

# RF-Not Just For Amateur Radio

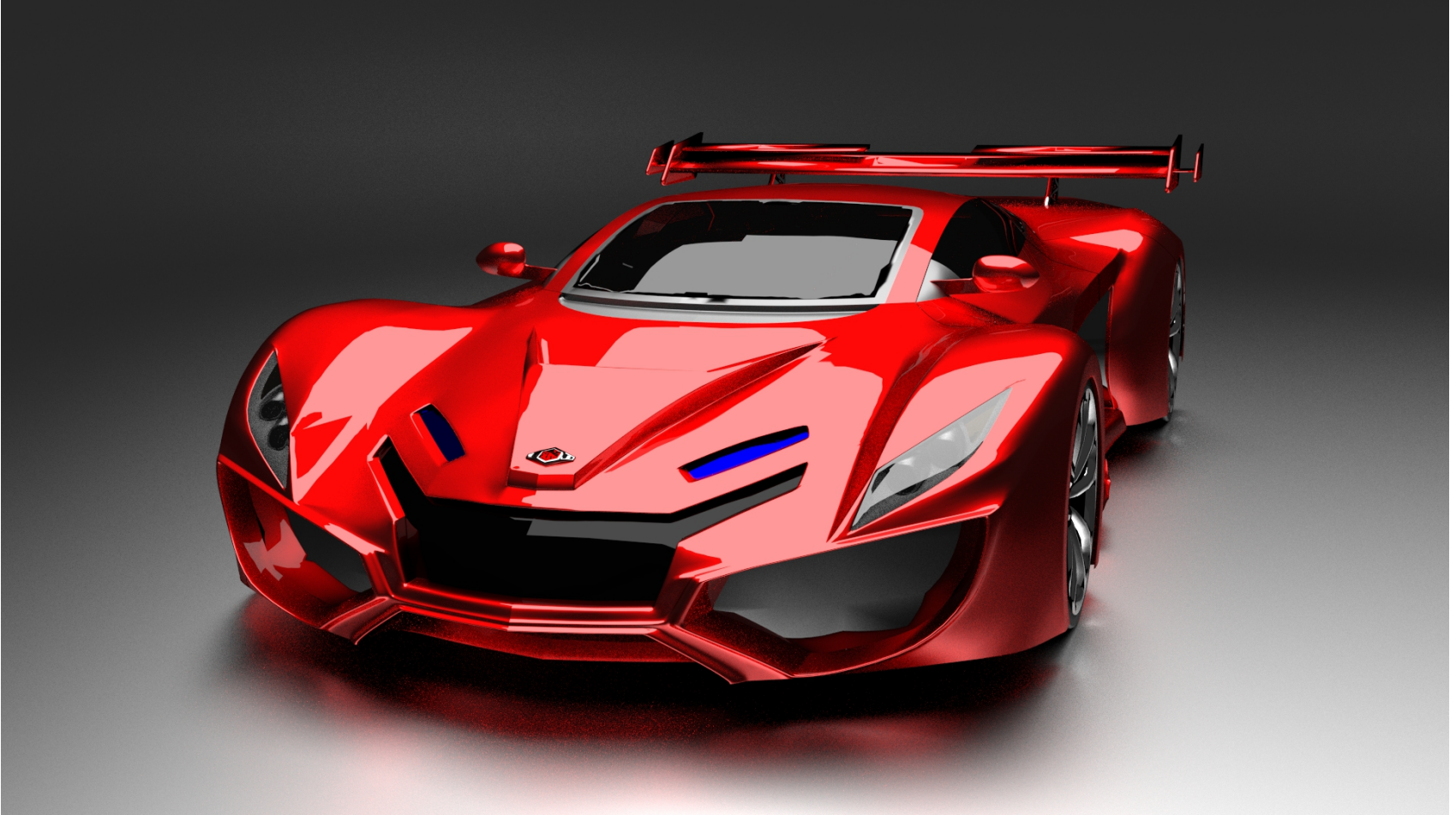
Gary Cohen

KE9KF

- Licensed 1969 (8<sup>th</sup> grade)
- Tech upgraded to Advanced
- UW-Milwaukee
- MCW 1980 (Dr. Kaplan  
Histology Professor)
- Pediatric residency 1980-1983  
Children's Hospital
- Private practice pediatrics----  
Full time faculty Neonatal  
Hospitalist
- Amateur radio hobby not a  
priority----Kids and work----  
Empty nesters -- late life crisis



# Late Life Crisis-Too Expensive



# TOO EXPENSIVE







# RF Effects

- Radio
- Television
- Radio communications
- Amateur radio
- Microwave point to point links
- Cell Phones



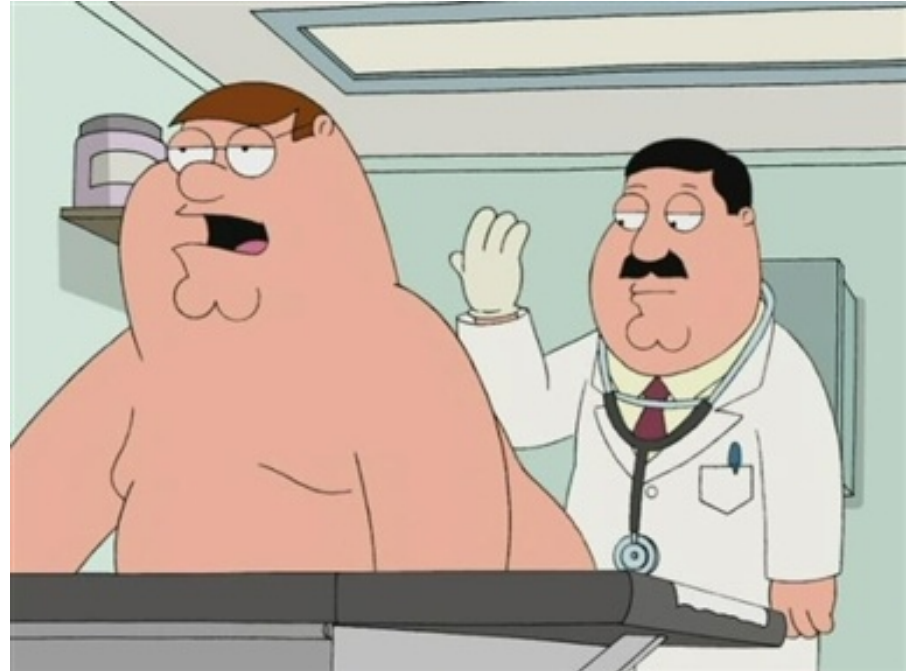
# RF Effects

- Thermal effect
  - Rapidly heat biological tissue
  - Microwave oven
  - Body has to dissipate heat
- Evidence for biologic effect for levels less than needed to produce heat are unproven



