

# Materials and Manipulation

- Materials they and we use
  - Chemistry or materials – Saul Griffith
  - Plastics: 1 through 6 and beyond
  - Chemical and catalytically created
  - Wood and other composites
  - Rubber
  - Foams
- Methods
  - Abrasion
  - Aggregation
  - Forming
  - Molding

# 1 through 6 and beyond

- 1 Polyethylenet...
  - WOW molds, great, strength
- 2 High density Polyethylene
  - Cheap pliable (great coating), black makes it last
- 3 Vinyl
  - Rubber replacement...pvf
- 4 Low Density Polyethylene
- 5 Polypropylene
  - Great stuff more money (live hinges)
- 6 Polystyrene (foam cups to clear)
  - Yuk but pretty
- 7 Other plastic lumber
- Santoprene rubber + plastic

# Beyond 7 comes quality materials

- Nylon
  - the miracle fiber: rope that stopped climbers from dieing
  - Never-wear-out carpet, socks,
- Urethane
  - More abrasion resistant than steel, Mix and mold
  - The roller skate,skateboard breakthrough
- Acrylic
  - Clear and smooth, cracks easily!
  - Laser cutter friendly
- ABS
  - The poor man's pc, used in remote controls...
- Polycarbonate
  - bullet proof but never clean with acetone
- Teflon
  - slippery high temperature, low creep, great dielectric stuff
  - abraade frying pan and adhere to the shards
- ...

# Weird

- Two part and catalytic
  - Epoxies... 2 equal parts (yes it refers to the chemistry)
    - conductive, fast, dielectric, “high temperature”...
  - Polyester resin (used to cheapen fiberglass)
    - A hardener catalyzes
- Kevlar , Spectra (its how you align things)
  - Spectra is polyethylene with aligned molecules
  - with better tensile strength than steel
- Composites
  - Wood: Lignin and cellulous
  - Glass, Carbon fiber
  - Metal

# NonPlastics

- **Rubbers**=elastomer, activator, filler, release agent, antioxidants, emulsifiers (stretches 400 %)
  - Natural (gummy but oxidizes faster than synthetics)
  - Latex (cheap)
  - Butyl (needs vulcanizing)
  - Neoprene (high temperature, oil resistant)
  - Silicone (waxy, UV resistant)
- **Foams: MDF, bluefoam “Wrenshape”**
  - Closed Cell (strength from captured air compressing)
  - Open cell (strength from foam material)

# Other

- **Cement** great in compression
  - to much water always
  - 1 to 5 strength ratio in practice!
  - Needs reinforcement iron or glass for most applications
- **Clay** (it's the size and shape baby 10 to 15 um)
  - Heat to turn to glass
  - Replace water with oil for lasting pliability of modeling clay
- **Ceramic**
  - Crystalline for heat and pressure crack resistance
- **Wax**
  - Protect, mold, lubricate

# Materials for other purposes

- **Adhesives** (“never in manufacturing”)
  - Super glue always (thin acrylic)
  - Silicon seal!!!!
  - “Contact” cement
  - Epoxies
  - Glue gun
- **Coatings** = pigment, adhesive, binder, carrier filler (a way to harden)
  - Natural
    - Lacquer , Varnish, linseed, carob
  - Solvent
  - curing
  - Cooling

# Methods for using the stuff

- Cutting
- Abrasion
- Sanding, grinding
- Aggregation
  - Papermache
  - plaster,
  - bondo!...
- Forming
  - Break, heat,
- Molding, form and pressure
  - Rubber, plaster, sand, metal...
  - Centrifugal, ...explosion,



- Hydocal
- Ultracal 30
- Syntactic doh
- Urethanes,
- Silicons

- Materials Functional
- Materials Safety Data Sheet.

# Rubber design

- Elastomer
- Plastisizer
- Filler
- Mold release
- Catylysts
- Pigments

- Viscosity
  - Base
  - Catalyst
- Hardness
  - Shore a for rubbers
  - Shore d for plastics
  - Shore 00 for skin
  - Shore 000 for fatty tissues
- Tensile strength
  - Force/pressure
- Percent elongation

- [Smooth-on.com](http://Smooth-on.com)
- Tom Mclaughlin Silicone Art
- [www.bumanfoam.com](http://www.bumanfoam.com)