of material, and note the precautions in material selection to prevent material failure.

6. Select materials in conjunction with materials specialists. It is helpful to know that materials specialists are able to specify a material for wear resistance best with complete knowledge of modes of wear of the proposed design, and that the first choice may not be successful, either functionally or economically.

(See Problem Set questions 11 a and b.)

SECTION A. COMMON EXPRESSIONS FOR TYPES OF WEAR (WEAR INCLUDES MATERIAL LOSS AND SURFACE DAMAGE)

EXPRESSIONS CONNECTED WITH APPEARANCE OF SURFACES	EXPRESSIONS CONNECTED WITH TYPE OF SERVICE	
Stained -f	Surface corrosion or Erosion-corrosion	In solid machinery -a1+c
Polished, or smooth wear -a1+c+e or a2+c+e		In fluids - a2+d2
Scratched (short grooves) - b3+c+e	Abrasive wear - b3+c	(Multiple scratches)
Gouged - b3+d1		
Scuffed-a1+initiated and periodically perpetuated by d3, +e	Gouging - b1+d1+e	
Galled - b1+d3+e (usually very rough)	Dry wear or unlubricated sliding - b1+d3+e, or a1+c+e	
Grooved (smooth or rough -a1+periodically advanced by d1 +e	Metal-to-metal wear, or adhesive wear - b1+d3+e	
Hazy - b2	Erosion at high angle - b2+d4	
Exfoliated or delaminated - d4+e	Erosion at low angle - b3+d1 or d2	
Pitted - b2 and/or d5		
Spalled - d4		
Melted - a3+?		
Fretted - a1+d5+f	Fretting - a1+d5+f	

Rigorous connection cannot always be made between the terms in the two columns because of wide diversity of use and meaning of terms.

SECTION B. LIST OF SURFACE PHYSICAL CHARACTERISTICS AND THE PROCESSES THAT PRODUCE THEM

a - micro-smooth	b - micro-rough
1. Progressive loss and reformation of surface films, e.g., oxide (oxidative wear?), others (erosion-corrosion?), by fine ABRASION and/or tractive stresses, mutually imposed by ADHESIVE or viscous interaction	1. Due to tractive stresses resulting from ADHESION
2. Very fine ABRASION, with loss of substrate in addition to loss of surface film, if any	2. Micro-pitting by FATIGUE
3. From MELTING	3. ABRASION by medium-coarse particles
c - macro-smooth	**d - macro-rough**
1. ABRASION by fine abrasives held on solid backing (lapping, polishing) (usually removing only oxides)	1. ABRASION by coarse particles, including carbide and other hard inclusions in the sliding materials,which are removed by sliding action as wear of matrix progresses
	2. ABRASION by fine particles in turbulent fluid, producing scallops,waves, etc.
	3. Severe ADHESION, at least as an initiator of damage
	4. Local FATIGUE failure resulting in pits or depressions, repeated rolling contact stress, or repeated thermal gradients, or repeated high friction sliding, or repeated impact by hard particles as in erosion
	5. Advanced stages of micro-roughening,
e - shiny	**f - dull or matte**
Very thin (or perhaps no surface film) of e.g., oxide, hydroxide, sulfide, chloride, or other species	Thick films of perhaps greater than 25nm thickness (resulting from "aggressive environments" including high temperature)

Careful observation usually reveals at least two scales of events, micro- and macro-, (omitting the several submicroscopic events that are known to occur).