How is this part made?

2.810

Professor Tim Gutowski

MIT 2.810 Manufacturing Processes and Systems							
Lab Asignments Fall 2013							
	Monday 9-12		Wednesday 9-12		Thursday 9-12		Friday 9-12
1	Secundo, Rafael	1	McMullin, Nathan	1	Guan,Dong (no show)	1	Artiles,Jessica A.
2	Kimball,Peter Evan	2	Churchill,Hugh Edwar	2	Larson,Richard W (no show)	2	Colucci,Lina Avancin
3	Kuan,Jiun-Yih	3	Georgiadis,Vasilis	3	Shah, Advait M.	3	Garcia,Jose Manuel
4	Morris,Taylor J.(no show)	4	Graves,Carmen M (no show)	4	Pan,Yichao (no show)	4	Modak,Ashin Pramod (no show)
5	Pak,Nikita	5	Mantzavinou,Aikateri	5	Reed,Christian R. (no show)	5	Ghosh, Sourabh
6	Ramos,Joshua D	6	Pharr,Vanea Ryann	6	Wu,Faye Y	6	Bhadauria, Anubha-Sin
7	Pombol, Chris	7	Swamy,Tushar	7	Chiang, Jerry Kao	7	Chandar, Arjun Subram
8	Knodel, Philip	8	Chang, Josh Woolin	8	Bastrikov, Igor	8	Chang, Woolim
9	Xu,Ruize	9	Charpentier, Erik	9	Dzhumaev, Almir Damir	9	Chawla, Yugank
10	Sondej, Nick	10	Yang, Maxine	10	Gorkina, Aleksandra	10	He, Yan
11	Jiang Sheng	11	Talyor, David	11	Sharipova, Aliya Fari	11	Jain, Sonam
12	Lesniewski, Victor	12	Michaluk, Nathaniel	12	Vyatskikh, Andrey	12	Puszko, Gregory D.
				13	Mekler, Jeff	13	Ranjan, Aditya
						14	Sedore, Blake William
						15	Svenson, Ernest Knute
						16	Tandon, Shubhang
						17	Thomas, Dale Arlington

