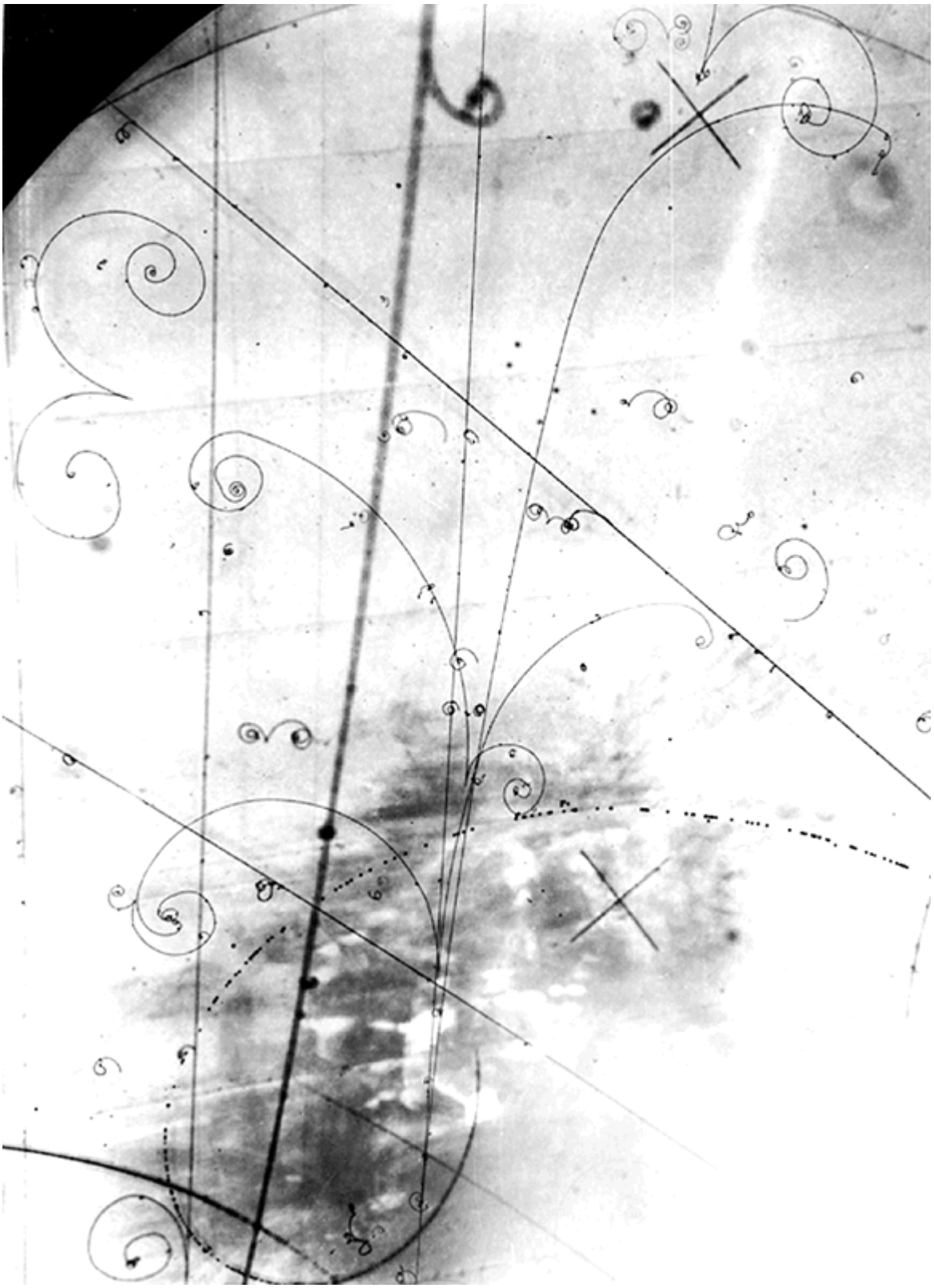
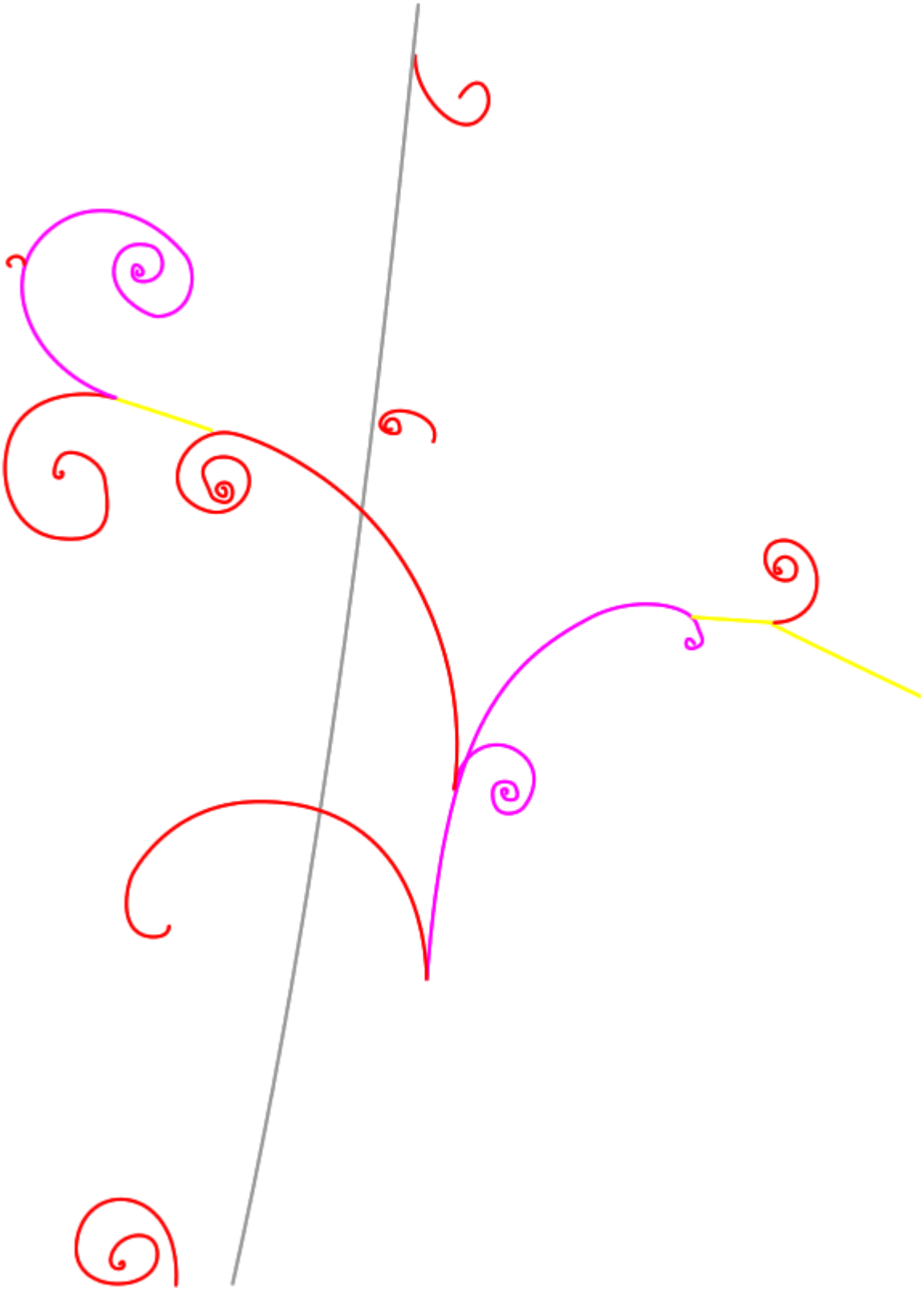
