



Radioactivity in Museums

Helena Janžekovič

Milko J. Križman

Slovenian Nuclear Safety Administration





- Introduction
- Inspection practice
- Regulatory control
- Conclusions



Introduction



- A use of ionising radiation started in 1895.
- As a rule radioactive items in museums origin from the period before 1970.
- The knowledge related to ionising radiation is different today than in the past, e.g. around 7000 years of reactor operational years exist.

W.C. Roentgen
(1895)

H. Becquerel
(1896)



ICRP



1895

1928

1954

1957

EURATOM, IAEA

SNSA

Time (years)

ICRP 2007



Introduction



- Sources identified today.



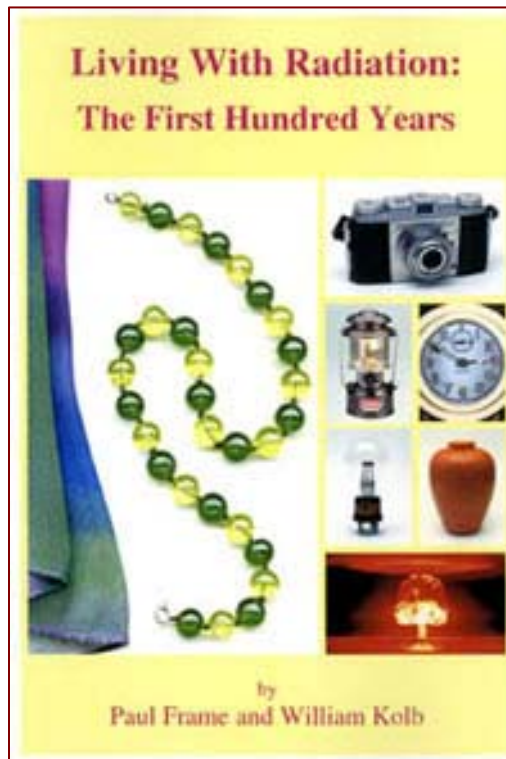
Photos SNSA.



Introduction



- A list of regulated i.e. controlled sources strongly depends on time.



<http://medcom.com/consumer.htm> (2007)



Introduction



- In 1898 Marie and Pierre Curie discovered Ra and Po.
- The Curie Museum, Paris, preserves Marie Curie's office and her personal laboratory. Two historic rooms are shown as they were in Marie Curie's time.



H. Janžekovič (Paris, 2009)



Introduction



- The decontamination of the facility took place.
- Some items in the museum are still radioactive e.g. paper, uranium sample.
- The instrument on a right picture indicate a dose rate of about 0.3 micro Sv/h.



H. Janžekovič (Paris, 2009)



Introduction



- A part of the museum presents of all kinds of radioactive items which were in a use in the period of Marie and Pierre Curie.
- At that time radiation safety did not use standards known today.



H. Janžekovič (Paris, 2009)



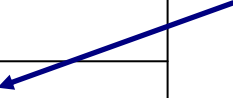
Inspection practice



- The Slovenian Nuclear Safety Administration (SNSA) performed in the period 2004-2010 a campaign related to sources which were not under a control in the past.
- A special challenge was identifying items which were usually not regarded as radioactive sources i.e. “unconventional sources”.
- Four types of institutions using such sources were identified.
 - research institutions
 - educational institutions
 - civil protection and defence institutions
 - museum collections.



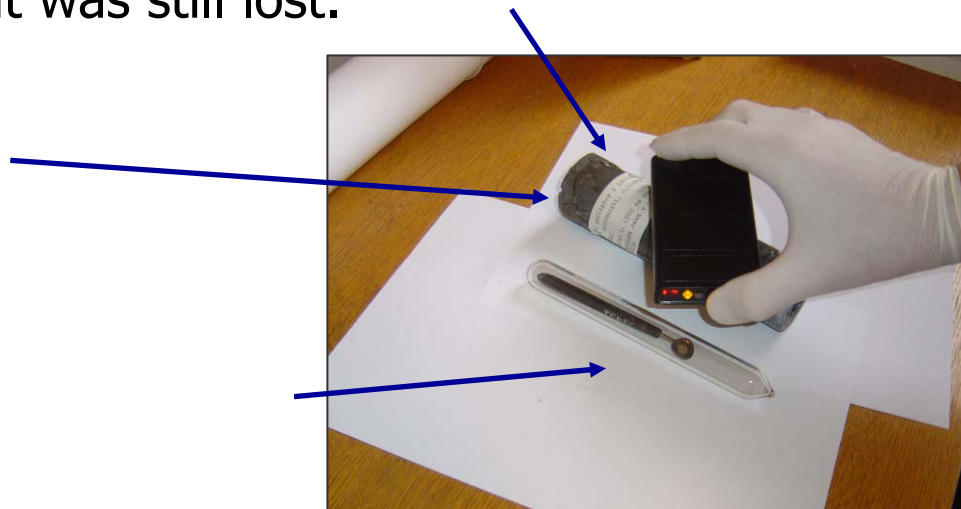
Type of an Institution	No. of Inspections
Research	42
Educational institutions	21
Civil protection and defence institutions	19
Museum collections	8





Case 1

- The first source used in Slovenia was found in 2007 at the *Institute of the history of medicine*.
- It was produced 1902 and contains Ra-226 of 0.15 MBq (4 micro Ci). All data were available at the time of its finding e.g. a first user was dr. E. Böck from Ljubljana.
- Decades ago the source was stored with many safety precautions but it was still lost.