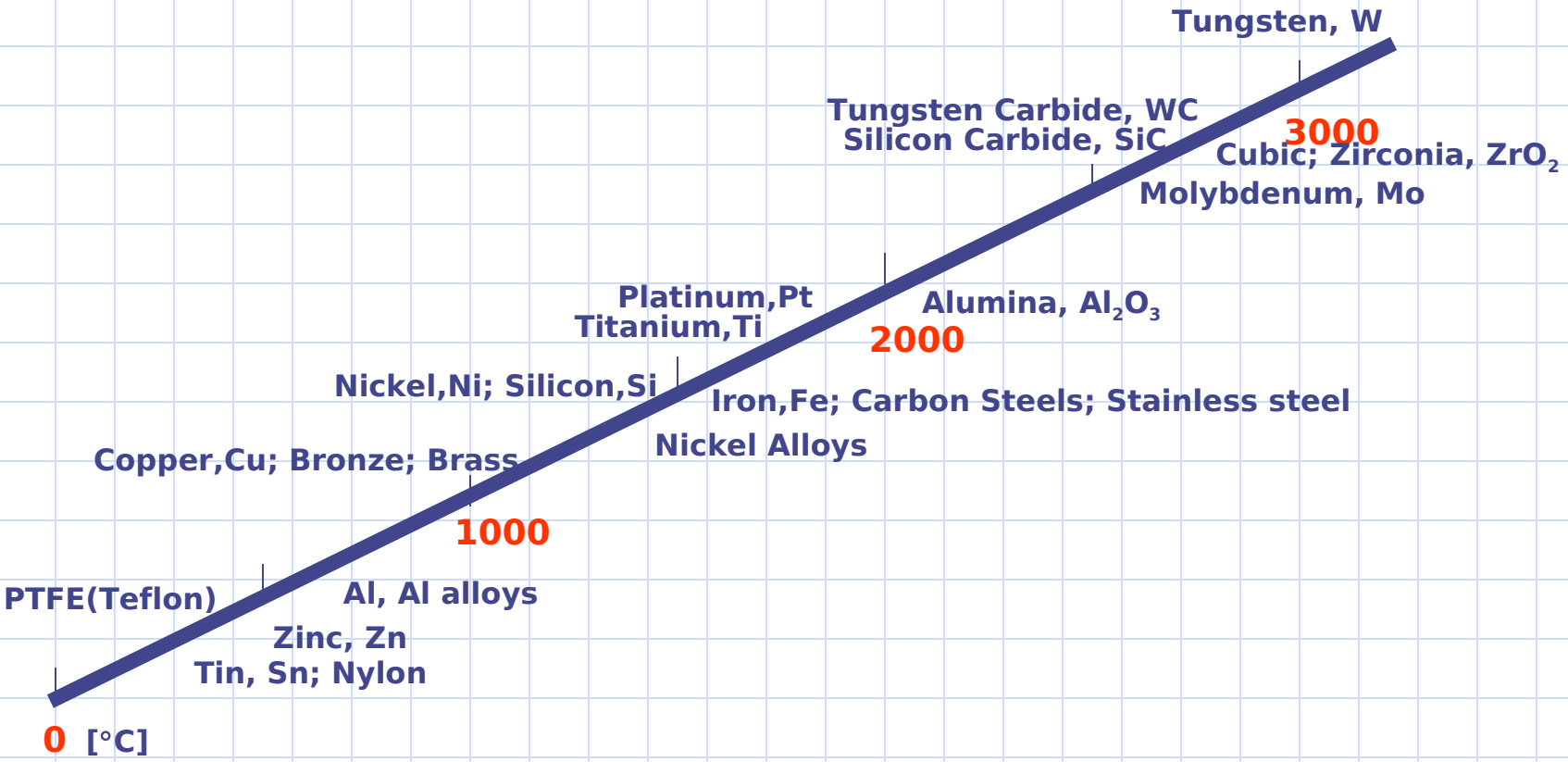
Process Identification

- What is the product?
  - Loads, environment, annual part volume
- What is the material?
  - Color, hardness, magnetic, surface
- Surface finish
  - Roughness, tool marks, gate location, trim line
- Shape
  - Curvatures, undercuts, internal passages, draft angles, threaded sections, warping, sink marks
- Size

TABLE 3.1 Physical Properties of Selected Materials at Room Temperature

Metal	Density (kg/m^3)	Melting point (°C)	Specific heat (J/kg K)	Thermal conductivity (W/m K)
Aluminum	2700	660	900	222
Aluminum alloys	2630–2820	476–654	880–920	121–239
Beryllium	1854	1278	1884	146
Columbium (niobium)	8580	2468	272	52
Copper	8970	1082	385	393
Copper alloys	7470–8940	885–1260	377–435	29–234
Iron	7860	1537	460	74
Steels	6920–9130	1371–1532	448–502	15–52
Lead	11,350	327	130	35
Lead alloys	8850–11,350	182–326	126–188	24–46
Magnesium	1745	650	1025	154
Magnesium alloys	1770–1780	610–621	1046	75–138
Molybdenum alloys	10,210	2610	276	142
Nickel	8910	1453	440	92
Nickel alloys	7750–8850	1110–1454	381–544	12–63
Tantalum alloys	16,600	2996	142	54
Titanium	4510	1668	519	17
Titanium alloys	4430–4700	1549–1649	502–544	8–12
Tungsten	19,290	3410	138	166
Zinc	7140	419	385	113
Zinc alloys	6640–7200	386–525	402	105–113
Nonmetallic				
Ceramics	2300–5500	—	750–950	10–17
Glasses	2400–2700	580–1540	500–850	0.6–1.7
Graphite	1900–2200	—	840	5–10
Plastics	900–2000	110–330	1000–2000	0.1–0.4
Wood	400–700	—	2400–2800	0.1–0.4