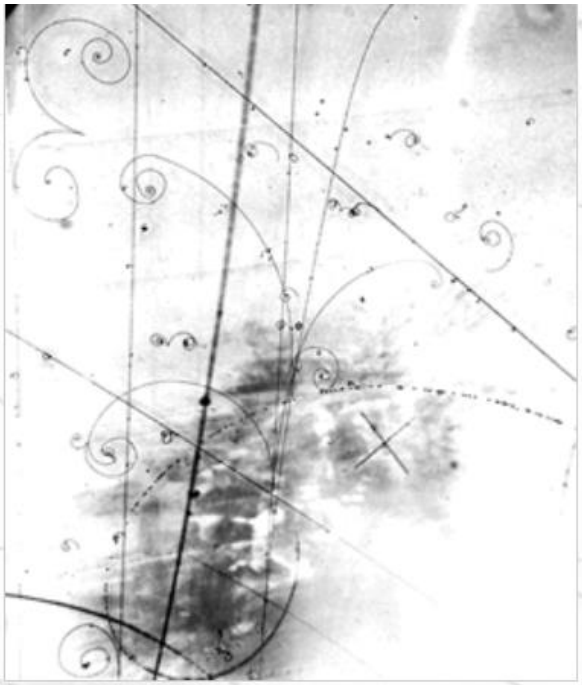
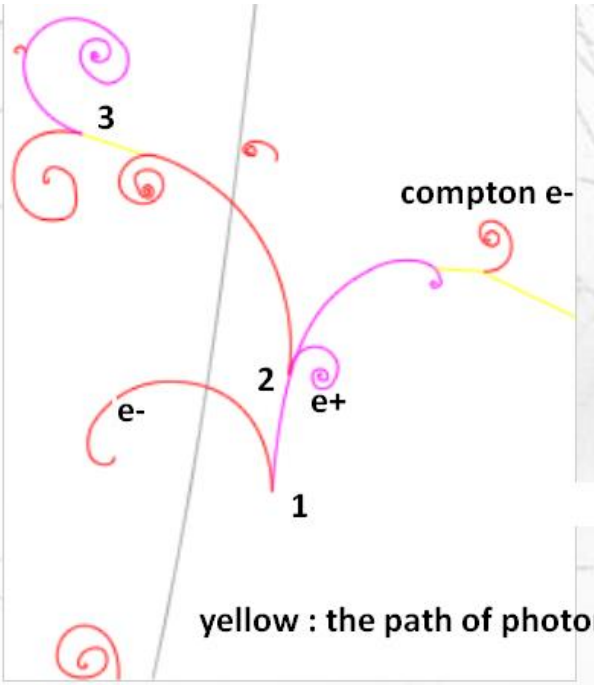
Save from :