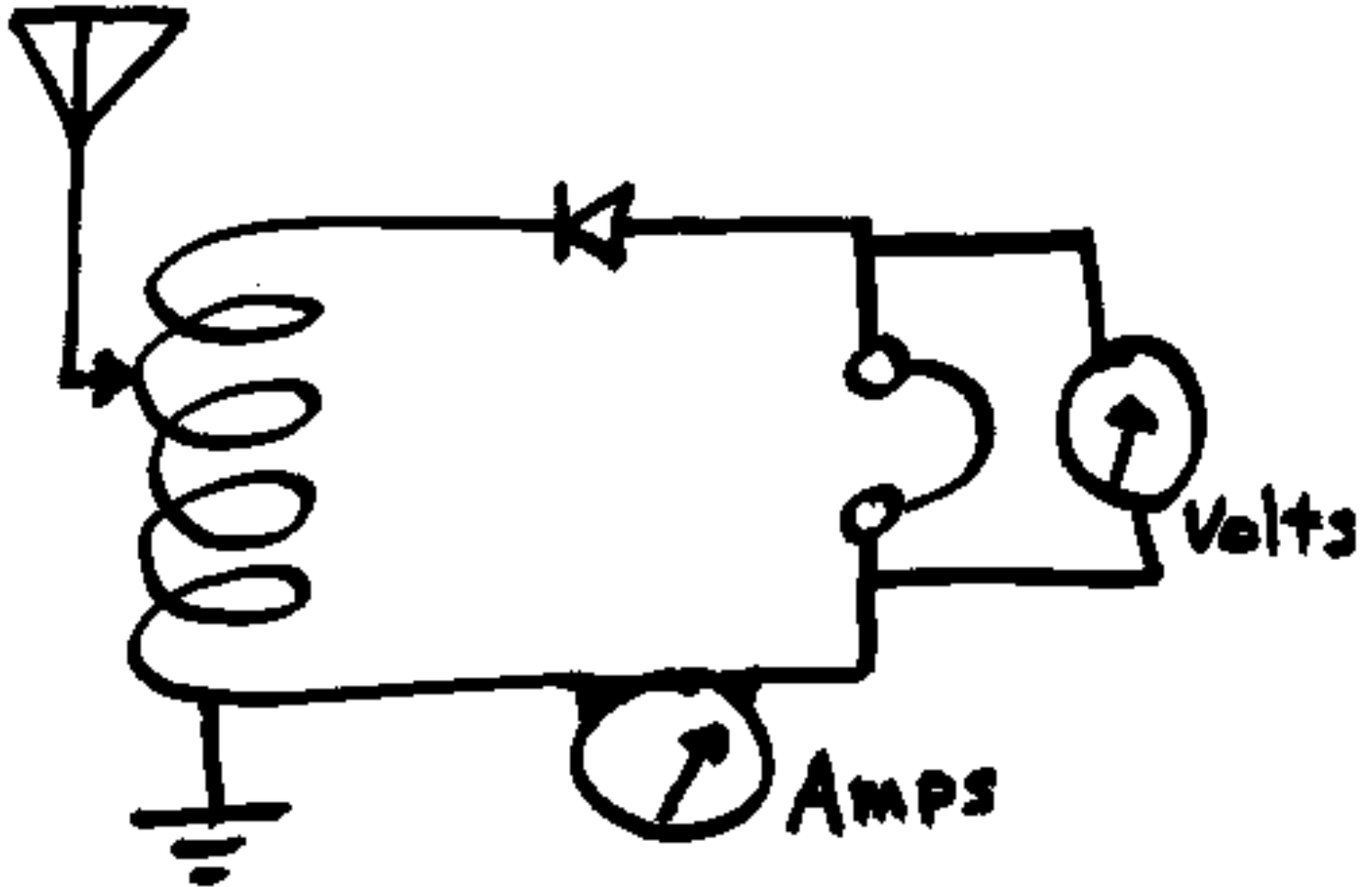
# Reported Health Effects

- Adult and childhood leukemia
- Brain cancer
- Infertility
- Altered immune function
- Neurological and developmental impairment





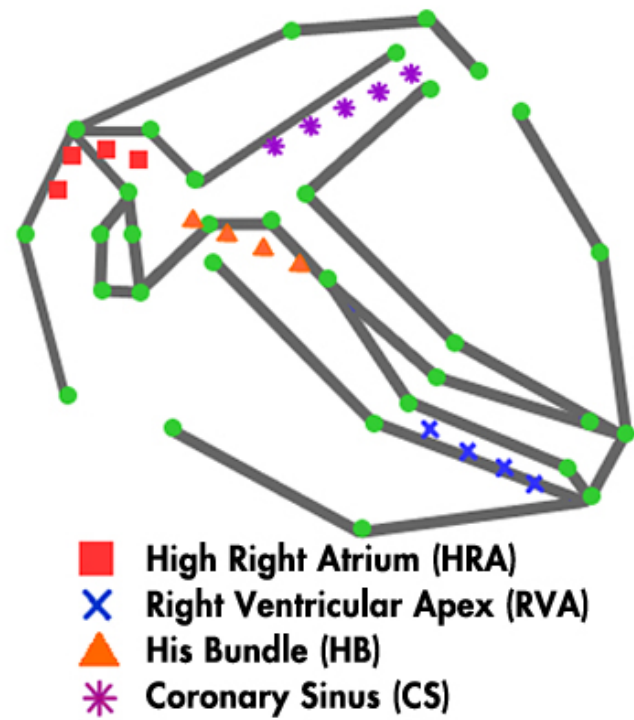
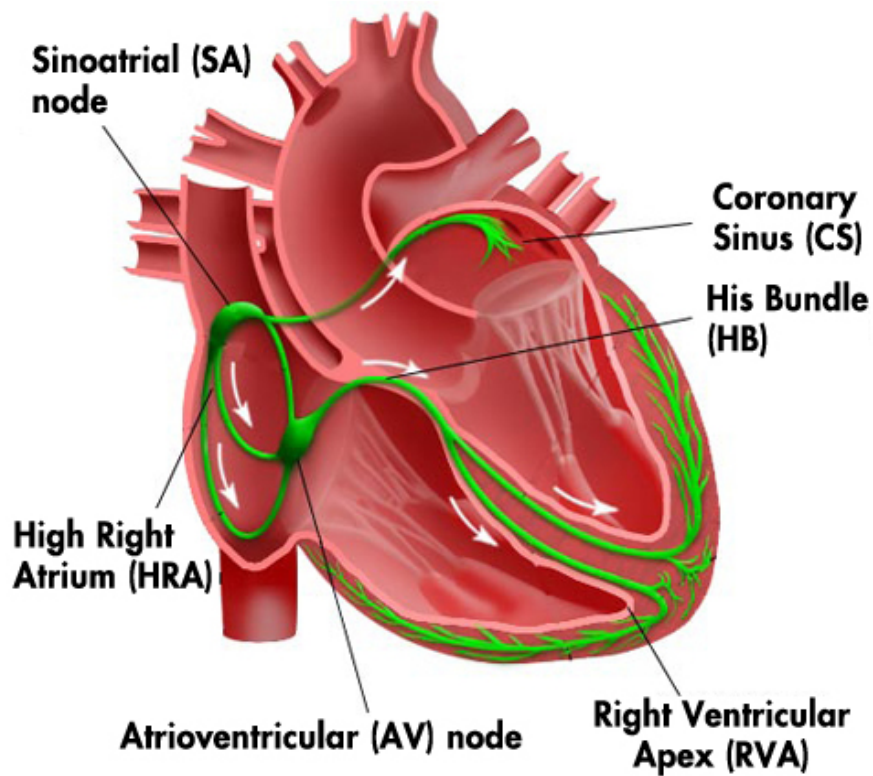
# Non-Radio Uses for RF



