

Table 1: Engineering-to-Biology Thesaurus Function Terms

Functional Basis Terms			Biological Function Correspondent Terms
Class	Secondary	Tertiary	
Branch	Separate		Bleaching, meiosis, abscission, mitosis, segment, <i>electrophoresis</i> , dialysis, denature, free, detach, release
		Divide	<i>Divide</i> , prophase, metaphase, <i>anaphase</i> , cleave, cytokinesis
		Remove	Deoxygenate, filtrate, liberate, expulsion, evacuate
	Distribute		<i>Circulate</i> , <i>diffusion</i> , <i>exchange</i> , disperse, scatter, spread, spray
Channel	Import		<i>Absorb</i> , attract, consume, inhale, intake
	Export		<i>Bind</i> , block, <i>breakdown</i> , excrete, inactivate, repel
	Transfer		Migrate, transfer
		Transport	Circulate, conduct, diffuse, pump, shift, displace, fly, swim, jump, bounce
		Transmit	<i>Communicate</i> , <i>transduce</i>
	Guide		Orient, position, slide, tunnel
		Translate	<i>Synthesize</i> , transcribe
		Rotate	Oscillate, spin, turn, swivel, roll
		Allow DOF	Articulate
	Connect	Couple	
Join			<i>Bind</i> , adhere, bond, fuse
Link			Clamp, <i>activate</i> , <i>bind</i> , project
Mix			Blend, <i>contract</i> , <i>exchange</i> , fragment
Convert	Convert		Polymerize, <i>synthesize</i> , burn, gluconeogenesis, metabolize, <i>grow</i> , <i>transduction</i> , <i>transduce</i> , fermentation, glycolysis, hydrolyze, hydrolysis, respiration, ionize, decompose, <i>degrade</i> , <i>develop</i> , <i>mutate</i> , <i>photosynthesize</i>

Table 2: Engineering-to-Biology Thesaurus Function Terms (cont.)

Functional Basis Terms			Biological Function Correspondent Terms	
Class	Secondary	Tertiary		
Control Magnitude	Actuate		<i>Activate</i> , induce, trigger	
	Regulate		<i>Electrophoresis</i> , gate, organogenesis, respire, sustain, preserve, remain, stabilize, maintain, regulate	
		Increase		Hyperpolarize, <i>pinocytosis</i> , grow, expand, multiply, replicate
		Decrease		Compress, coil, <i>divide</i> , fold, shorten, <i>wrap</i>
	Change			<i>Pinocytosis</i> , <i>degrade</i> , alter, <i>bind</i> , catalyze, <i>contract</i> , hydrolysis, twist, <i>mutate</i> , radiate, charged, slip, acclimatize, alternate, fluctuate
		Decrement		Decarboxylation, <i>constrict</i>
		Shape		Elongate, <i>stretch</i> , attach, <i>spread</i>
		Condition		Osmosis, <i>constrict</i>
	Stop			Clog, extinguish, halt, interphase, seal, suspend
		Prevent		Constrain, obstruct
		Inhibit		Cover, destroy, <i>inhibit</i> , repress, <i>surround</i>
Provision	Store		Conserve, <i>hold</i> , <i>convert</i> , deposit, <i>photosynthesize</i>	
		Contain	<i>Absorb</i>	
		Collect	<i>Absorb</i> , catch, <i>breakdown</i> , concentrate, digest, reduce	
	Supply		Feed, lactate	
Signal	Sense	Detect	Detect, locate, see, smell, <i>transduce</i>	
		Measure	Observe, monitor, gauge, watch	
	Indicate		Fluoresce, <i>communicate</i> , <i>react</i> , mark	
	Process		Learn	
Support			<i>Develop</i> , <i>wrap</i>	
	Stabilize		Homeostasis, cling, <i>hold</i> , <i>bind</i> , <i>connect</i>	
	Secure		<i>Surround</i> , envelope	

