

Integration of Radiological Protection of the Environment in to the System of Radiological Protection

**ICRP & Alliance, Integrated Protection of People and
the Environment**

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Radiological Protection of the Environment: History & Development

○ Origin and philosophy



○ Guidance and tools



○ The future





ICRP 91 (2003): A framework for assessing the impact of ionising radiation on non-human species

Reviewed ethics and principles

Recommended the system should

- *focus on biota;*
- *consider **adequate protection** by understanding effects;*
- *identify Reference Animals and Plants (RAPs); and*
- *let RAPs guide*
 - *exposure scenarios,*
 - *effects data*
 - *dose rates benchmarks*





ICRP103: Recommendations of the ICRP














(30)aim is...preventing and reducing the frequency of deleterious radiation effects to a level where they would have negligible impact on the maintenance of **biological diversity**, the **conservation of species**, or the health and status of **natural habitats, communities** and **ecosystems**.

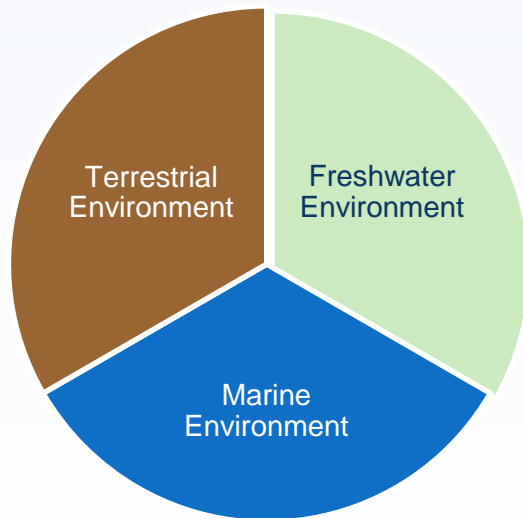
(366)Reference Animals and Plants.....





ICRP 108: Environmental Protection: the Concept and Use of Reference Animals and Plants

WILDLIFE GROUP		RAP
Large terrestrial mammals		Deer
Small terrestrial mammals		Rat
Aquatic birds		Duck
Amphibians	 	Frog
Freshwater pelagic fish		Trout
Marine fish		Flatfish
Terrestrial insects		Bee
Marine crustaceans		Crab
Terrestrial annelids		Earthworm
Large terrestrial plants		Pine tree
Small terrestrial plants		Wild grass
Seaweeds		Brown seaweed