Melting temperatures

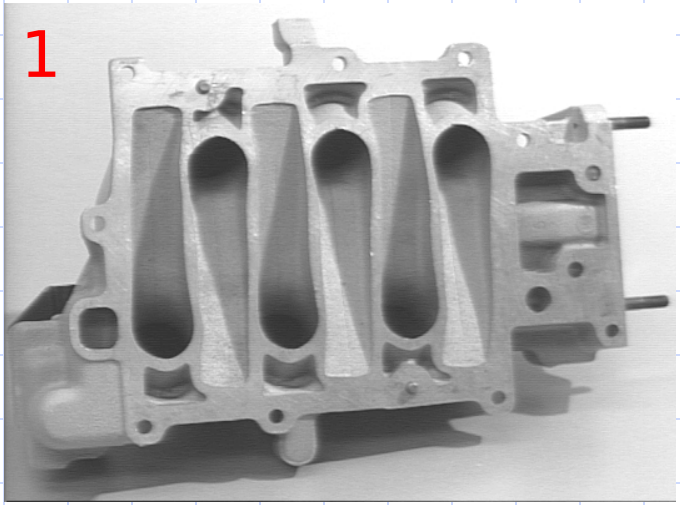


Melt temperature for crystalline metals and ceramics and semi crystalline thermoplastic polymers

Hardness

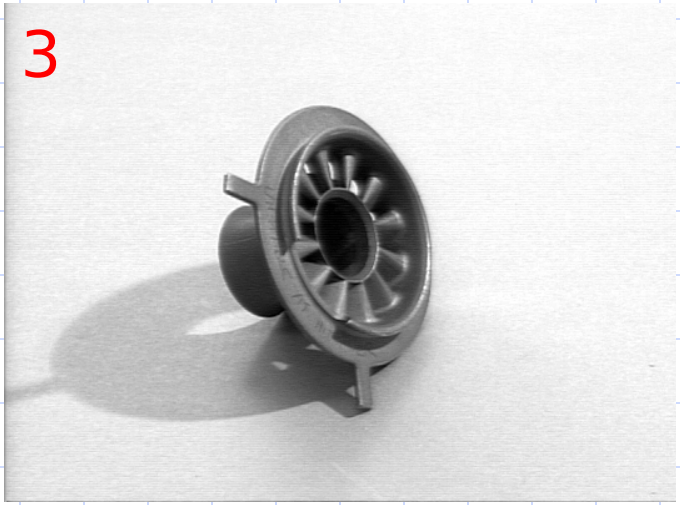
Hardness values for some ceramics, metals, and polymers. (ref. Rabinowicz)