Table 3: Engineering-to-Biology Thesaurus Material Flow Terms

Functional Basis Terms			Biological Flow Correspondent Terms	
Class	Secondary	Tertiary		
Material	Human		Being, <i>body</i>	
	Gas		Oxygen, nitrogen, chlorine	
	Liquid		Acid, chemical, water, <i>blood, solution</i> , base, buffer, fluid, plasma	
	Solid	Object		Fiber, <i>body</i> , substrate, microfilament, microtubules, structure, chain, <i>organ</i> , nucleus, <i>tissue</i> , muscle, cilia, flagella, tube, vein, heart, plant, ribosome, somite, apoplast, stem, kidney, egg, ovary, leaf, embryo, bacteria, chloroplast, carbon, sperm, glucagons, adipose, angiosperm, meristems, mineral, stoma, shoot, seed, capillary, receptors, hair, bone, tendon, neuron, sporangium, photoreceptor, mechanoreceptor, chromosome, petiole, lysosome, archaea, cone, strand, centriole, spore, zygote, sulfur, lipoprotein, nephron, hyphae, plasmodesma, conifer, plasmid, plastid, xylem, pigment, sperm, hippocampus, phloem
			Particulate	Cytokinin, pyruvate, nicotine, opium, glycerol, carotenoid, GTP, ATP, urea, <i>RNA</i> , tRNA, mRNA, <i>DNA</i> , glucagon, parathormone, cryptochromes, <i>ligand</i> , promoter, gene, exon, intron, molecule, <i>enzyme, lipid, hormone</i>
			Composite	<i>Enzyme</i> , virus, ribosome, prokaryote, macromolecule, polymerase, nucleotide, polypeptide, organelle, symplast, mesophyll, brood, codon, messenger, <i>DNA, RNA, cytoplasm, organ, tissue</i>
	Mixture	Gas-gas		Air
		Liquid-liquid		<i>Hormone</i> , melatonin, thyroxine, calcitonin, thyrotropin, estrogen, somatostatin, cortisol, glucagon, adrenocorticotropic, testosterone, auxin, insulin, intracellular fluid, extracellular fluid, spinal fluid, poison, urine, peptide, <i>solution</i> , steroid
		Solid-solid		Adenosine, glomerulus, blastula, monosaccharide, membrane, phosphate, ribosome, centrosomes
		Solid-Liquid		Algae, synapse, peptidoglycan, cell, glia, phytochrome, retina, protein, repressor, hemoglobin, <i>blood</i> , membrane, bacterium

Table 4: Engineering-to-Biology Thesaurus Signal Flow Terms

Functional Basis Terms			Biological Flow Correspondent Terms
Class	Secondary	Tertiary	
Signal	Status		Change, variation, lateral, swelling, catalyzed, translation, exposed, active, separated, cycle, formation, reaction, redox, deficient, saturated, diffusion, broken, hybridization, orientation, resting, cue, magnetic, volume, under, organized, fruiting, fatty, anaphase, metaphase, prophase, conjugation, osmolarity, senescence, signal, allele
		Auditory	Sound
		Olfactory	Smell
		Tactile	Pain
		Taste	Gustation
		Visual	Length, shortened, long, dark, full, double
	Control		Place, <i>inhibit</i> , release, excrete, <i>develop</i> , match, induce, <i>digest</i> , integrate, translation, <i>transduction</i> , equilibrium, grow, splice, capture, <i>distribute</i> , <i>phosphorylation</i>
		Analog	Binding, center, synthesis, photosynthesis
		Discrete	Flower, translocation

Table 5: Engineering-to-Biology Thesaurus Energy Flow Terms

Functional Basis Terms			Biological Flow Correspondent Terms	
Class	Secondary	Tertiary		
Energy	Human			
	Acoustic		Echolocation, sound wave	
	Chemical		Calorie, metabolism, glucose, glycogen, <i>ligand</i> , nutrient, starch, fuel, sugar, mitochondria, <i>lipid</i> , gibberellin	
	Electrical		Electron, potential, feedback, charge, field	
	Electromagnetic	Optical		Light, infrared radiation
		Solar		Light, sunlight, ultraviolet light
	Hydraulic		Pressure, osmosis, osmoregulation	
	Magnetic		Gravity, field, wave	
	Mechanical			<i>Muscle contraction</i> , pressure, tension, stretch, depress
		Rotational		
		Translational		
	Pneumatic			Pressure
	Thermal			Temperature, heat, infrared, cold