ICRP 108 (2008) Evolution of Parallel Protection Pathways

Planned, emergency, and existing exposure situations

Environmental radionuclide concentrations

Reference Male & Female,
Representative Person

Reference Animals and
Plants

Dose limits, constraints
and reference levels

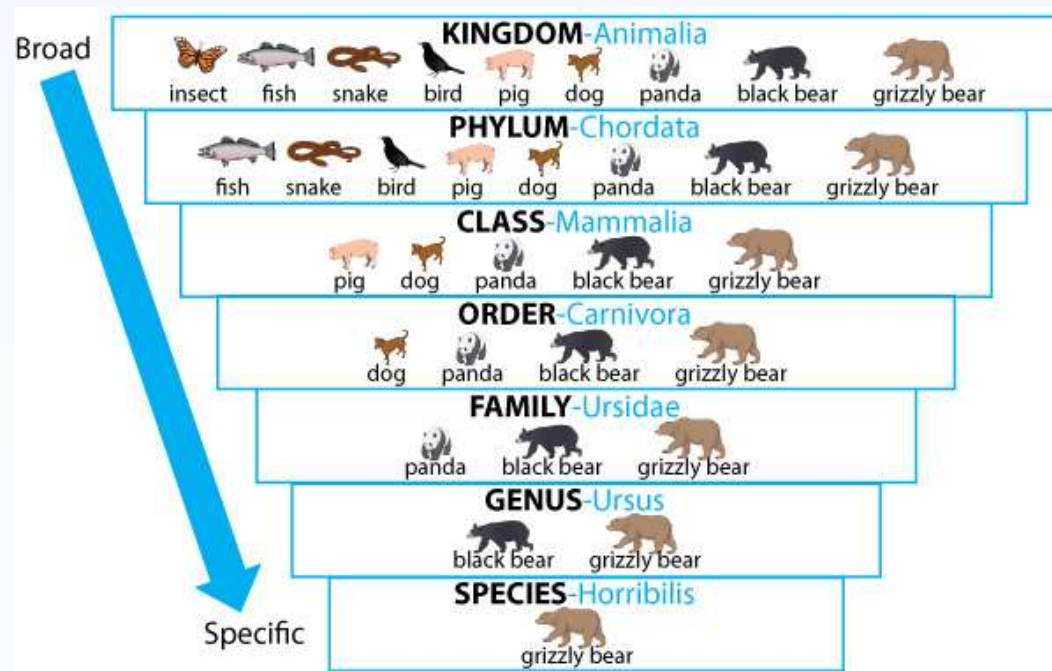
Derived Consideration
Reference Levels

Decisions regarding protection of public health and the environment