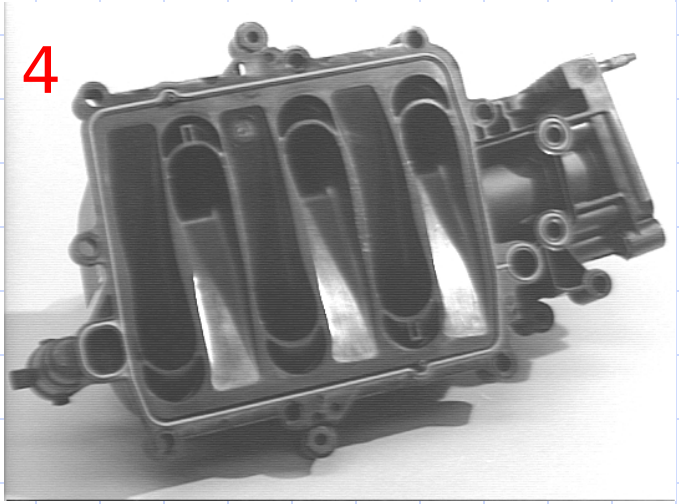
1



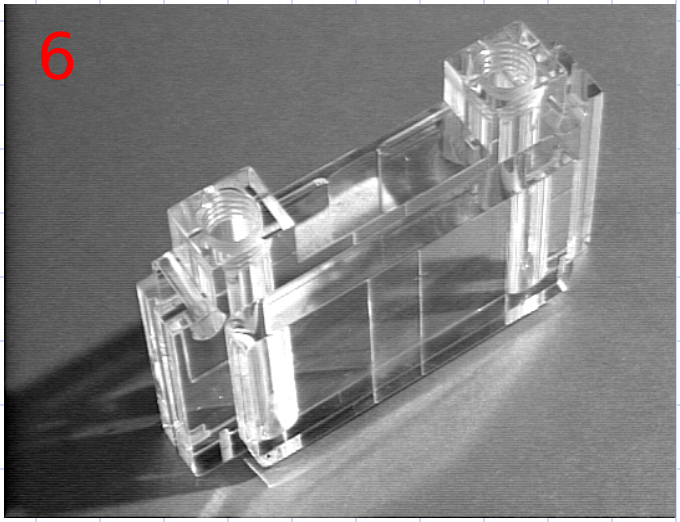
2

3

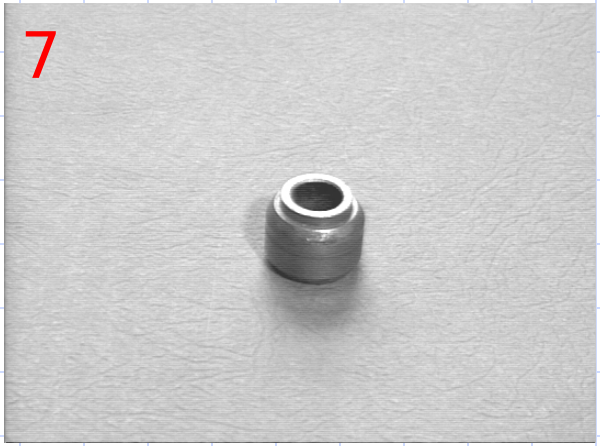



4

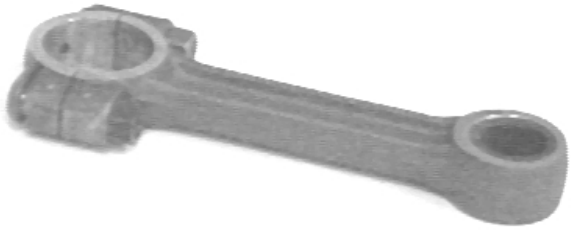
5


6

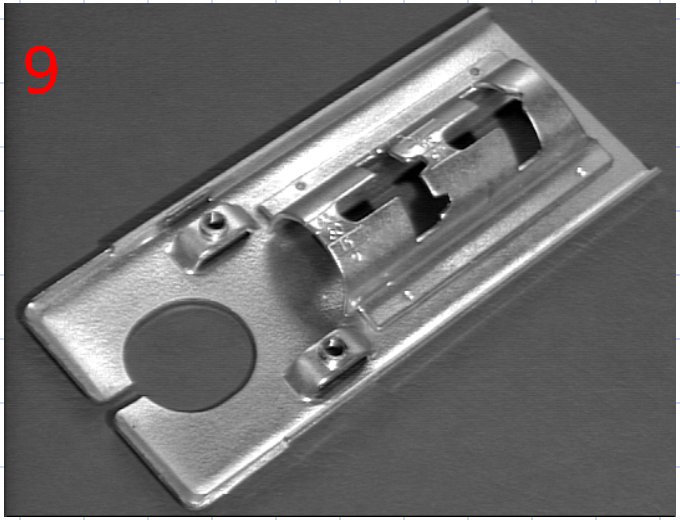
7