https://hst-archive.web.cern.ch/archiv/hst2005/bubble_chambers/bcwebsite/index.htm









Electrons, positrons and photons

The knock-on electron (bottom left) and the lone Compton electrons show that negative particles turn to the left.

There are three linked highlighted examples of high energy photons materialising into **e- e+** pairs in the field of a nucleus. In the order in which it have happened:

1. the first photon materialises (nearest the bottom of the picture);
2. the second is most likely a bremsstrahlung photon from the **e+** of the first **e- e+** pair;
   - the Compton electron (on the right of the picture) is caused by a bremsstrahlung photon from the **e+** of the second **e- e+** pair;
3. the third **e- e+** pair (on the left of the picture) is caused by a bremsstrahlung photon from the **e-** of the second **e- e+** pair.

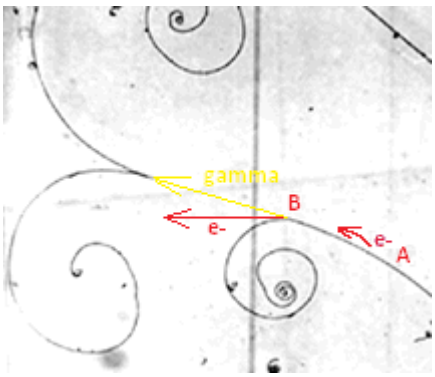
The thick track coming in from the top of the picture (one can tell which way it is going by noticing the knock-on electron) is a cosmic ray, probably a muon. This is a reminder of the link between cosmology and particle physics.

Exercise:

Can you find another clear example of a bremsstrahlung photon materializing into an **e- e+** pair? (Often referred to as *pair-production*.) **see the historical image, extreme top of it**

If you look at the location of the gamma n°2, it's in the same position (almost) as the positon (point 2 is on the track of the positon). Same for the location 3, the gamma is emitted at at very narrow angle from the electron.

To understand, here is a focus of the location 3:



At point A, the electron travel in matter, then at B it encounter a nucleus and lose a great amount of energy by Bremsstrahlung. This produce a gamma which the direction is in yellow. If we take a picture of the direction of the electron at this event, it would be the horizontal red arrow. We see that the angle between the gamma produced and the initial electron is narrow (few degrees). After B the electron had lose a great energy (kinetic energy) so make more and more curvature by the magnetic field (it still emit gamma in this décélération)

https://www.cloudylabs.fr/wp/lorentz/