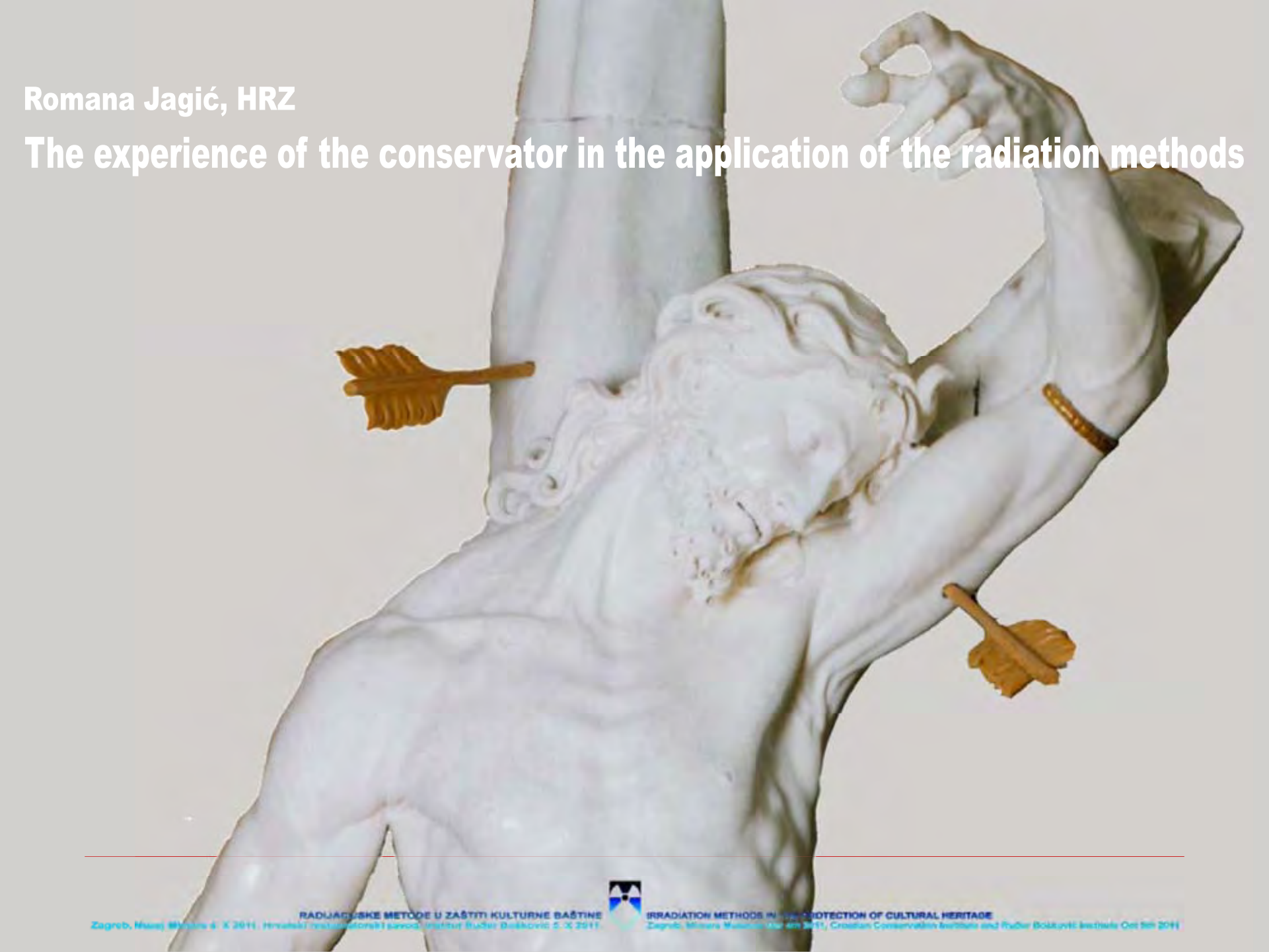
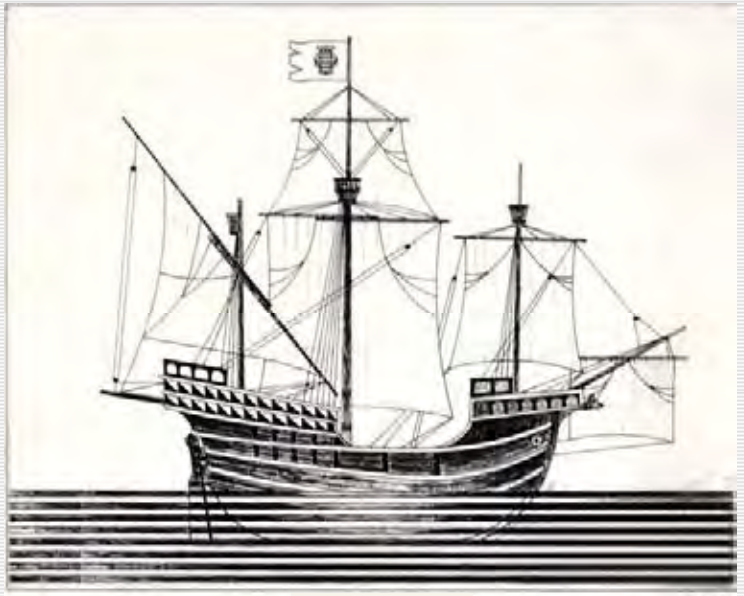
Romana Jagić, HRZ