for the same exposure situation by way of representative individuals and representative organisms



ICRP 108: Review of biological characteristics of RAPS

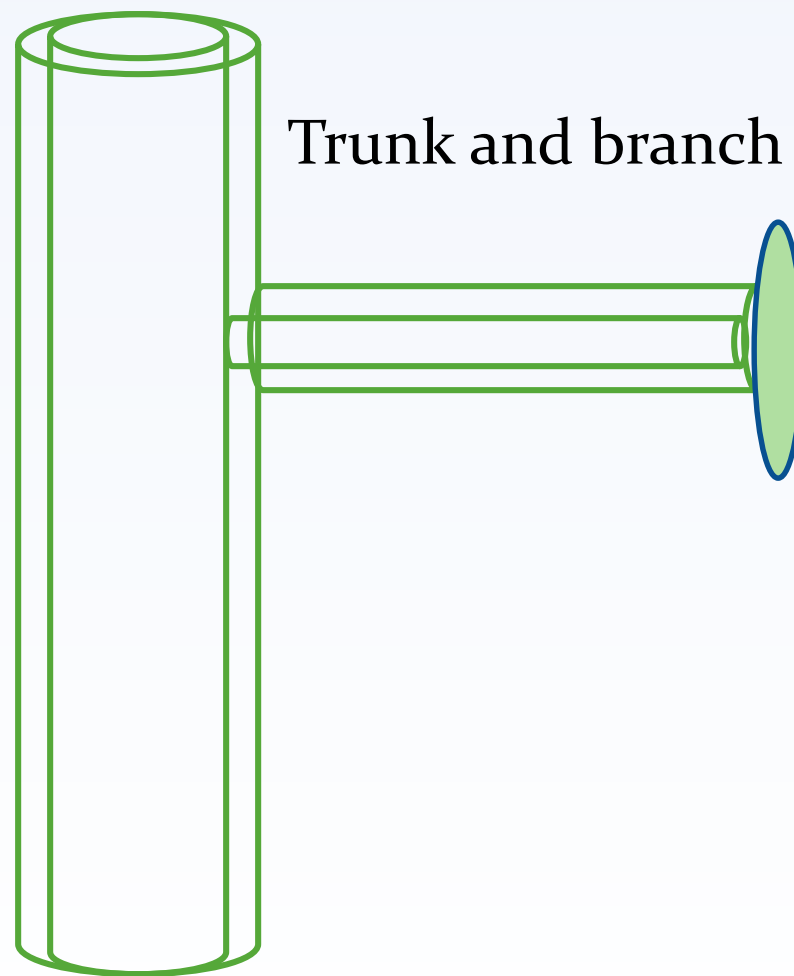
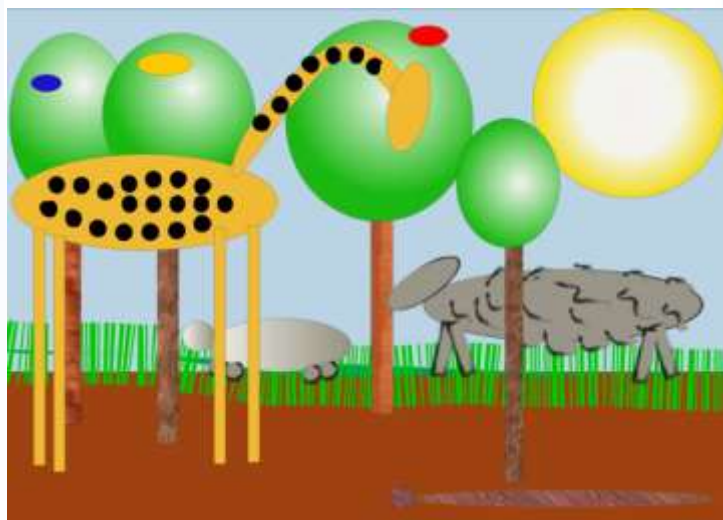
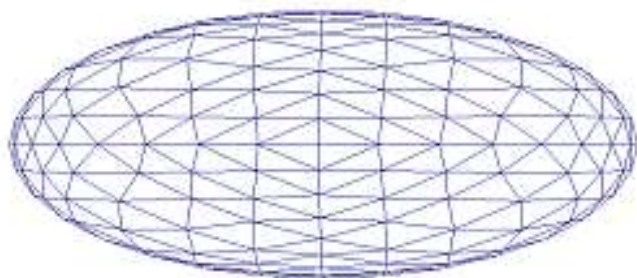
- *Occurrence*
- *Taxonomy*
- *Life cycle and life span*
- *Reproductive strategy*
- *Physiology*
- *Ecology*
- *.....other factors.....*