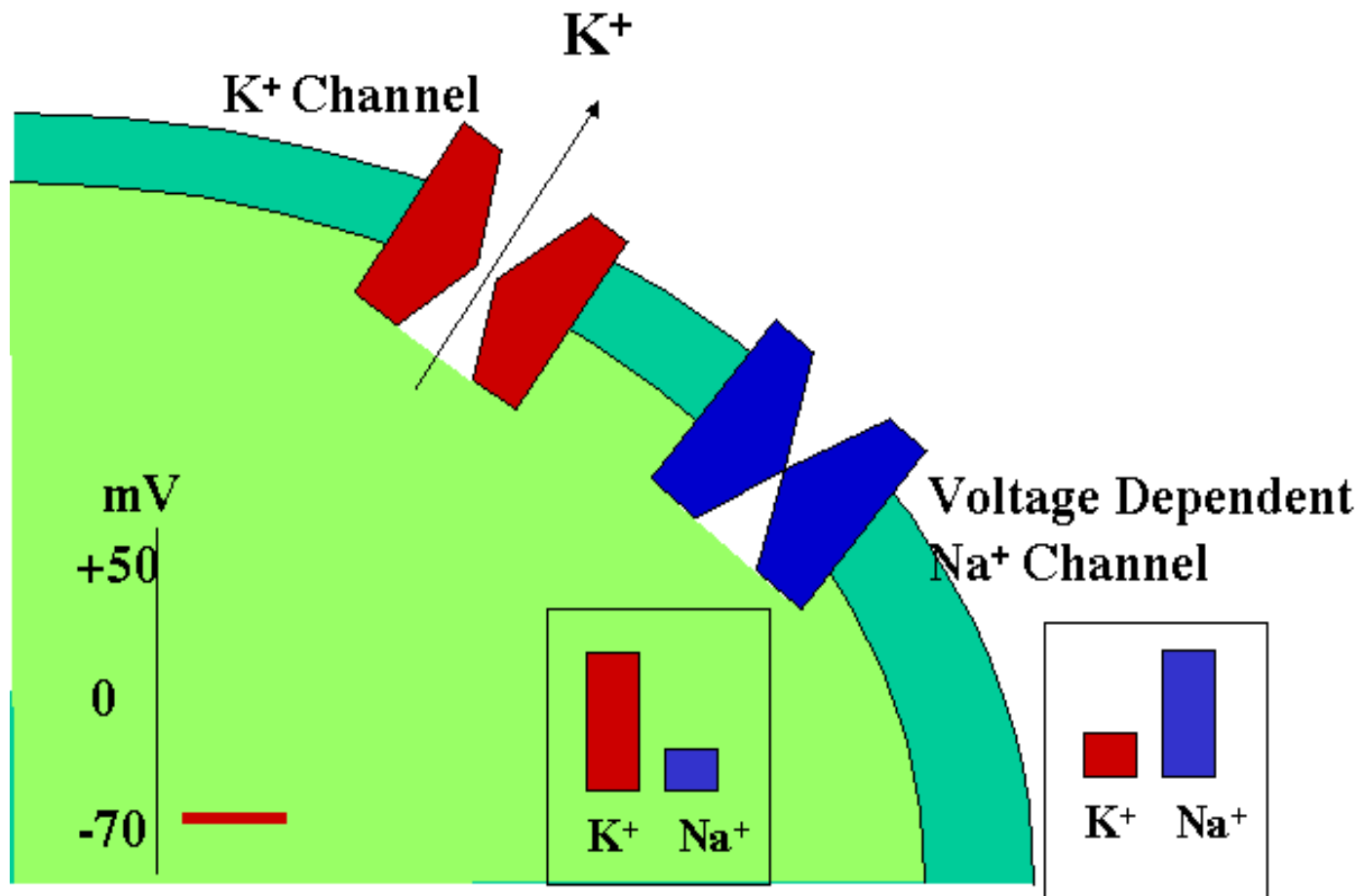
# RF Ablation-Heart Rhythm

- Non-Surgical
- Treats certain types of abnormal heart rhythms
  - Uncoordinated heart beats
- RF energy applied to abnormal heart tissue
- Heat destroys abnormal tissue

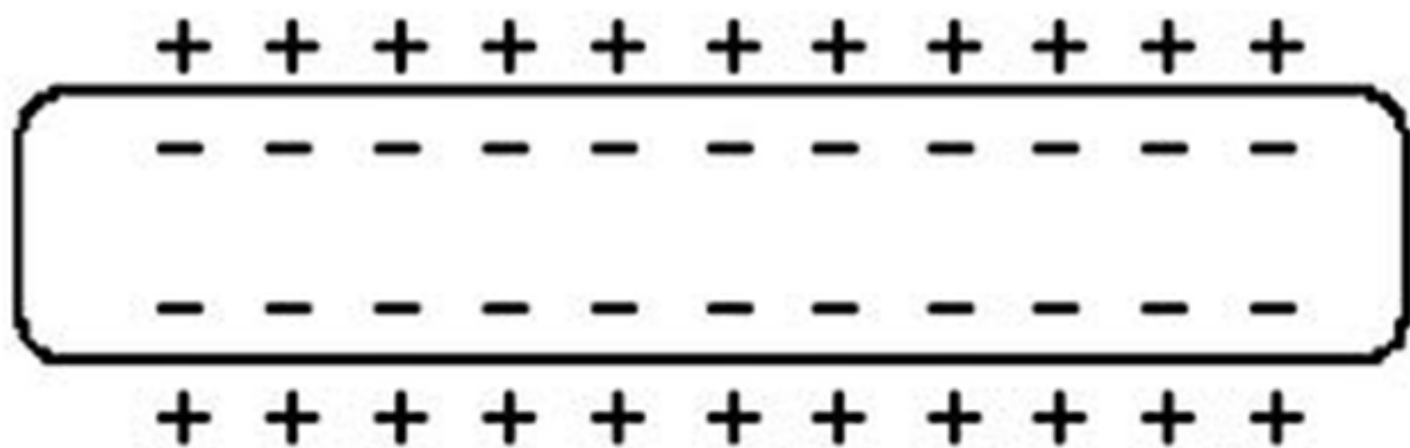


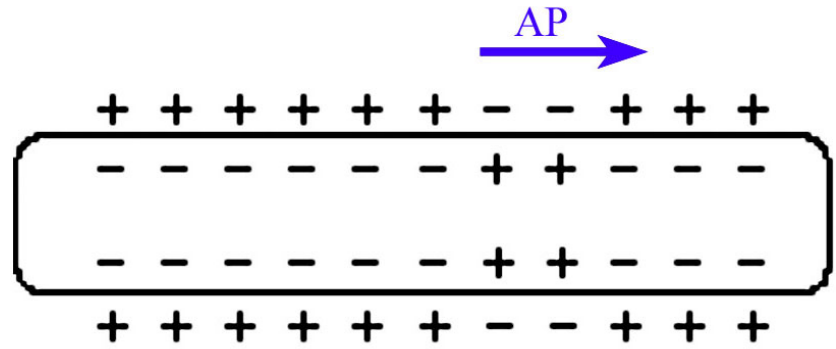
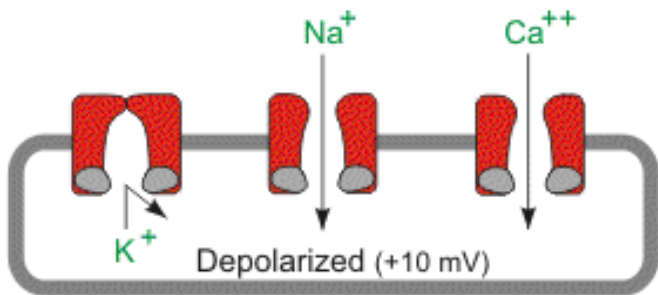
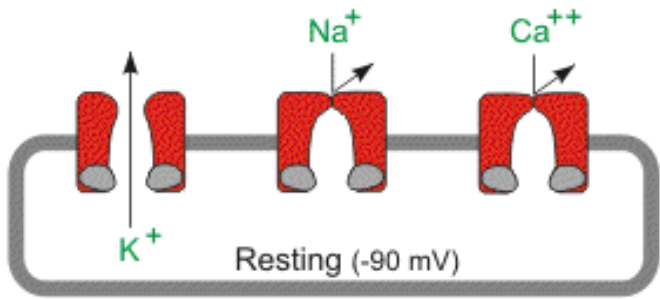