The experience of the conservator in the application of the radiation methods



Protection of wood is probably as old as the use of the wood itself. Some methods of protection of ships and bridges made of wood dates back to the earliest recorded history.

- *"So make yourself an ark of cypress wood; make rooms in it and coat it with pitch inside and out "* [1]
- In ancient Greece at the time of Alexander the Great lumber for bridges was soaked in olive oil.
- *"...to protect a wood against woodworm soak it in a blend of pepper, garlic, mustard seeds and salt ...* [2]
- The importance of the wood protection was great, so on the Croatian coast and islands is often that name of the bay or a village emerged from the word "paklina" (meaning. pitch, tar) for places where it was collected or prepared for ships. For example: The bay and place named Pakljena on the island Sipan, where medieval shipbuilding was well developed.



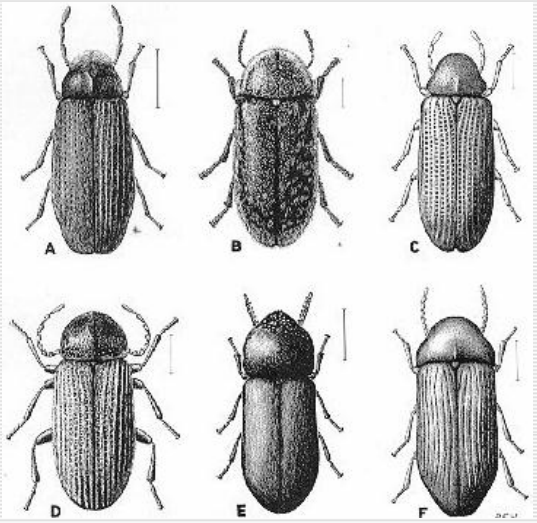
Karaka

[1] Genesis, 6:13-14 New International Version (©1984)

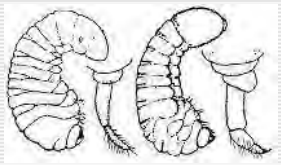
[2] František Petr, Umělecké dřevořezy a jejich restaurování, Státní nakladatelství krásné literatury, hudby a umění, Praha, 1953

Experience shows that some types of wood without artificial chemical protection resist wood worm attacks. Those are hard and dense, resin-rich wood species.

In the art the most common is Anobium punctatum (furniture beetle) - adult worms and larvae of this insect live in an old, dry wood below the surface. After a long period they can destroyed the wood to such an extent that it is porous as a sieve. Sometimes it is just gesso and layers of color which hold in one piece.