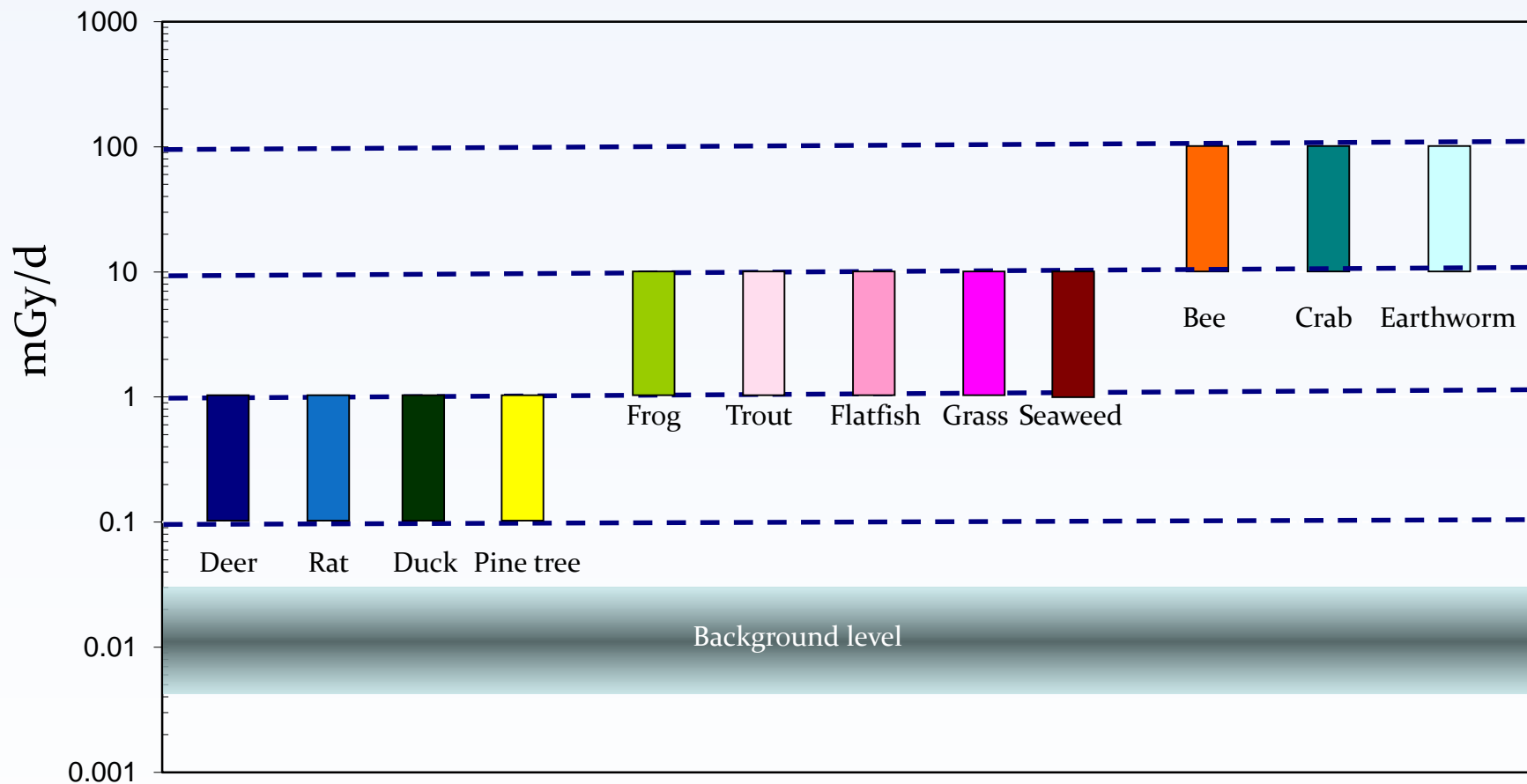
ICRP 108: Dosimetry of RAPS

DCCs for simple geometries





ICRP 108: Derived Consideration Reference Levels (DCRLs)

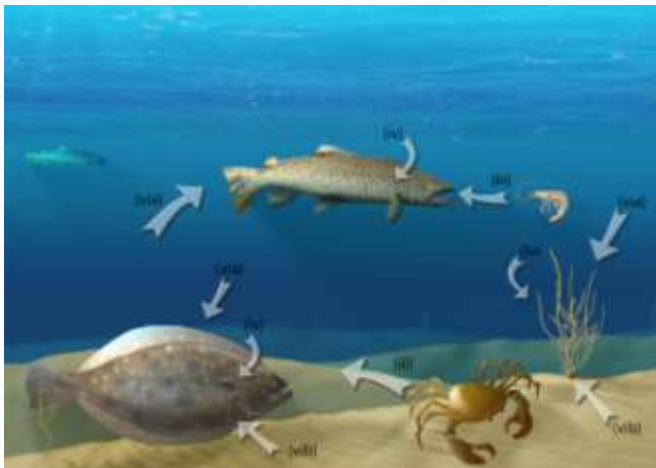




ICRP 114: Environmental Protection: Transfer Parameters for Reference Animals and Plants