# Resting potential





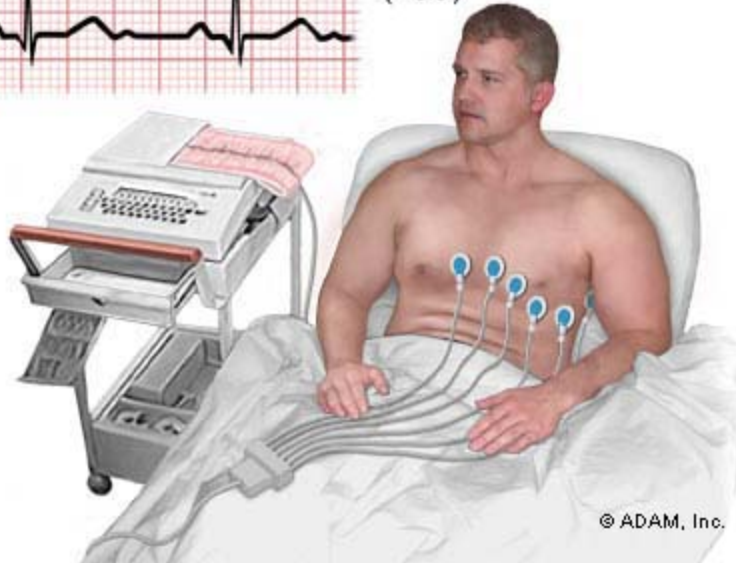




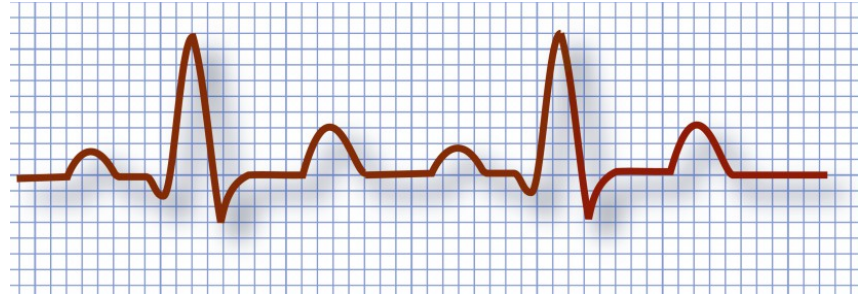




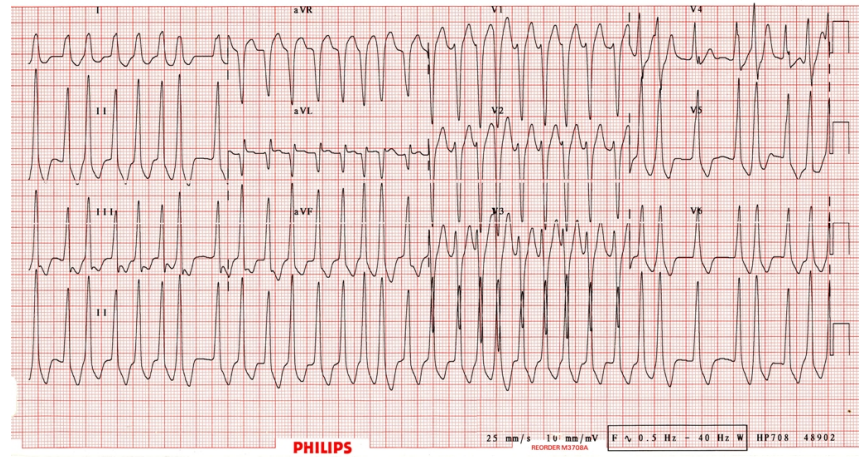
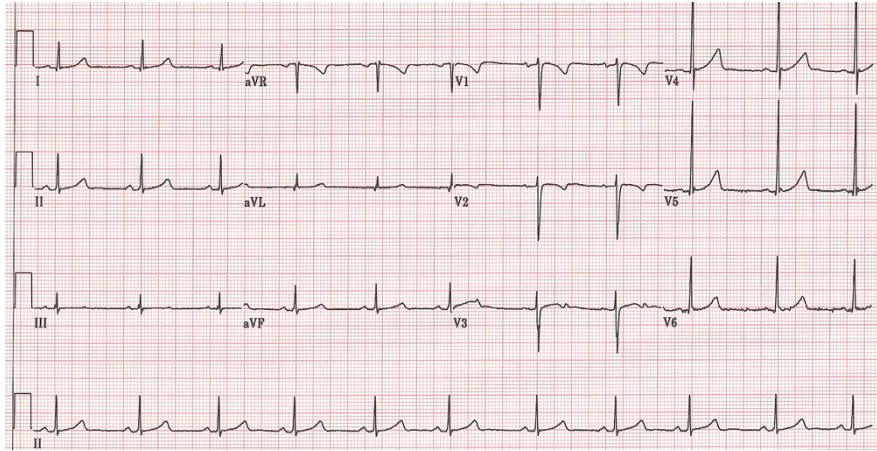
Electrocardiogram  
(ECG)

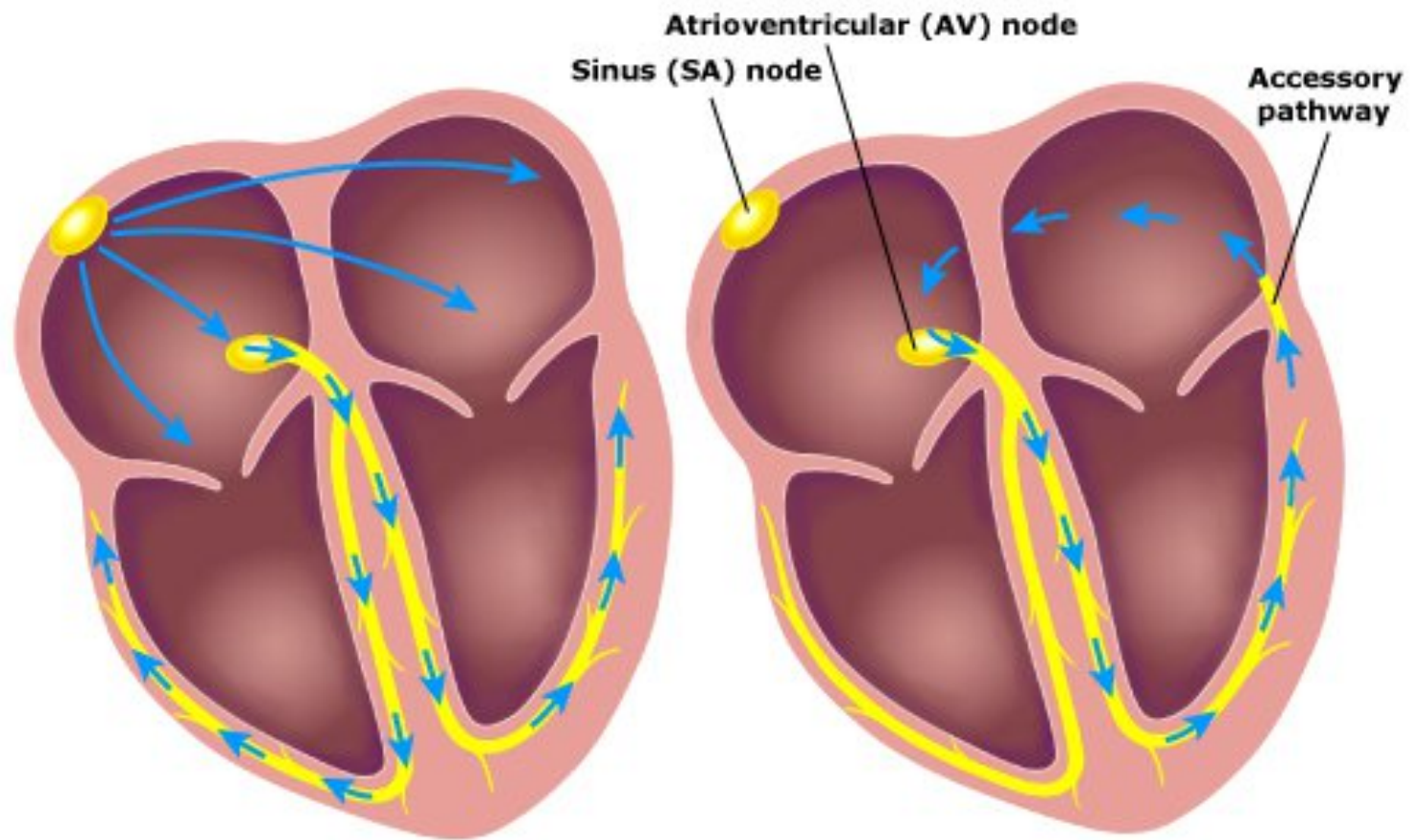


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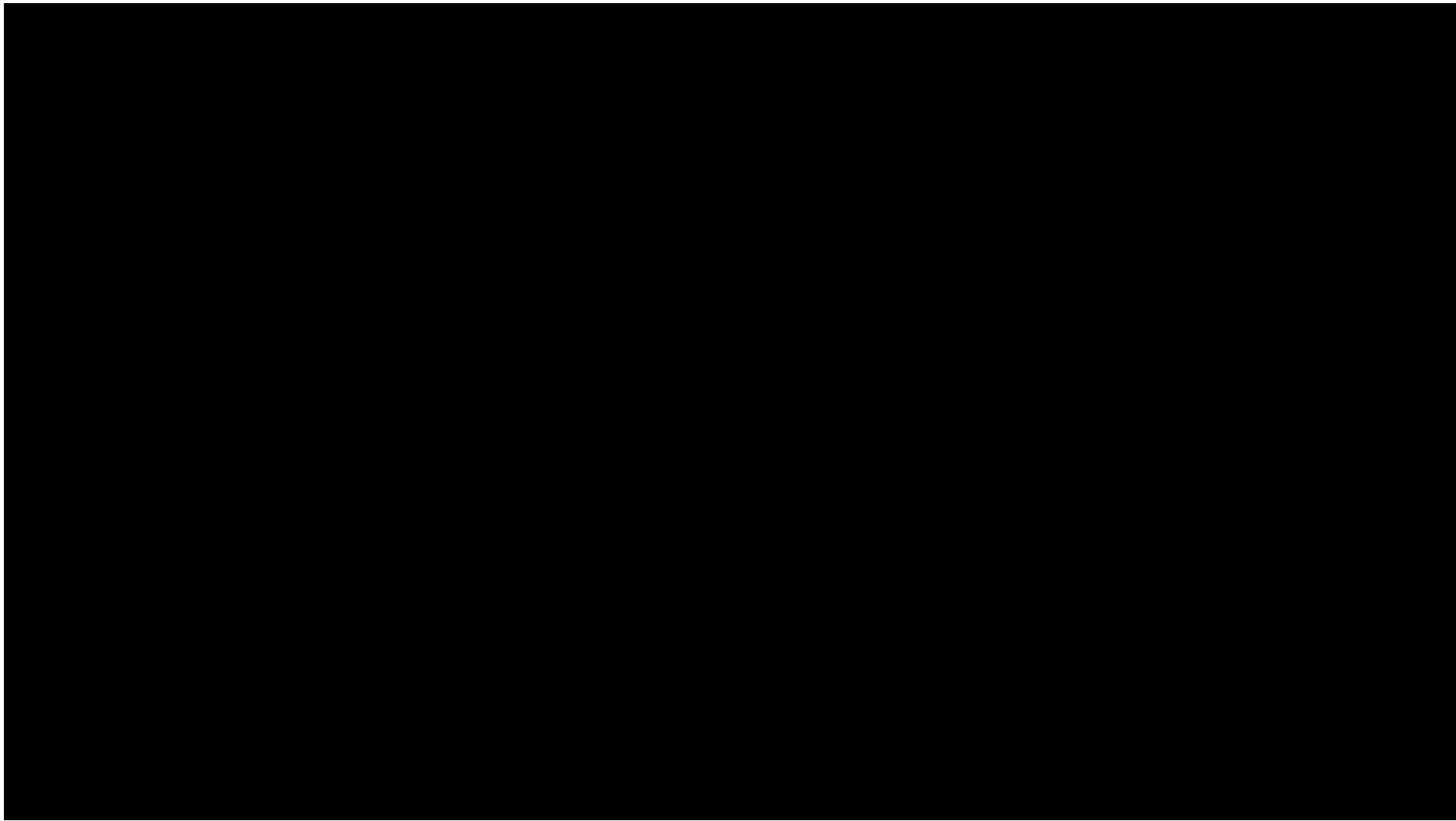






