The Three Laws of Robots

- A robot may not injure a human being, or, through inaction, allow a human being to come to harm.
- A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.
- A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

From Handbook of Robotics, 56th Edition, 2058 A.D.

Distributed System Issues

- Latency
- Memory access
- Concurrency
- Partial Failure

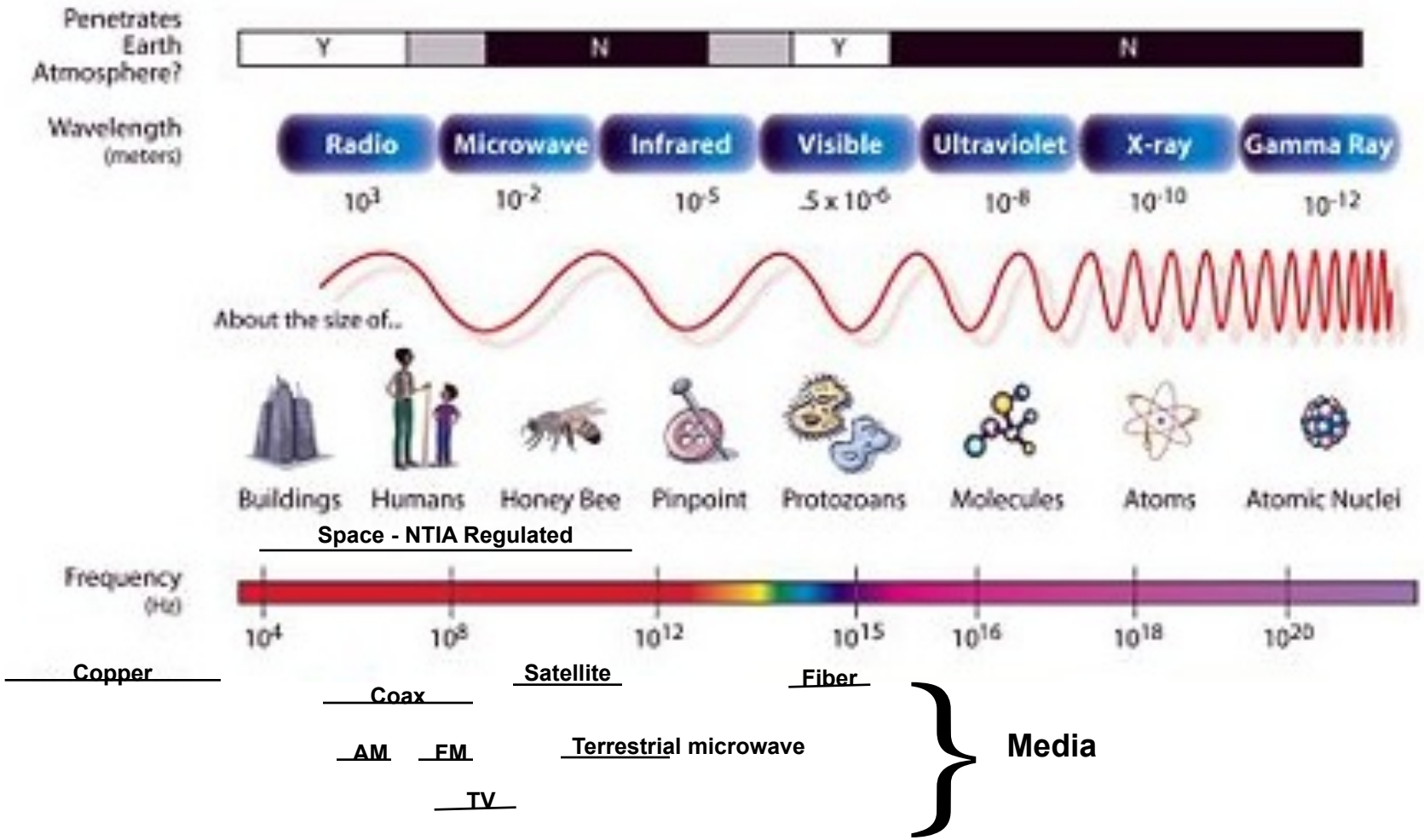
Essential Problems and Solutions

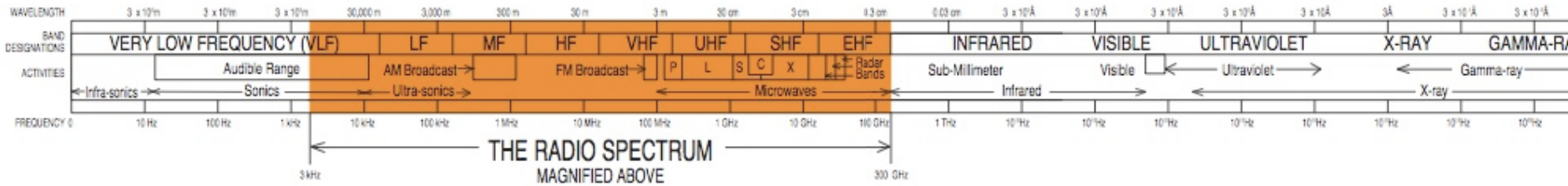
- **Leader election**: who's in charge here?
  - Lowest id
- **Agreement**: fight or flight?
  - Impossible!
- **Broadcast**: does everybody know… ?
  - Spanning tree: get organized
- **Routing**: what path to use?
- **Robustness**: did it work? did you hear me?

Robot Swarms

- Avoid Many Robots
- Disperse from Source
- Disperse uniformly
- Follow the leader

THE ELECTROMAGNETIC SPECTRUM




WAVELENGTH
BAND DESIGNATIONS
ACTIVITIES
FREQUENCY
VERY LOW FREQUENCY (VLF)
LF
MF
HF
VHF
UHF
SHF
EHF
INFRARED
VISIBLE
ULTRAVIOLET
X-RAY
GAMMA-RA
Audible Range
AM Broadcast
FM Broadcast
P
L
S
C
X
Radar Bands
Sub-Millimeter
Visible
Ultraviolet
Gamma-ray
Infra-sonics
Sonics
Ultra-sonics
Microwaves
Infrared
X-ray
10 Hz
100 Hz
1 kHz
10 kHz
100 kHz
1 MHz
10 MHz
100 MHz
1 GHz
10 GHz
100 GHz
1 THz
3 kHz
300 GHz
THE RADIO SPECTRUM
MAGNIFIED ABOVE