASPARTYL-P
ASPARTATE KINASE
HOMOSERINE
HOMOSERINE DEHYDROGENASE
HOMOSERINE KINASE
HOMOSERINE-O-PHOSPHATE
THREONINE SYNTHASE
THREONINE
THREONINE DEHYDRATASE
2-OXO-BUTYRATE
HOMOSERINE SUCCINYL-TRANSFERASE
O-SUCCINYL-HOMOSERINE
O-SUCCINYL-HOMOSERINE (THIOL)-LYASE
CYSTATHIONINE
CYSTATHIONINE β-LYASE
HOMOCYSTEINE
5-METHYL-THF-HOMOCYSTEINE METHYL TRANSFERASE
METHIONINE
PYRUVATE DIHYDRODIPICOLINATE SYNTHASE
2,3-DIHYDRODIPICOLINATE
NADPH DIHYDRODIPICOLINATE REDUCTASE
PIPERIDEINE-2,6-DICARBOXYLATE
SUCCINYL-2-AMINO-6-OXOPIMELATE
SUCCINYL-DIAMINO-PIMELATE TRANSAMINASE
SUCCINYL-LL-2,6-DIAMINOPIMELATE
SUCCINYL-DIAMINO-PIMELATE DESUCCINYLASE
LL-2,6-DIAMINO-PIMELATE
DIAMINOPIMELATE EPIMERASE
meso-2,6-DIAMINO-PIMELATE
DIAMINOPIMELATE DECARBOXYLASE
LYSINE
BACTERIAL CELL WALLS
BACTERIAL CELL WALLS
2-ACETO-LACTATE
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REDUCTOISOMERASE
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DIHYDROXY ACID DEHYDRASE
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VALINE
ISOLEUCINE
LEUCINE
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BRANCHED AMINO ACIDS
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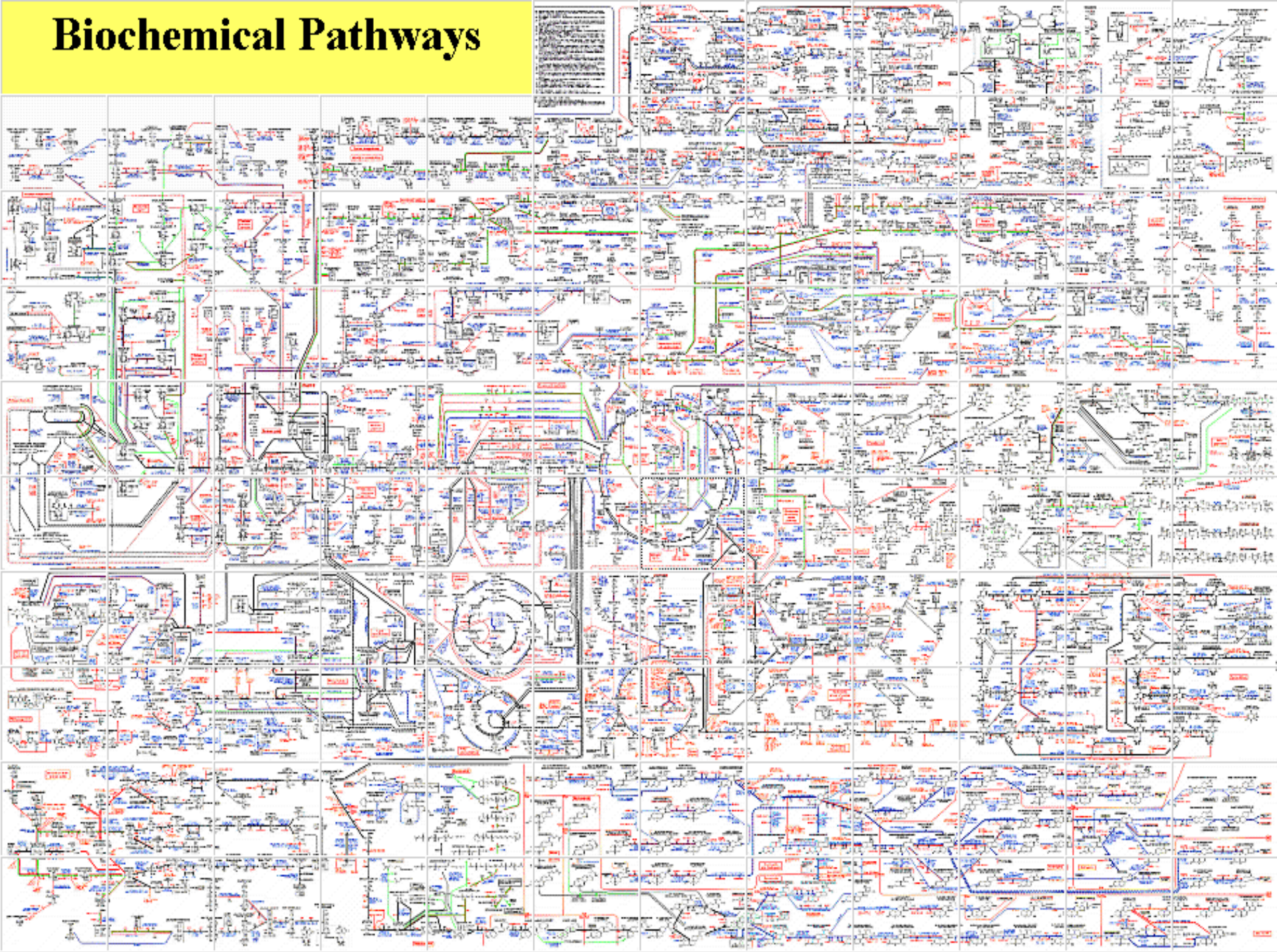
3-ISOPROPYL-MALATE DEHYDRATASE
DIMETHYL-CITRACONATE
3-ISOPROPYL-MALATE DEHYDRATASE
3-ISOPROPYL-MALATE
RIBOSE-5-PHOSPHATE
FROM PENTOSE PHOSPHATE PATHWAY
RIBOSE-P-PYRO-PHOSPHOKINASE
5-RIBOSYL-PP
ATP PHOSPHORIBOSYL TRANSFERASE
PHOSPHORIBOSYL-FORMIMINO-AICAR-P
PHOSPHO-RIBOSYL-AMP-CYCLO-HYDROLASE
PHOSPHO-RIBOSYL-ATP-PYROPHOS-PHATASE
PHOSPHORIBOSYL-ATP
ERYTHRO-IMIDAZOLE-GLYCEROL-PHOSPHATE
IMIDAZOLE-GLYCEROL-P DEHYDRATASE
IMIDAZOLE ACETOLPHOSPHATE
HISTIDINOL-P TRANSAMINASE
HISTIDINOL-PHOSPHATE
HISTIDINOL-P PHOSPHATASE
HISTIDINOL
HISTIDINOL DEHYDROGENASE
HISTIDINE

Biochemical Pathways



Merci de votre attention