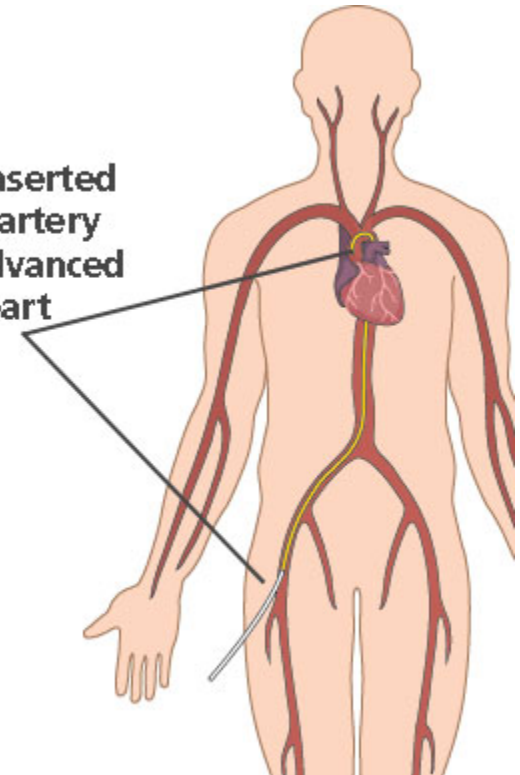
**Normal electrical pathways**

**Abnormal electrical pathway  
in Wolff-Parkinson-White syndrome**



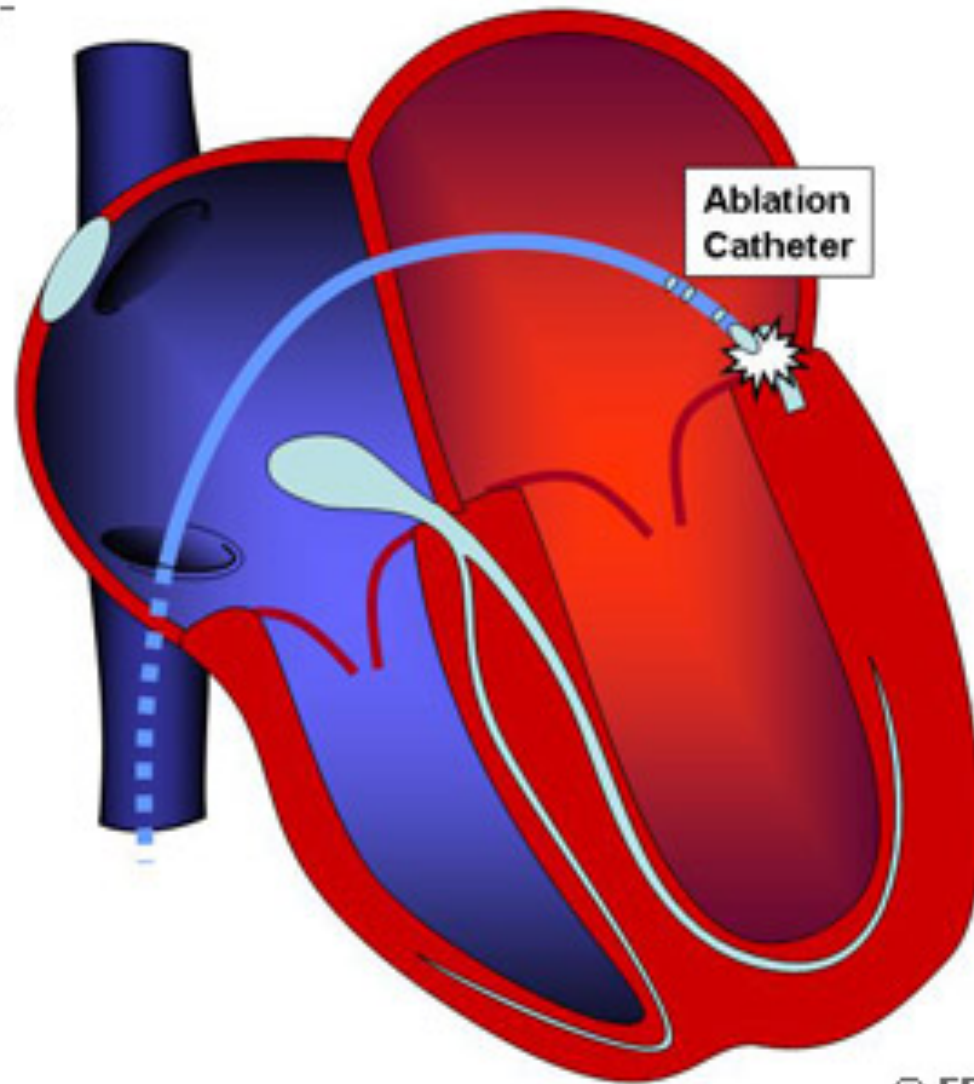


**Catheter is inserted through an artery and gently advanced to the heart**

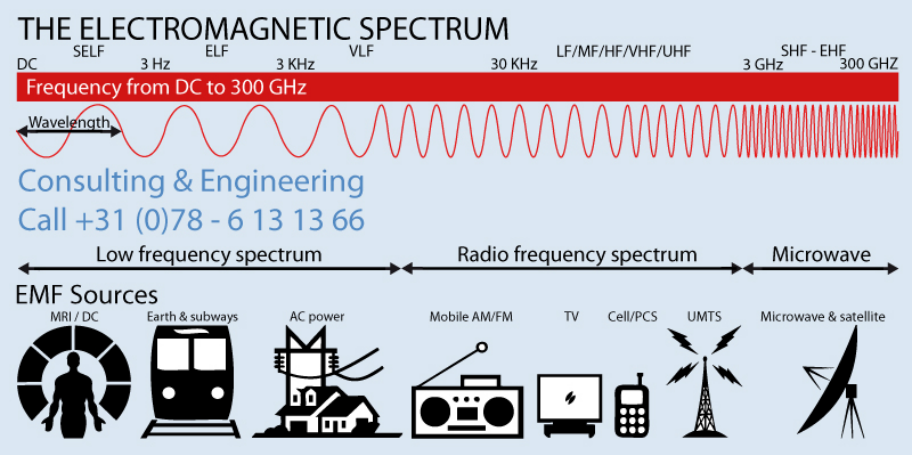




**Catheter Ablation of Accessory Pathway in Wolff-Parkinson-White Syndrome**



- RF energy applied to target tissue
  - 300-750 KHz
  - 20-40 watts
  - 20-60 seconds
  - Achieve temp of 60-75 degrees C
  - Success rate of over 90%
- Complications
    - Damage to vessel
    - Clots
    - Induce other heart rhythm problems



