Thermal (black body) radiation

Convection ?, Conduction ?, **Radiation!**

All material objects that are at non-zero absolute temperature emit electromagnetic radiation

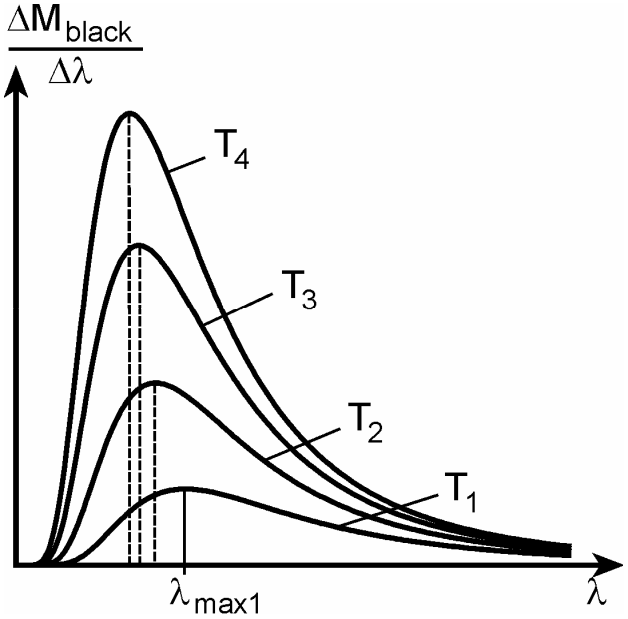
Kirchhoff's law: objects that have intense thermal radiation are also efficient absorbers of the same radiation

$$\frac{M_{\lambda_i}}{\alpha_{\lambda_i}} = \frac{M_{\lambda_j}}{\alpha_{\lambda_j}}$$

where M_λ is the emitted flux density (unit: W/m^2);
α_λ is the absorbtivity ($E_{absorbed}/E_{total}$)

Absolute black body: fully absorbs all incident energies ($\alpha = 1$)
(The human body is 95% black body)

Emission spectrum of thermal radiation at various temperatures



$T_1 < T_2 < T_3 < T_4$

The emission spectrum is continuous with a maximum

Stefan – Boltzmann law:

$$M_{\text{black\_total}}(T) = \sigma T^4$$

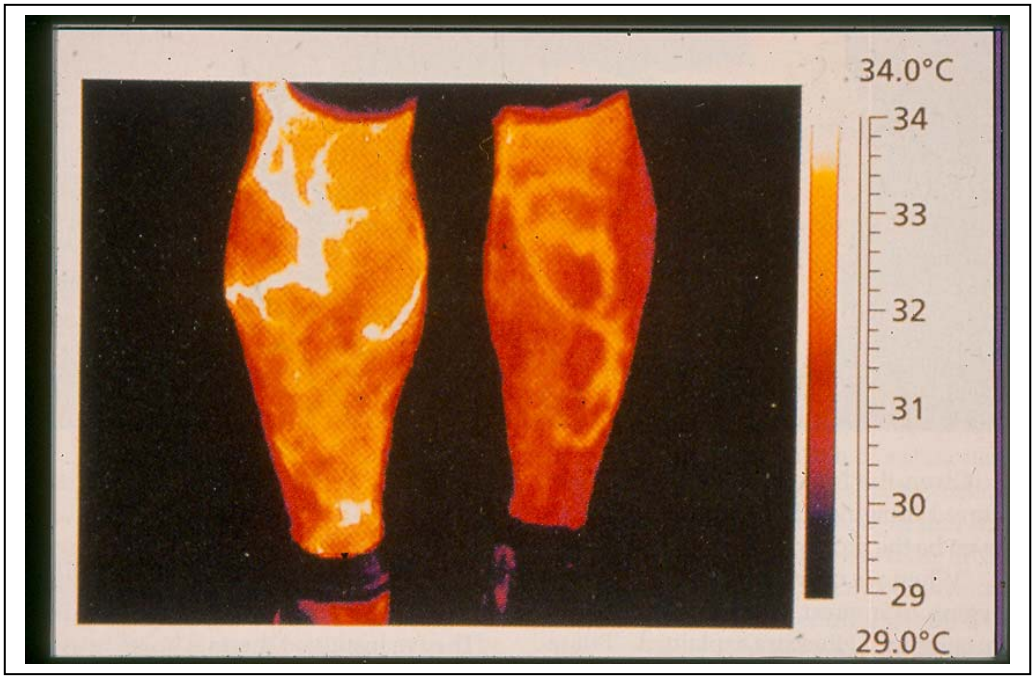
(area below the curve of the emission spectrum)