Furniture beetle[1]



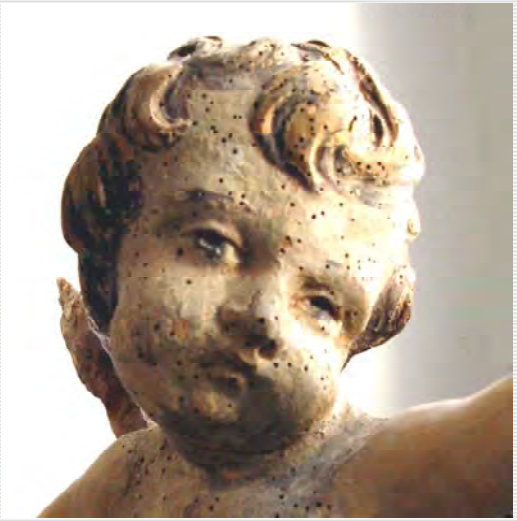

Šipan, Paklena, Church of the Assumption, detail of the lunettes of the main altar destroyed by a woodworms.

[1] Urban entomology (Ebeling Chapt.5 part2) Wood-destoying insects and Fungi http://entomology.ucr.edu/ebeling

The wood of the birch, linden, beech and poplar are not resistant to woodworms, and many of the sculptures are carved, as most of the altar in this region, in a soft and supple linden wood.

- A specific problem are constructions of altars because they consist several connected wood species; one type of wood is used for the structure of the altar, the other for carved decorative elements, and, quite often, the third, for carving statues.

- Detection of pests in wood - visible active woodworms
- Holes



- Dust
- Insects

- The back of the altar 7.5 meters width, attacked by insects from the family of technical pest, urgent desinsection required.

Options: There are different methods and each can be a solution for a specific object of art

- Pheromone traps
- Temperature - the heat and freezing (dry freezing)
- Fumigation with carbon dioxide
- Argon (Practice: argon and methyl bromide)
- Methyl bromide (The Montreal Protocol of the UN in 1992 prohibit the use and production. Until 2015 it can be used only in some countries)
- Sulforyl fluorid “Vikane®” – in Croatia has not tried yet, due to import barriers.
- Nitrogen – chamber in use in Restoration Centre of the Croatian Conservation Institute in Ludbreg
- **Gamma radiation**

Options: treatment of the infected wood with chemicals

- Only treatments by liquids are curative and preventive in a same time (questionable durability of protection and unquestionable health hazard)

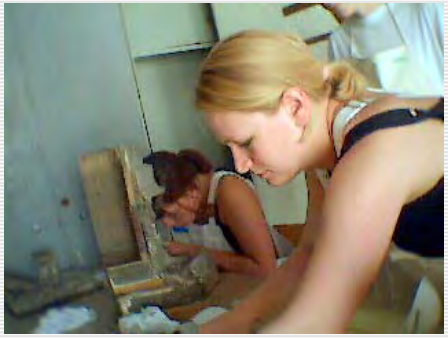
- Chemicals and fumigation / combined. After fumigation the chemical protection is applied. In practice, still the most used treatment of large monuments is cost-effective gas fumigation.

Beginning of cooperation with the Ruđer Bošković Institute was in 1991/1992

- The fall of 1991: the cultural monuments were destroyed.

The consequences of the devastation after four years: overgrown of microbial populations on the remains of the altars, Kamensko

Kamensko, parts of the altar of Sv. Cross



- Remains of burnt altar of Sts. Cross were collected in several occasions, fixed, packed in cardboard boxes and foil and transported to radiation desinfestation to the Ruder Boskovic Institute by dose required for such material.

- The parts had irradiated and they were further transported to the workshops. The great advantage of irradiation is that objects undergo disinfestation without unwinding on their way to the workshop.