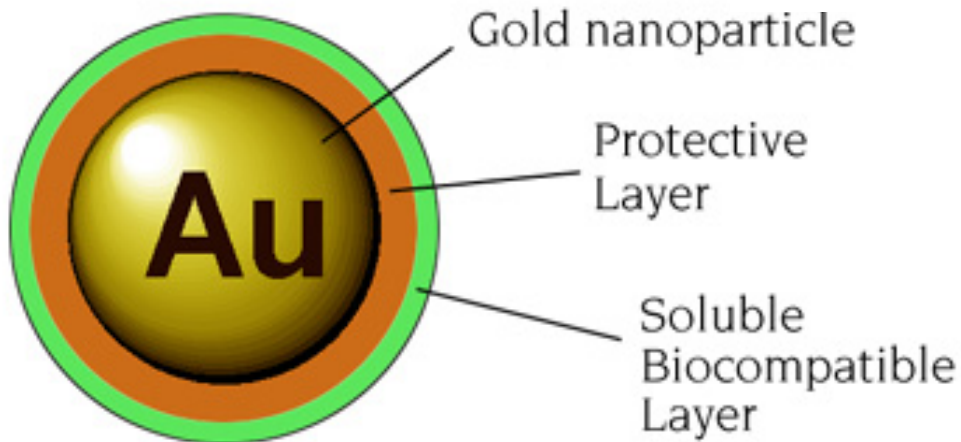
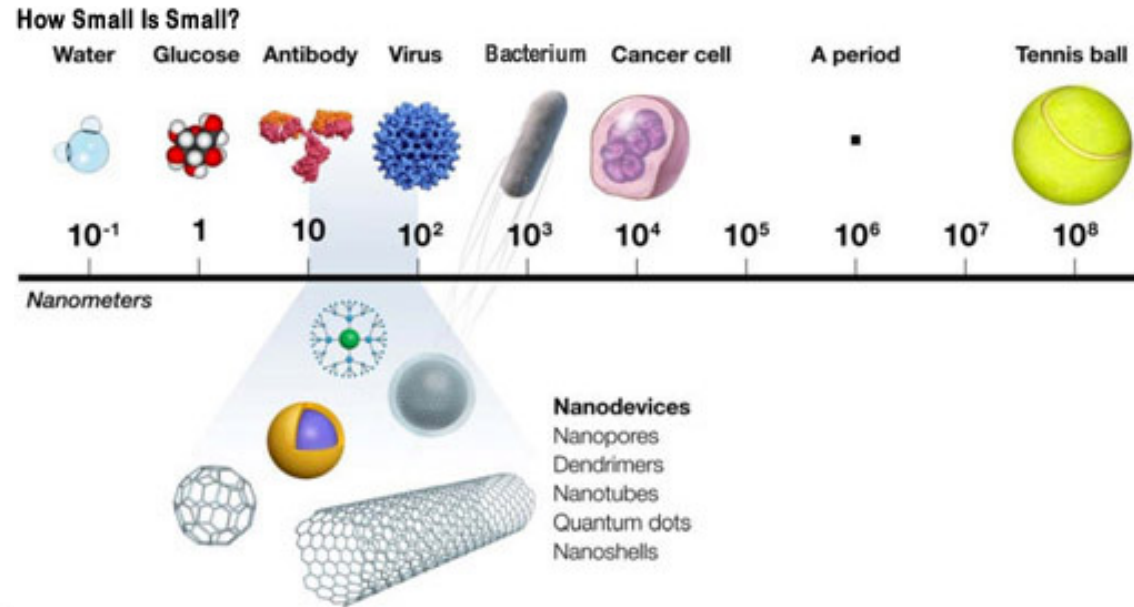
# RF and Gold to Kill Tumors

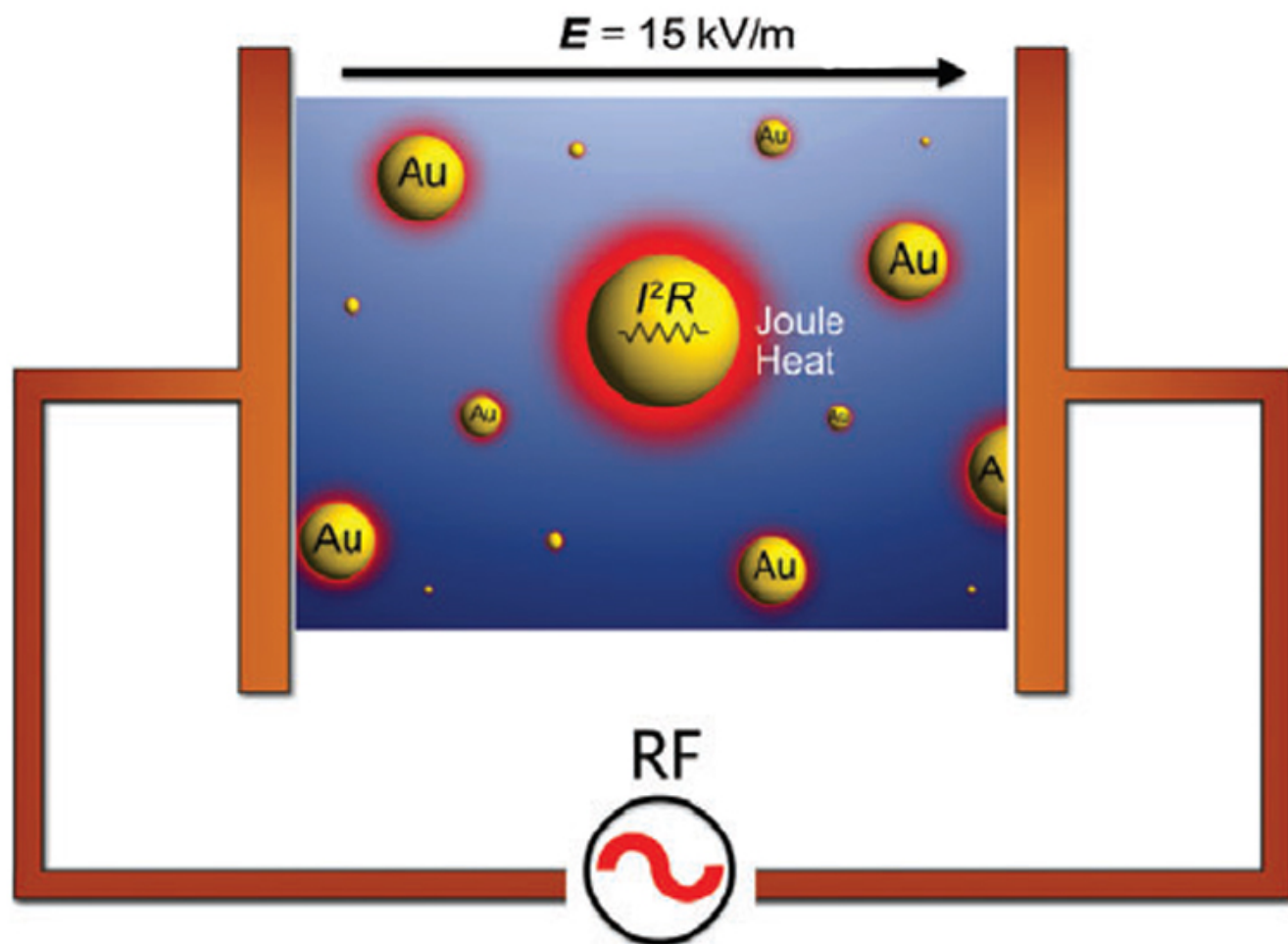
- Use nanoparticles to cook tumors to death
  - Target gold nanoparticles to tumor
  - Absorb radio waves- penetrate deep in body
  - Generate heat that damages cells
  - Coated with molecules that target tumor
- Animal Studies
    - 13.6MHz
    - 600 watts
    - 35 watts
    - 13 minutes



