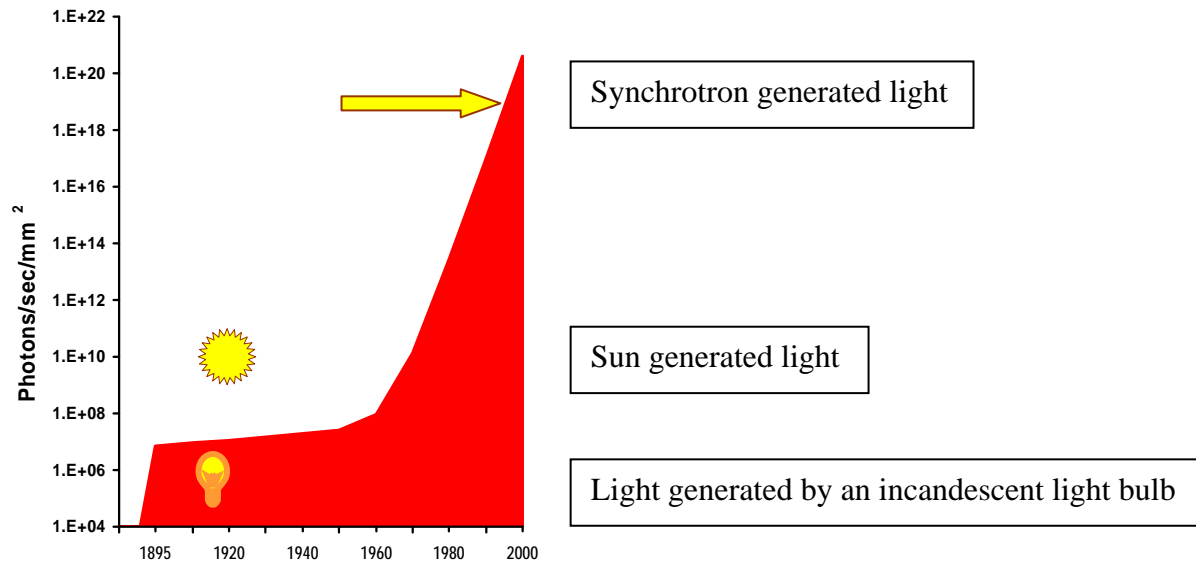


## Synchrotron Light

A synchrotron is certainly not the only way to generate IR, UV, or X-Ray light and so many other techniques can also be used at other types of facilities. There are four general advantages to using synchrotron generated light for these techniques and there are some techniques that can only be successful using synchrotron light.

### Brightness or Flux

If you were to expose a  $1\text{mm}^2$  sample, similar to what a researcher might put under a regular light microscope, to a number of different light sources and measure the amount of energy the matter in that sample interacted with, you would find that the energy generated by a synchrotron using Insertion Devices is considerably higher than what is produced by other light sources. Generally speaking, synchrotron sources of light pack more photons into a smaller beam of light. This offers researchers more information about their sample and a greater variety of techniques to use to learn about their sample.

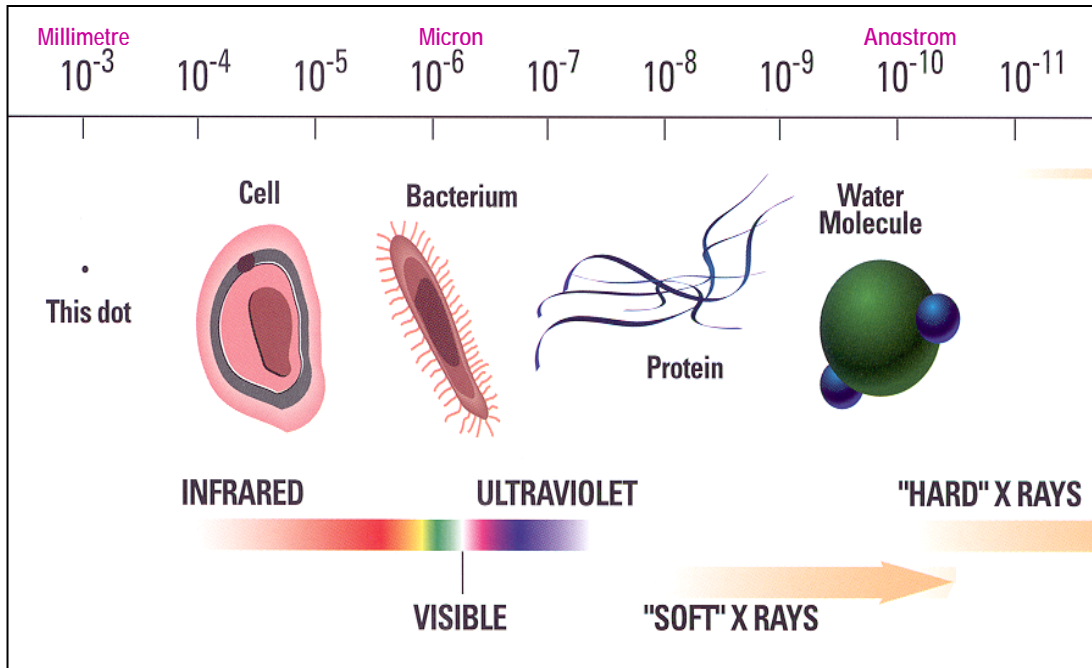


### In situ experiments

Another advantage to some synchrotron techniques is the ability to conduct the experiments in situ, or as they are – without treatment. There are a number of techniques that have been used in research that require the scientist to treat their sample (crush it; make a solution; slice it; etc). While this is also required for some synchrotron techniques, there are also some that allow for the sample to be analyzed without treatment or with less treatment, which can be a significant advantage.

## Tunability or ability to select specific light

By producing high flux light across a significant portion of the spectrum, a synchrotron offers many different techniques to researchers in one building. In order to gather information, the wavelength of the light has to be appropriate for the size of the matter of interest. Shorter wavelengths allow scientists to gather information about smaller things. In addition, each element absorbs energy at a known level. Thus, being able to select a specific wavelength, or range of wavelengths, allows researchers the flexibility to direct their research towards specific questions



## Speed

Due to the extreme brightness of the light, it does not take as long to conduct the same experiment using a synchrotron source of light as it does with a 'table top' source for some techniques.