Kamensko, remains of the altar of St. Cross after radiation and drying out

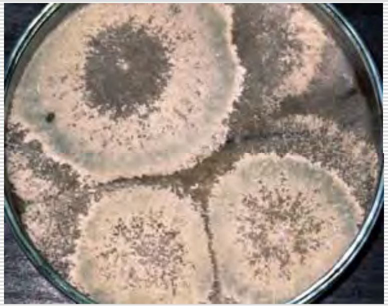
- Kamensko, the reconstruction of construction and altar after the works

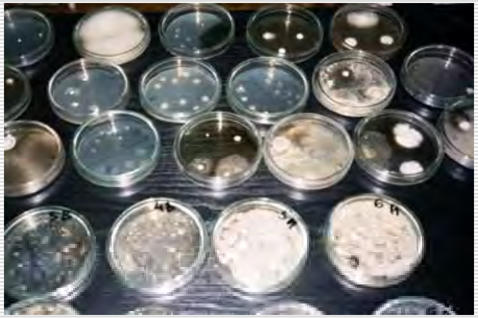
Moulds - a potential health hazard

- "Considering that the area of microbial destruction in restoration activities has not been systematically scientifically studied, at this point no one can say for sure that there is no danger for the art and objects / or the health for people handling them, because the mold can be pathogenic." [1]

- "Many contacts of reckless curious people with infested artworks, and even more unprotected people that do not respect the necessary protection, while dealing with contaminated art can lead to undesirable acute or chronic asthma, can damage the immune system (immunosuppression), mycetoma skin dermatitis, ear infections, digestive disorders, glioma, brain tumor or heart problems." [2]

1, 2) Stjepan Pepeljnjak, *Plijesni - potencijalna opasnost po zdravlje restauratora*]ERUQLN UDGRYD 0LNURELRORãND GHWUXKFLMD VSRPHQLND NXOWXUH =DJUHE 0X]HM 0LPDUD WDYQMD www.h-r-z.hr – aktivnosti - stručni skupovi - 0LNURELRORãND GHWUXKFLMD VSRPHQLND NXOWXUH
-]ERUQLNBUDGRYDBPLNURELRORBNDBGHWUXKFLMDBVSRPHQLNDBNXOWXUHBBKU]BVHPLQDUB





Photos of microbial populations from polychrome altar:www.h-r-z.hr 6HPLQDU ,55$' ,$7,21 0(7+2'6 ,1 &8/785$/ +(5,7$*(352 7(&7,21 =DJUHE
4._a_survey_of_the_microbiological_activity_on_samples_of_polichromed_wood 0E

Radiation provides opportunities for one-time treatment for various pests on different painted objects

3DLQWHG FRIILQV IURP FUL SWLQ 3RåHJD

Radiation - options for treatment of objects made of composite materials. It is advisable to dismantle the bone material, horns, precious stones, mother of pearl, and all kinds of glass (glass gets darken*)

*In case of accidental exposure the glass (eg Broken pieces on the right) it can became clear again. The process is reversible by heating the glass.

Limitations: difficult access to the chamber with a larger artwork, eg. Sv. Sebastian, Virovitica, 2.7 m in height, complicated entry into the chamber - 1 pack

Cooperation with the Institute Ruder Boskovic started in the year 1991/1992. , the more serious cooperation from 94/95.
The IRB made possible that evacuated Artobjects pass disinsection immediately upon arrival and before entering the restoration workshop or depot. From 2001. the more detailed record of the entry of works of art to gamma radiation.

2001th year end, only one packet
2002nd - 17 Pack
2003rd - 14 Pack
2004th - 21 Pack
2005th - 16 packages
2006th - 25 Pack
2007th - 25 Pack
2008th - 11 Pack
2009th - 11 Pack
2010th - 13 Pack
2011th - 5 Pack

From experience, practice is to radiate most of the artwork at a distance 3 m from the source for 24 hours with a dose of 2 kGy. An average of 1.5 m^3 volume has been radiated. The chamber can accommodate a maximum of 6 m^3 of art objects at once, but that requires a longer stay in the chamber (the practice is that the IRB radiates 1.5 m^3 of material with a 24-hour stay in the chamber).

Expectations of further development in the areas of:

- *Examining the effects of radiation on the techniques of old masters*
- *Cooperation on the possibilities of consolidation of completely destroyed wood*
- *Further successful cooperation in the disinfection (and if necessary, disinfection)*