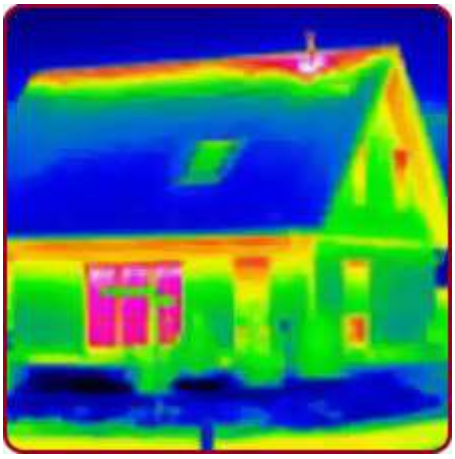
Wien's displacement law

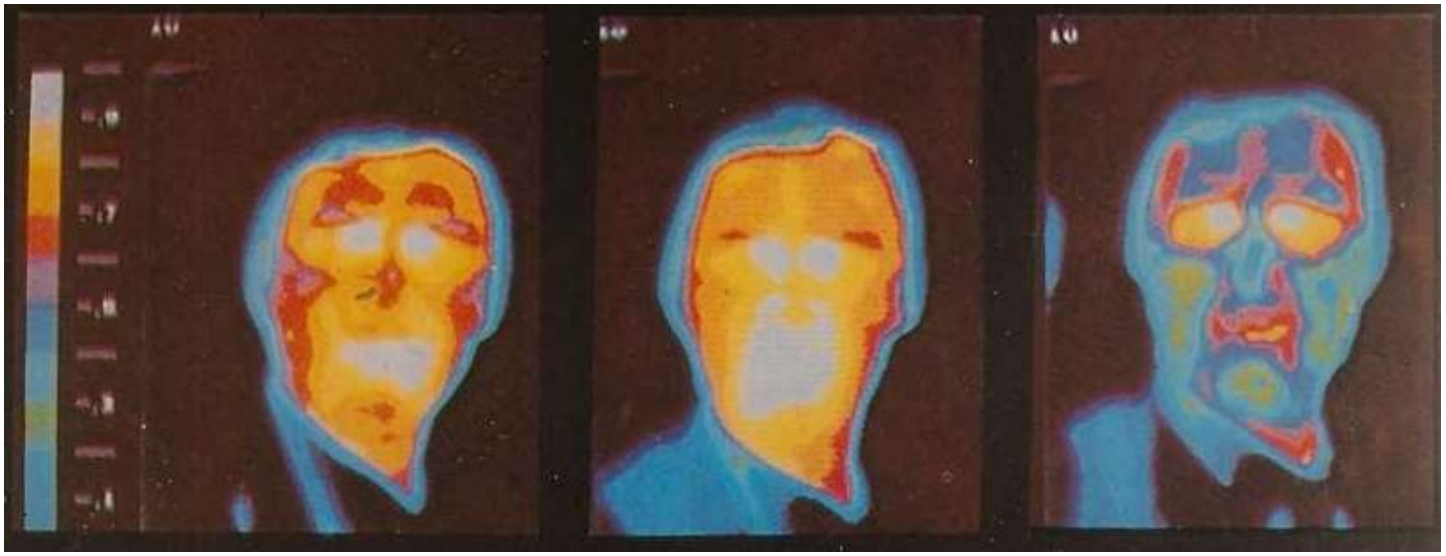
$$\lambda_{\max} T = \text{constant}$$

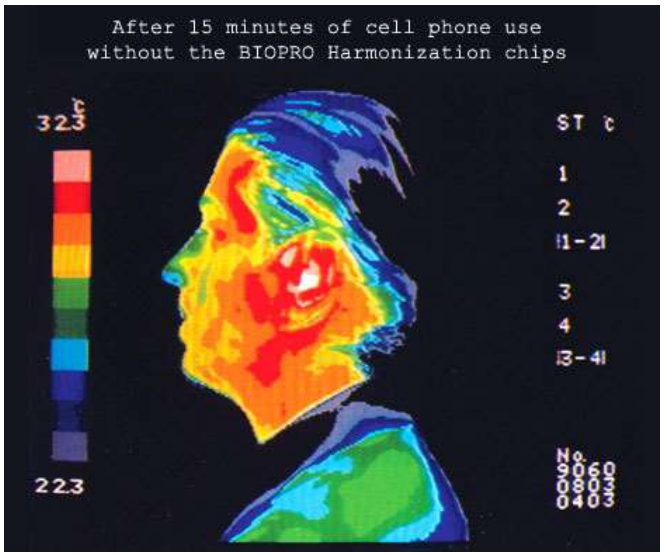
The wavelength of maximum intensity shifts to shorter wavelengths when T is increased