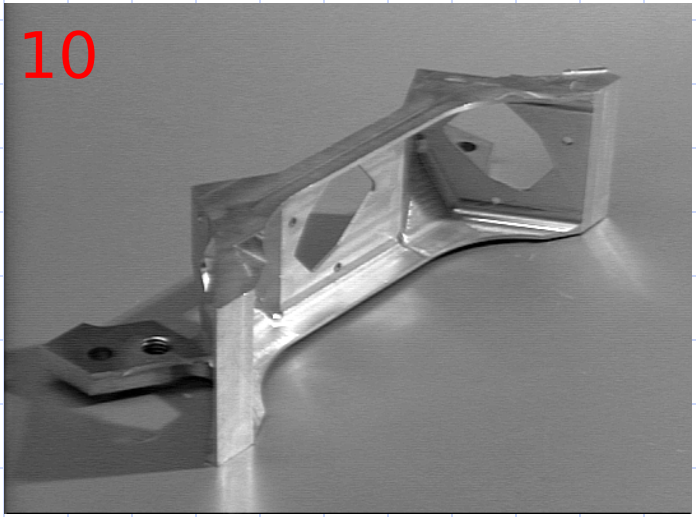
8



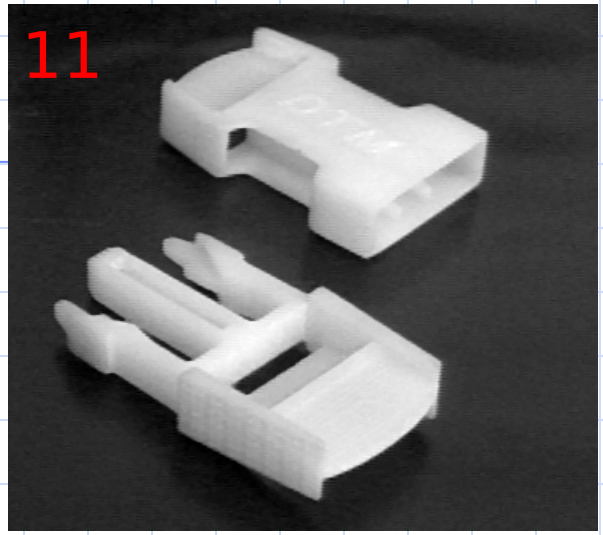
9



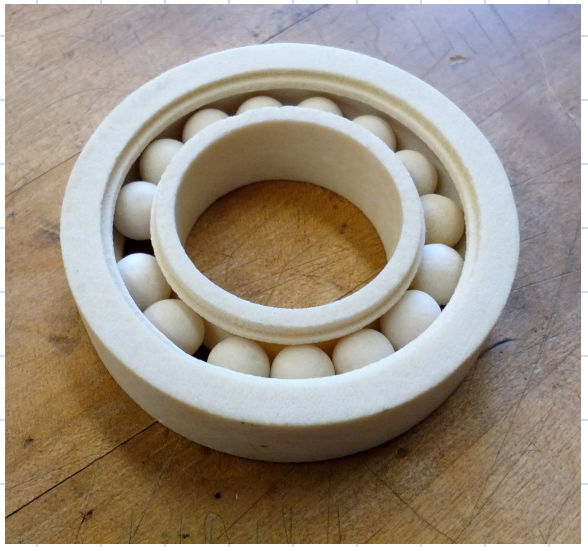
10



11



12



13

14

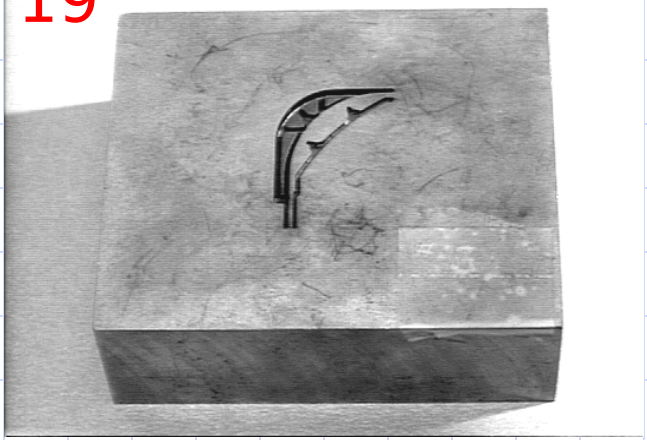
15

16

17

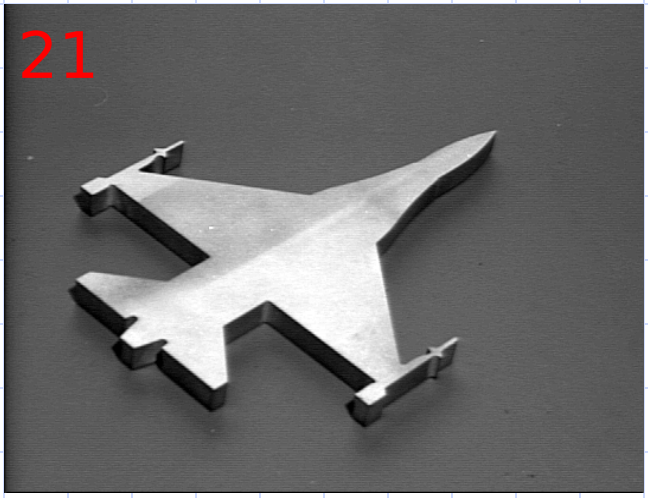
18

19



