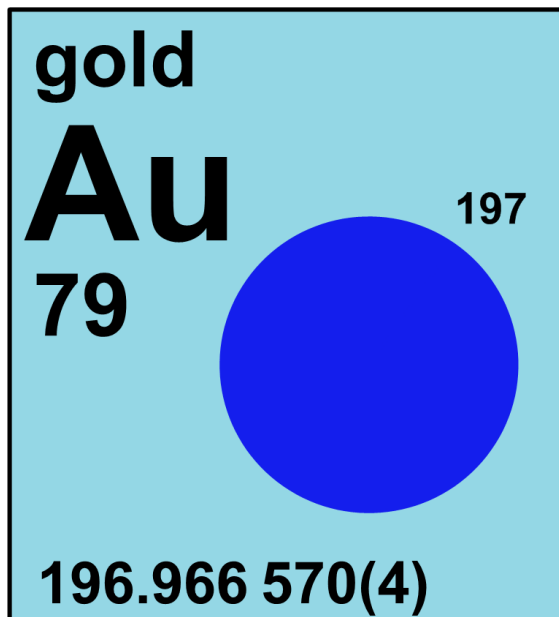


## 4.79 gold

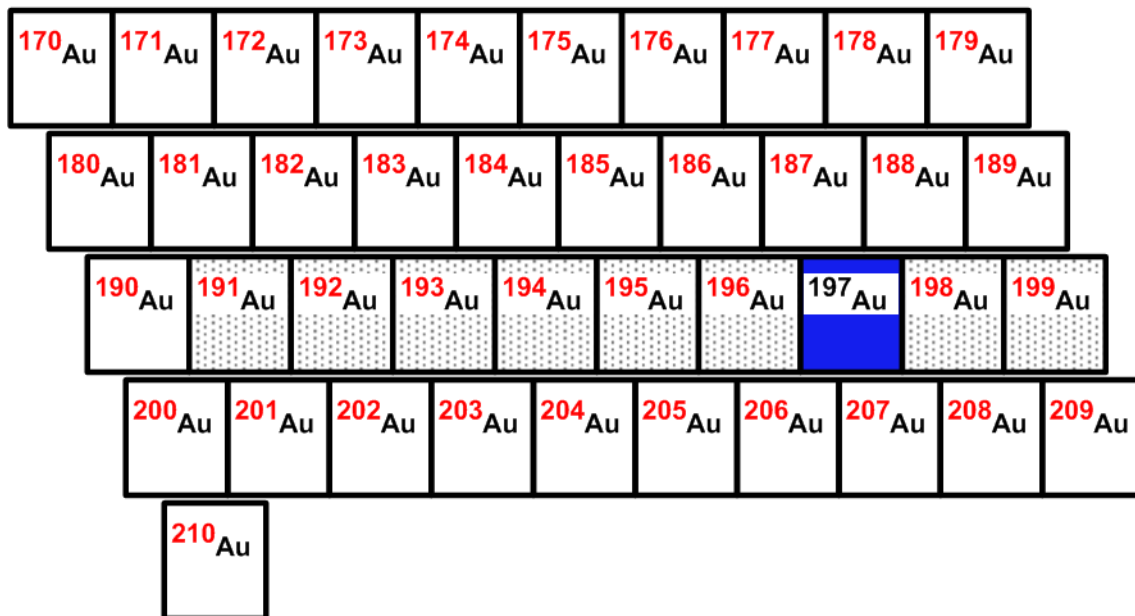


Stable isotope	Relative atomic mass	Mole fraction
$^{197}\text{Au}$	196.966 569	1

## Half-life of radioactive isotope

Less than 1 hour

Between 1 hour and 1 year



## 4.79.1 Gold isotopes in biology

$^{195}\text{Au}$  (with a **half-life** of about 0.51 year) has been used to study particle movement within the lungs of rats [525].  $^{198}\text{Au}$  (with a half-life of 2.7 days) was used in a study to model gold cycling

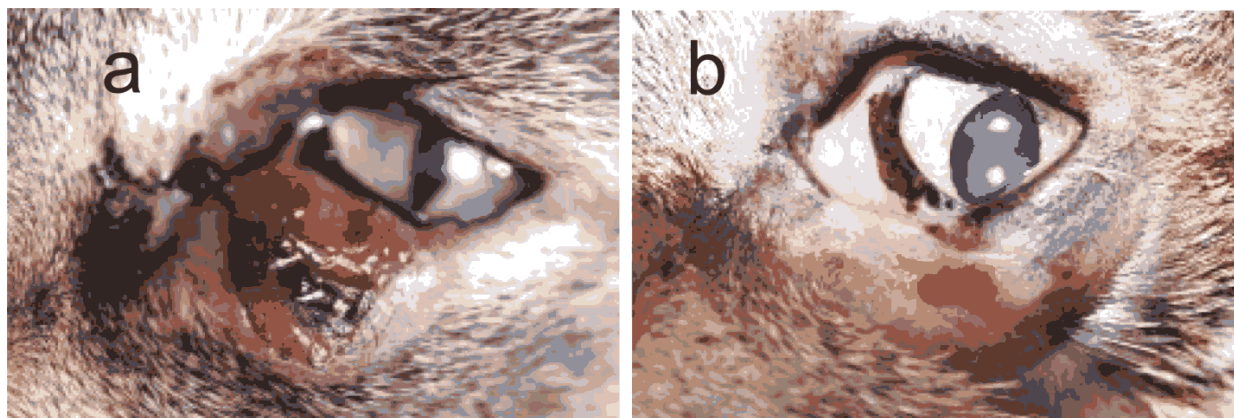
in plants. This study demonstrated that gold particles are retained by humates (organic constituents of soil), which contain fulvic acid, humic acid, ulmic acid, and lignin, and would therefore be likely to accumulate in mull humus or forest litter [526].

#### 4.79.2 Gold isotopes in medicine

$^{198}\text{Au}$  has several medical uses. It has been used as both a diagnostic tool and a treatment option for cancer [527, 528].

- As a diagnostic tool, colloidal  $^{198}\text{Au}$  is injected into the affected organ. Normal cells will take up the gold colloid, but tumor cells will not. Therefore, an abscess will show up as a “cold area” on a scan [528].
- As a treatment option, gold is intended to provide localized irradiation and can be implanted or injected into the affected area. When implanted, the gold “seed” offers an advantage over other materials in that it can be left in place due to its short **half-life** (~65 hr). As a colloidal injection,  $^{198}\text{Au}$  has been found to produce improvement from a wide variety of cancers [527]. Figures 4.79.1a and 4.79.1b, respectively, show squamous cell carcinoma (cancer) on the lower left eyelid of a cat and the eyelid six weeks after implantation of  $^{198}\text{Au}$  seeds [529].

Recent studies have shown the effectiveness of  $^{198}\text{Au}$  nanoparticles and nanodevices in reducing tumor size in mice while minimizing radiation spread to other areas [527, 530, 531].  $^{198}\text{Au}$  has been studied and successfully used as an anti-inflammatory (property of a substance or treatment that reduces the body tissues response to harmful stimuli such as swelling) for improving arthritic conditions [532, 533].



**Fig. 4.79.1:** (a) Squamous cell carcinoma on the lower left eyelid of a cat [529]; (b) the lower left eyelid six weeks after implantation of  $^{198}\text{Au}$  seeds [529]. (Copyright permission will be purchased through Copyright Clearance Center once publication is approved.)