Case 2

- Sources found at military institutions which were used in the past containing Ra-226.





Case 3

- *Air and Space Museum, Washington DC, USA (2009)*



H. Janžekovič (Washington DC, 2009)



Case 4

- Sources found at the military institutions which were used in the past containing Th-232 or Ra-226.





Case 5

- Museum items in the *Park of Military History* in Slovenia (2009)

http://www.prekrizane-meje.eu/eng/park_of_military_history/





Case 6

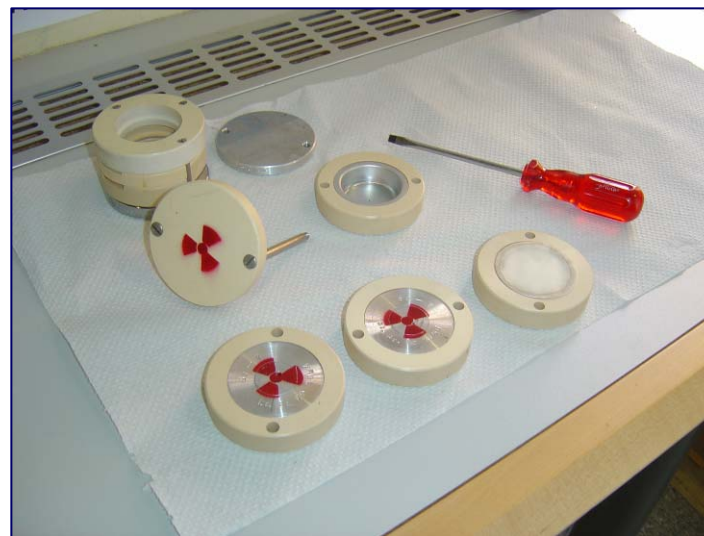
- Old equipment used in the airplanes and exhibited as a part of the museum collection.





Case 7

- Old equipment for measuring contamination produced at an nuclear institute and for decades stored at one of the faculties.





Case 8

- Old equipment for measuring dose rate produced in a factory and for decades stored at different locations operated by different operators e.g. rescue teams.





Case 9

- A use of H-3 was very common when constructing old instruments. Activity levels are above exemption levels.





Case 10

- *Naturhistorische Museum* in Vienna had a very high dose rate in the showrooms with a the mineral collection, e.g. above 36 micro Sv/h in 2009 and has already rearranged the collection of minerals. In addition, radon should not be neglected.



H. Janžekovič (Vienna, 2009)



Case 11

- Some fossil samples can be radioactive e.g. petrified wood or a mastodon tusk with a high dose rate at the contact shown on a picture. The analysis is still taking place.





Case 12

- Glasses or decorative items which are radioactive can be found in the museums.



Inspection practice



- A specific issue are items which were sources in the past and are today not used at all.
- A photo is showing old equipments which were ionising sources and were for years stored at the remote area.



Regulatory control



- As a rule countries do not focus on unregulated radioactive items from the past.
- The nuclear legacy is still a big issue in many countries e.g. nuclear legacy exists at Andreev bay, Russia.
- When a source is not controlled from its cradle to its grave it is very difficult to establish a control over it.
- Few approaches regarding the items in collections were identified.
 - The control of such items is disregarded.
 - The control of such items is excluded from the regulations.
 - The control of such items is excluded from the regulations if the sources are of "natural origin" using the definitions from the BSS.
 - A control is taken on a case by case basis.
 - The control of such items is fully controlled.





- In all cases the regulatory authority establishing a control over sources could be confronted with:
 - overlooking high dose rates well above natural background e.g. a collection of minerals in an office can cause a very high dose rate, or overlooking the contamination and radon issues.
 - overregulation especially if unrealistic models when assessing doses to the workers and to the population are taken into account.
- Private collectors should be controlled as appropriate.
- An example how to tackle a problem: In 2010 the SNSA prepared a lecture for personnel of the Slovenian museums.

Conclusions



- The museum items which are at the same time ionising sources require a specific attention because they are handled by persons not as a rule trained to work with sources.
- The museum collections are very often related to a very close contact with a general public, students, private collections etc. so that very high radiation safety standards are necessary.
- A regime of a control requires a careful study of sources, handling as well as storing in showcases or in museum storages.