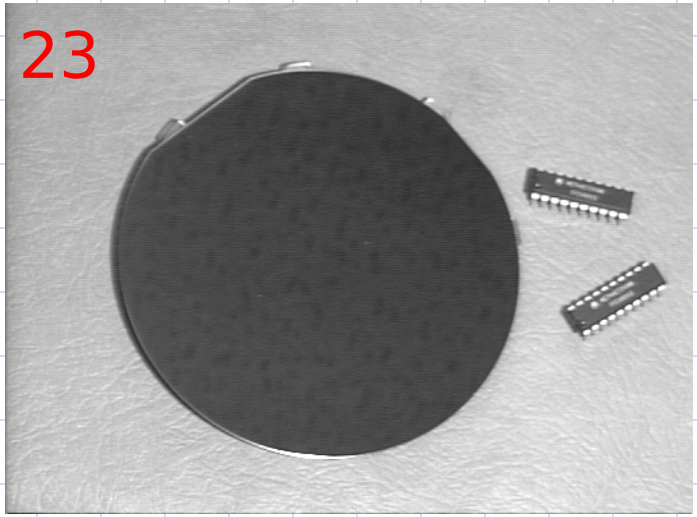
20

21



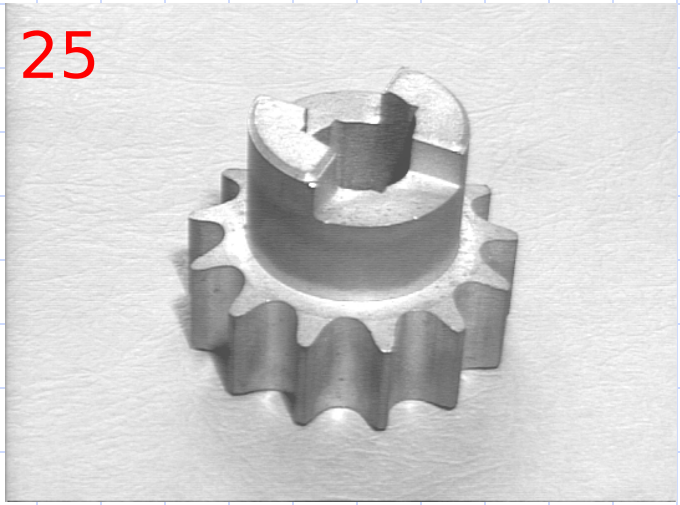
22

23

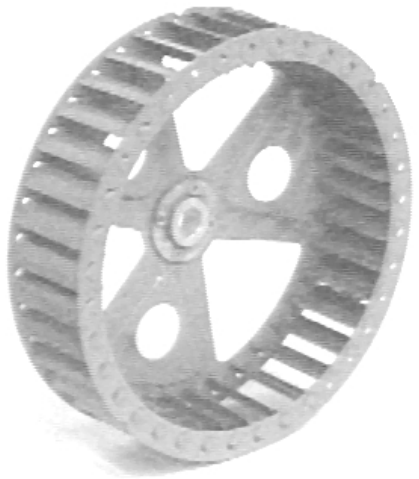


24

25



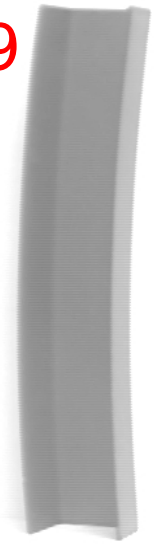
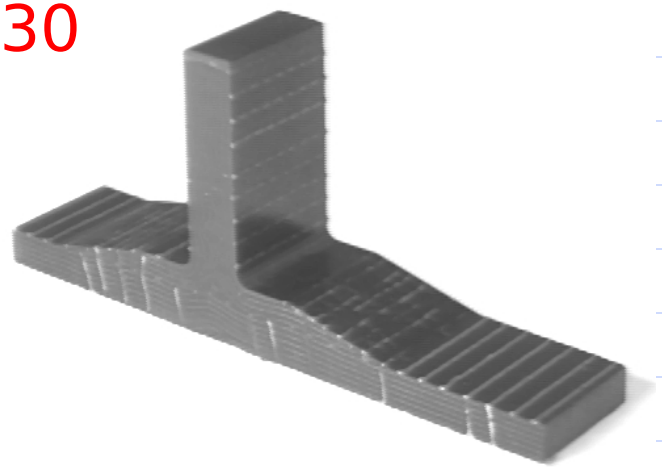
26



27

28

29



30