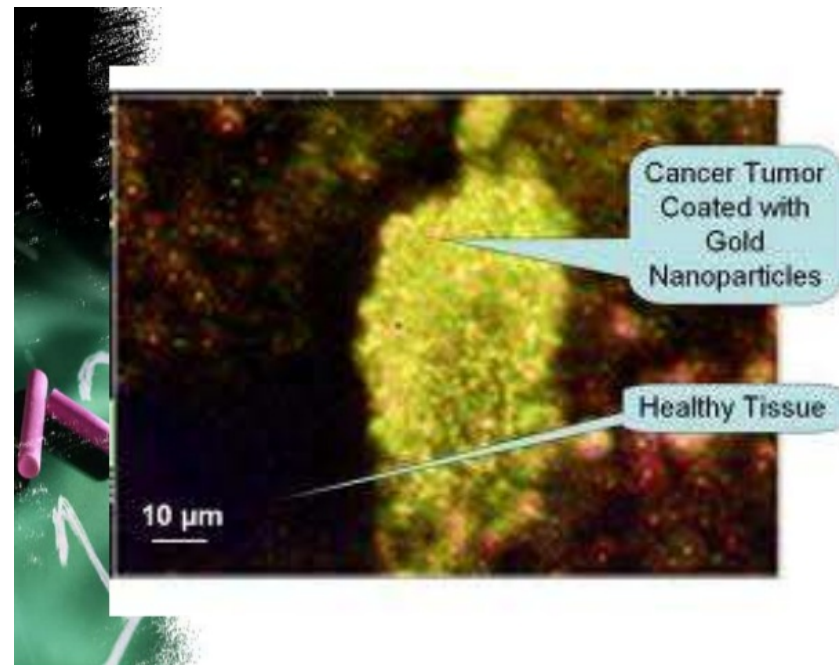
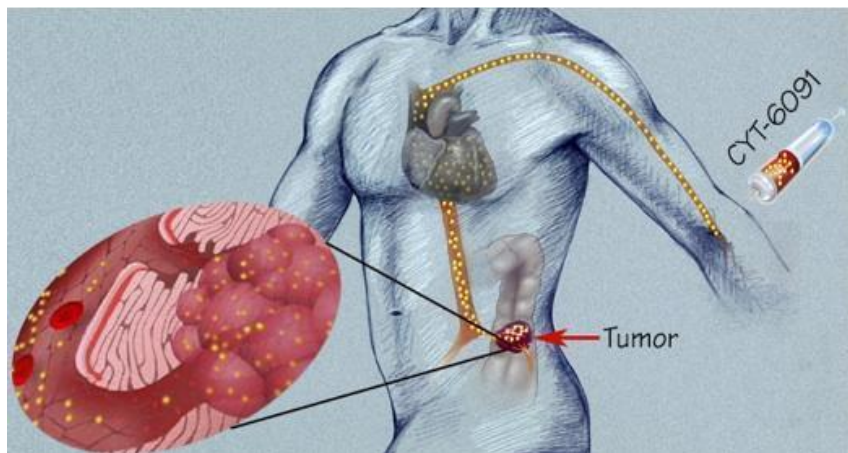
# RF and Gold

- 150 nm size



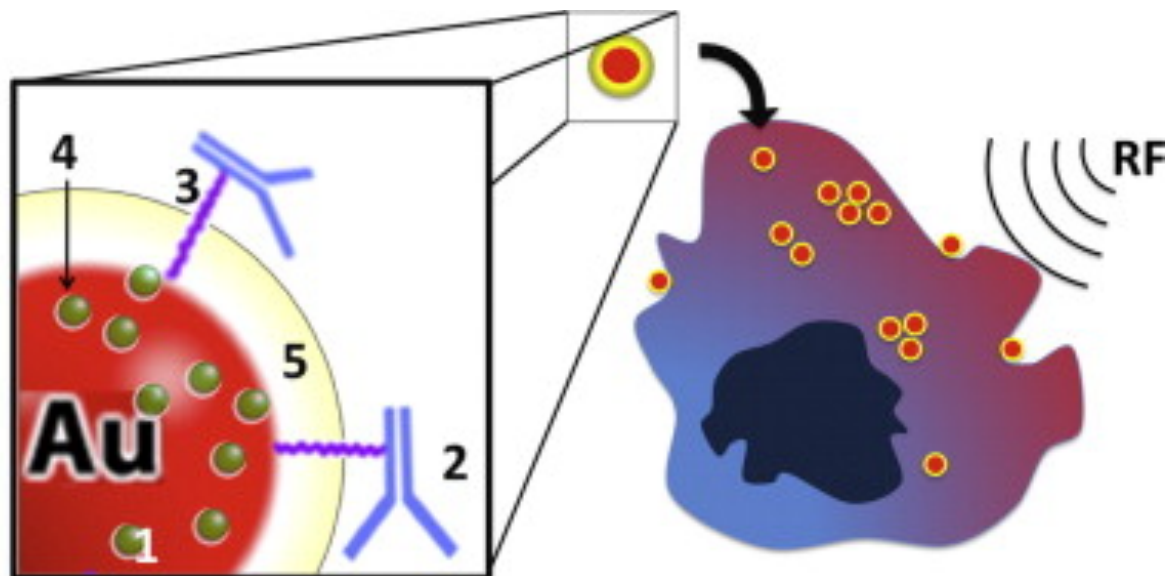








1. Gold nanoparticle
2. Cetuximab (C225)
3. Linker
4. Gemcitabine
5. mPEG



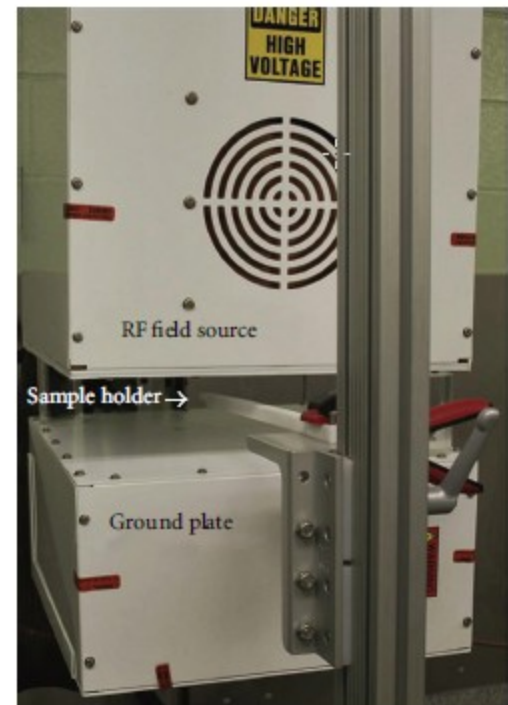
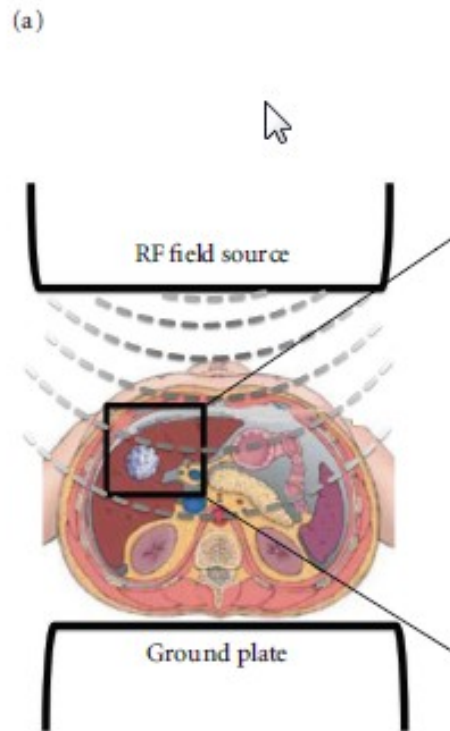
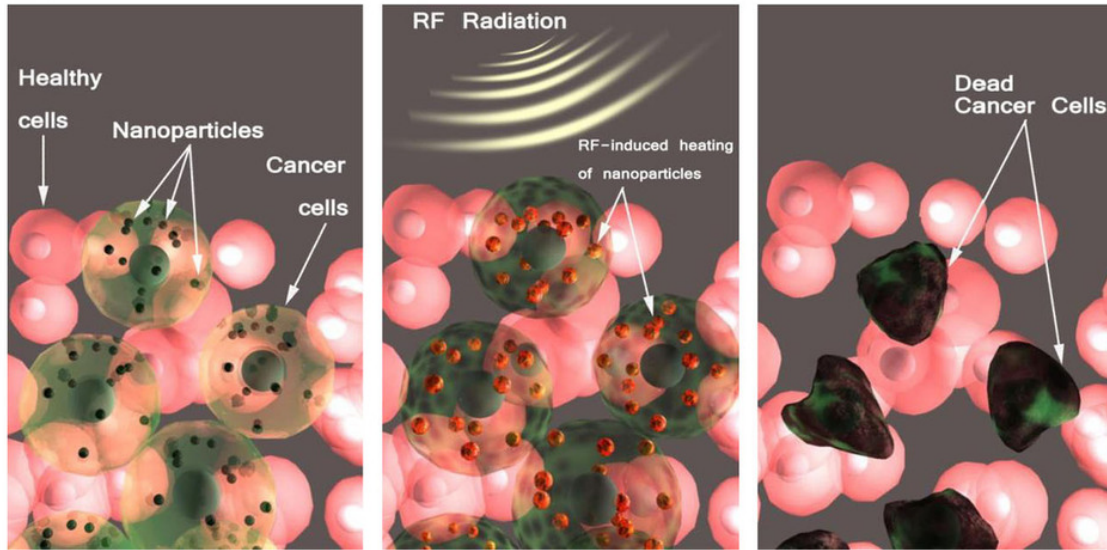
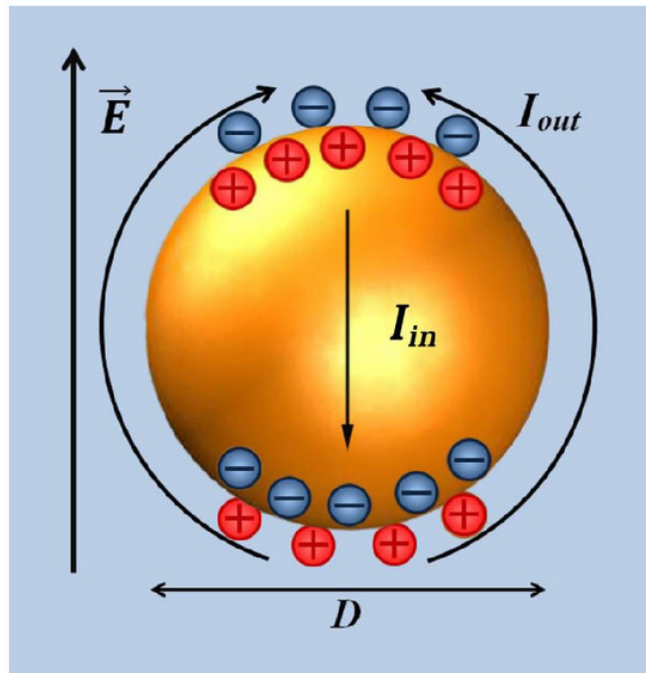