Application in medical diagnostics:
Telethermography
Mapping the intensity of IR radiation emitted by the human body over a given surface by IR camera inflammations, changes in blood circulation, metabolic changes in tumors lead to temperature changes i.e. changes in the intensity of IR radiation








After 15 minutes of cell phone use
without the BIOPRO Harmonization chips
32.3
22.3
ST C
1
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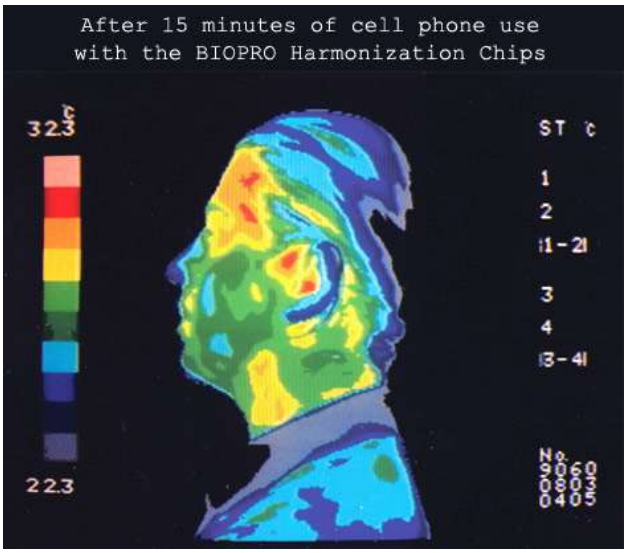
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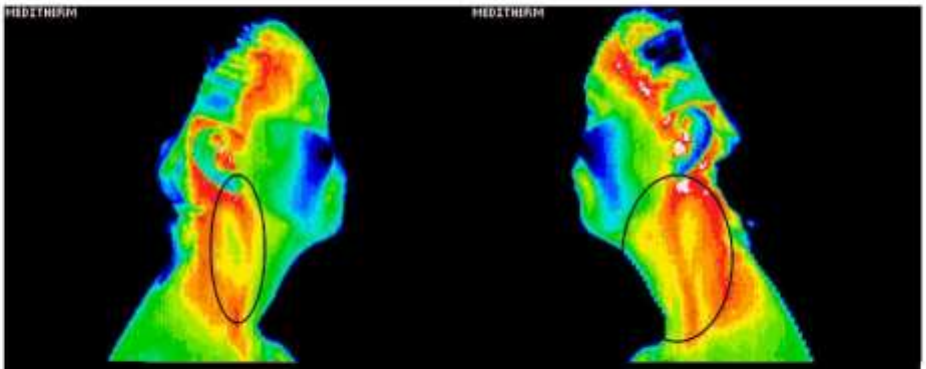
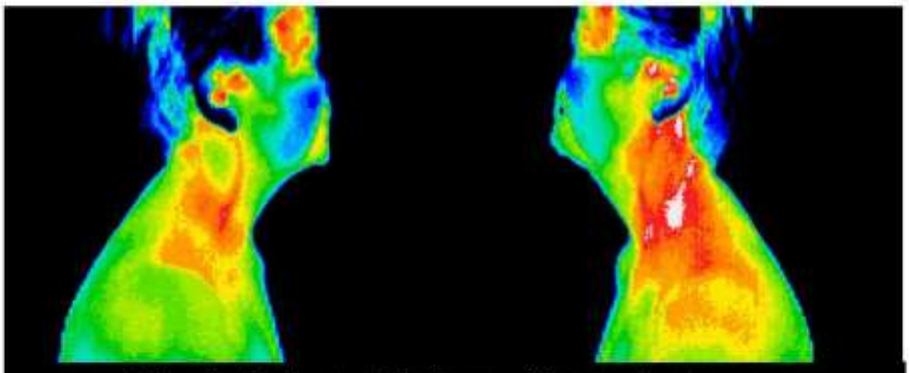
Love Your Heart...
Prevent Heart Disease

Heart disease and strokes are PREVENTABLE, but only if you KNOW before it's too late



Patient with elevated C-Reactive Protein, an early risk indication for heart disease



This patient had severe infection requiring open heart surgery Within 2 weeks of this image

Arterial Inflammation can be an *early* indication of future heart disease. Thermographic screening can be crucial to your health and longevity!