<table>
<thead>
<tr>
<th>Organism</th>
<th>Number of predicted genes</th>
<th>% of Genome that encodes proteins</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>E. coli</em> (bacteria)</td>
<td>5,000</td>
<td>90%</td>
</tr>
<tr>
<td><em>S. cerevisiae</em> (yeast)</td>
<td>6,000</td>
<td>70%</td>
</tr>
<tr>
<td><em>C. elegans</em> (worm)</td>
<td>18,000</td>
<td>27%</td>
</tr>
<tr>
<td><em>D. melanogaster</em> (fly)</td>
<td>14,000</td>
<td>20%</td>
</tr>
<tr>
<td><em>A. thaliana</em> (plant)</td>
<td>25,500</td>
<td>20%</td>
</tr>
<tr>
<td><em>Homo sapiens</em> (human)</td>
<td>35,000</td>
<td>&lt; 5%</td>
</tr>
</tbody>
</table>

Adapted from [www.ebi.ac.uk/microarray/biology_intro.htm](http://www.ebi.ac.uk/microarray/biology_intro.htm)
Figure 4-17 Representation of the nucleotide sequence content of the human genome.
This page is part of The Genetics of Cancer resource center, created and maintained by Eugene Pergament, MD, PhD, Northwestern University Medical School, Chicago, and Morry Fiddler, PhD, School for New Learning, DePaul University, Chicago.
Gene expression differences

- **Ubiquitous expression**
  - "house-keeping" genes
  - Genes expressed at relatively constant levels in nearly all cell types
  - Proteins often involved in cell metabolism

- **Differential gene expression**
  - Genes expressed in a subset of cell types (tissue specific)
  - OR only at certain times (developmental, regulated)
  - Proteins often have very specialized functions
GAPDH: Glyceraldehyde-3-phosphate dehydrogenase

skin; brain; lung; lymph; ovary; placenta; uterus; breast; stomach; eye; colon; kidney; testis; pancreas; cervix; liver; prostate; b-cells; marrow; salivary gland; heart; muscle; head_neck; eye, retina; colon; adrenal gland; lymph, t-cell; chondrosarcoma; fetal pancreas; leiomyos; brain, hippocampus; kidney_tumor; breast cancer; aorta, endothelium; bladder_tumor; osteoarthritic cartilage; prostate_normal; hepatocellular carcinoma; bone; epid_tumor; gall bladder; bladder; lens; foreskin, melanocyte; pooled colon, kidney, stomach; thymus; lung metastastic chondrosarcoma; placenta_normal; uterus_tumor; whole embryo; uterus; nervous_normal; testis, cell line; fibrosarcoma; brain, pituitary gland; b cells from burkitt lymphoma; ovary; blood; cartilage; lung, neuroendocrine lung carcinoids; pancreas, islet; adipose, white adipose tissue; brain, amygdala; retina; larynx; lung epithelial cells; trabecular meshwork; rpe and choroid; testis, epididymus; pancreas, exocrine; colon; spleen; retina; bone marrow stroma; prostate, epithelium; head_normal; omentum; pituitary; muscle, skeletal muscle; uterus, epithelium; lung with fibrosis; eye anterior segment; ear, cochlea; placenta; bone, synovia; pooled pancreas and spleen; lymph, b-cell; bone, trabecular bone cells; prostate, metastatic prostate; bone lesion; tonsil, germinal center b-cells; brain, pineal gland; lung_tumor; brain, cerebellum; muscle (skeletal); breast_normal; germ cell; amnion_normal; sympathetic trunk; esophagus; brain, hippocampus; testis_normal; muscle, striated; pnet; umbilical cord, endothelium; hypothalamus; cord blood; lung, cell line; parathyroid; tongue; uterus, endometrium; nervous_tumor; bone marrow; non cancerous liver tissue; whole blood; brain; fetal brain; colon_normal; synovial membrane; optic nerve; head and neck; umbilical cord vein, endothelium; fetal eye; brain, miningioma; aorta; lymph node; leukocyte; foveal and macular retina; connective tissue; placenta; brain, pituitary; genitourinary tract; eye, ciliary body; lung; prostate tumors; skin, melanocyte; brain, astrocytoma; nose, olfactory epithelium; thyroid; blood, lymphocyte; germ
Gene expression differences

Ubiquitous expression
“house-keeping” genes

Genes expressed at relatively constant levels in nearly all cell types

Proteins often involved in cell metabolism

Differential gene expression

Genes expressed in a subset of cell types (tissue specific) OR only at certain times (developmental, regulated)

Proteins often have very specialized functions
GJB2: Gap junction protein, beta 2, 26kD (connexin 26)

head_neck; skin; colon; ear, cochlea; brain; stomach; lung; ovary, epithelium; human eye anterior segment; esophagus; germ cell; uterus; nervous tumor; kidney; pool, liver+spleen; pancreas, exocrine; leiomios; pooled colon, kidney, stomach; bladder; testis; whole embryo; ovary; uterus, pooled; uterus, epithelium; heart; hepatocellular carcinoma; prostate; colonic mucosa with ulcerative colitis
TECTA: Tectorin alpha

brain; testis; ear, cochlea
Sites of Noggin Gene Expression

Alba: A genetically engineered white rabbit that glows in the dark

http://abcnews.go.com/media/OnAir/images/ho_alba_green_000918_h.jpg
See: http://www.pitt.edu/~biohome/Dept/Img/graphics/grabowski/altsplice.jpg
THE UNIVERSAL TREE OF LIFE
Charles Darwin

1809 - 1882
See: Molecular Biology of the Cell, Vol. 4, Alberts et al.

Figure 4-18 Conserved synteny between the human and mouse genomes.
Additional Readings

Molecular Biology of the Cell, Vol. 4, Alberts *et al.*