FIGURE 2: Kanzius RF generator: RF field source transmission antenna (Tx head) and ground plate (Reciprocal Rx head) are separated by 10 cm air-gap. Samples are placed 2.5 cm from the Tx head on the Teflon holder.

(a)

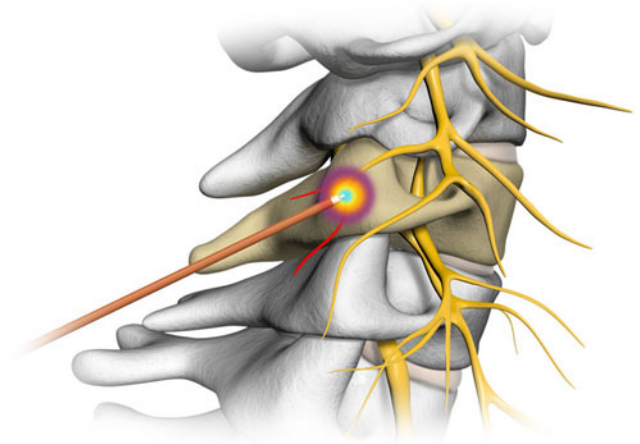


(b)

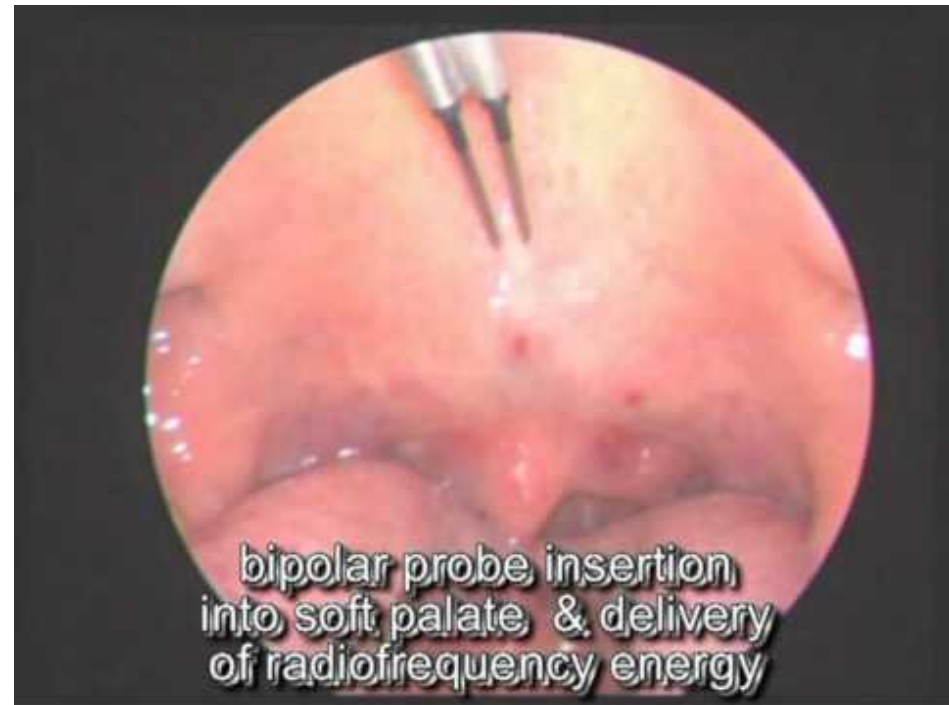
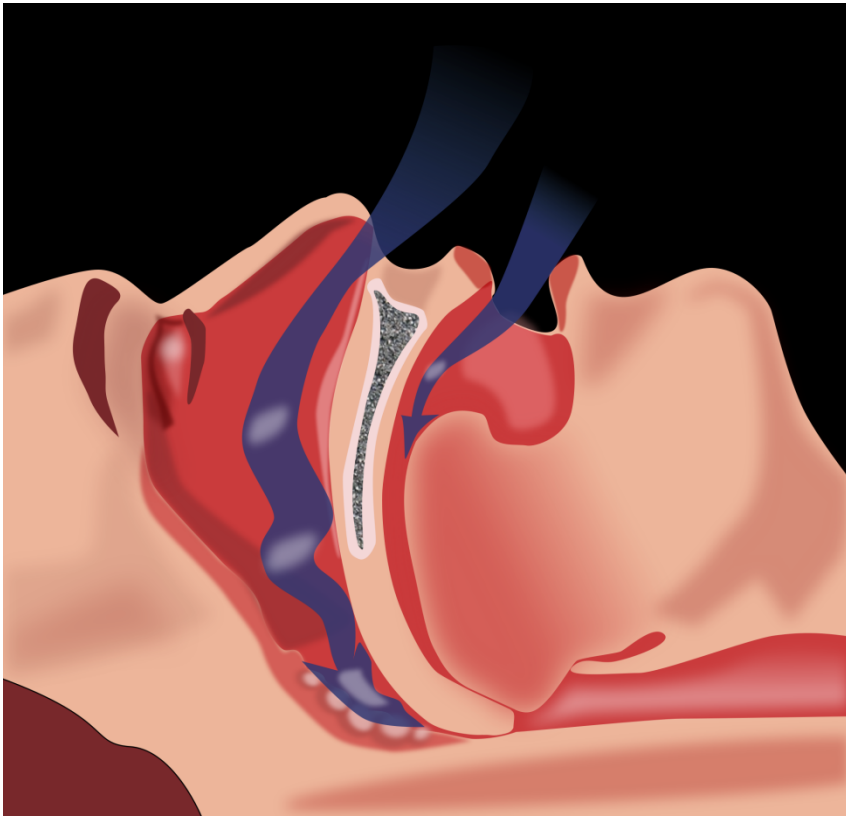


- Inexpensive particles
- Biocompatible
- Radio waves penetrate entire body
- Nanoparticles are small and penetrate abnormal tissue
- Specific tumor targeting
- Thermal injury to healthy tissue

# Radioablation for back Pain



# Snoring





# Plastic Surgery





# RF

- Vision Correction treatment utilizes the controlled release of radiofrequency energy, instead of a laser or scalpel, to reshape the cornea and correct vision in people over age 40. The minimally invasive Treatment takes less than three minutes and is done in-office with only topical (eye drop) anesthesia.
- Enlarged Prostate:
- Transurethral needle ablation of the prostate is a procedure used to treat benign prostatic hypertrophy. RF is transmitted through a needle to the tissue at a precise rate for approximately 4 minutes per lesion, thereby killing cells and reducing tissue size.

# RF

- Tightening Loose Joints: When applied to loose connective tissue surrounding joints, RF energy tightens the collagen and creates a tighter joint
- Other procedures using RF include treatment of varicose veins, back pain, incontinence, as well as dermatology applications such as skin resurfacing