Concentration ratios for 39 elements and 12 RAPs

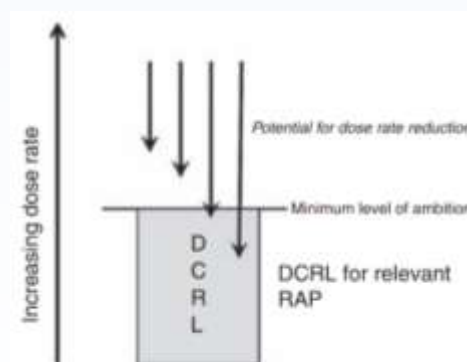
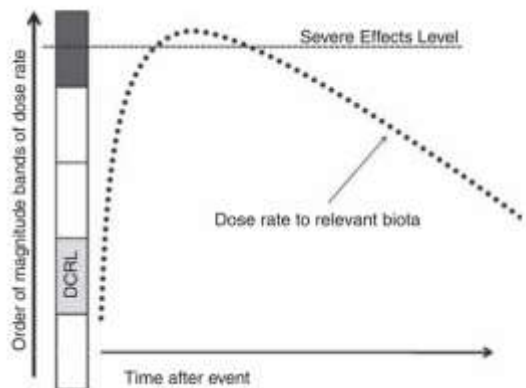
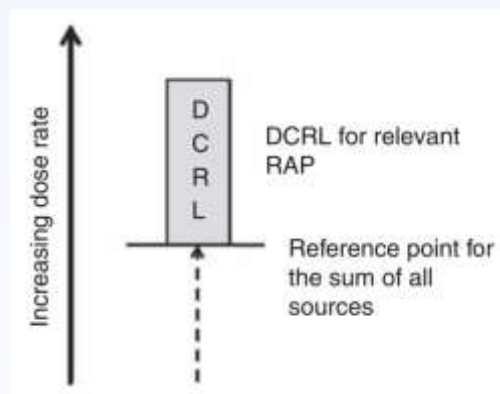
- *with associated statistics;*
- *from field and laboratory data;*
- *used new methodology to derive missing data ('surrogate data');*
- *accounted for life cycle stages and habitats, when possible; and*
- *discussed robustness of the data*





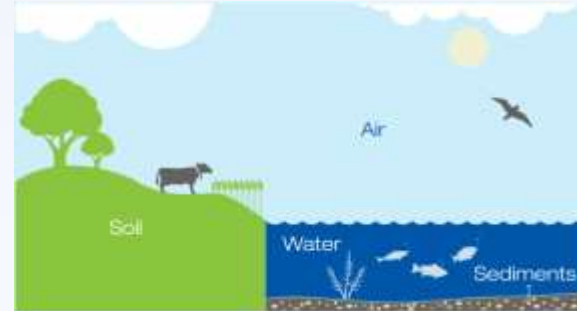
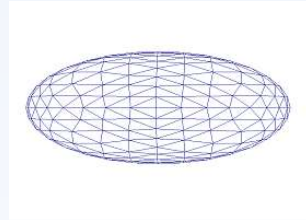
ICRP 124 (2013) Application of the system in planned, existing and emergency exposure situations

- Considered justification, optimization, and limitation in context of environmental protection
- DCRLs used as guides

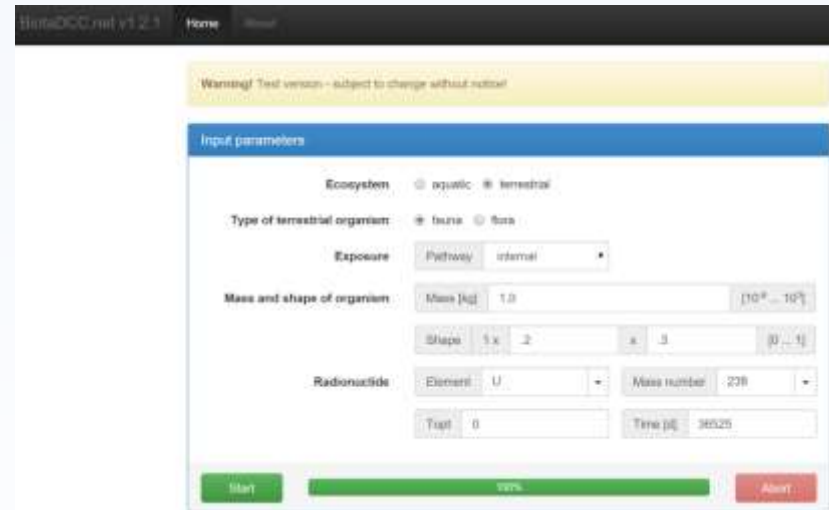




Refinements and Updates



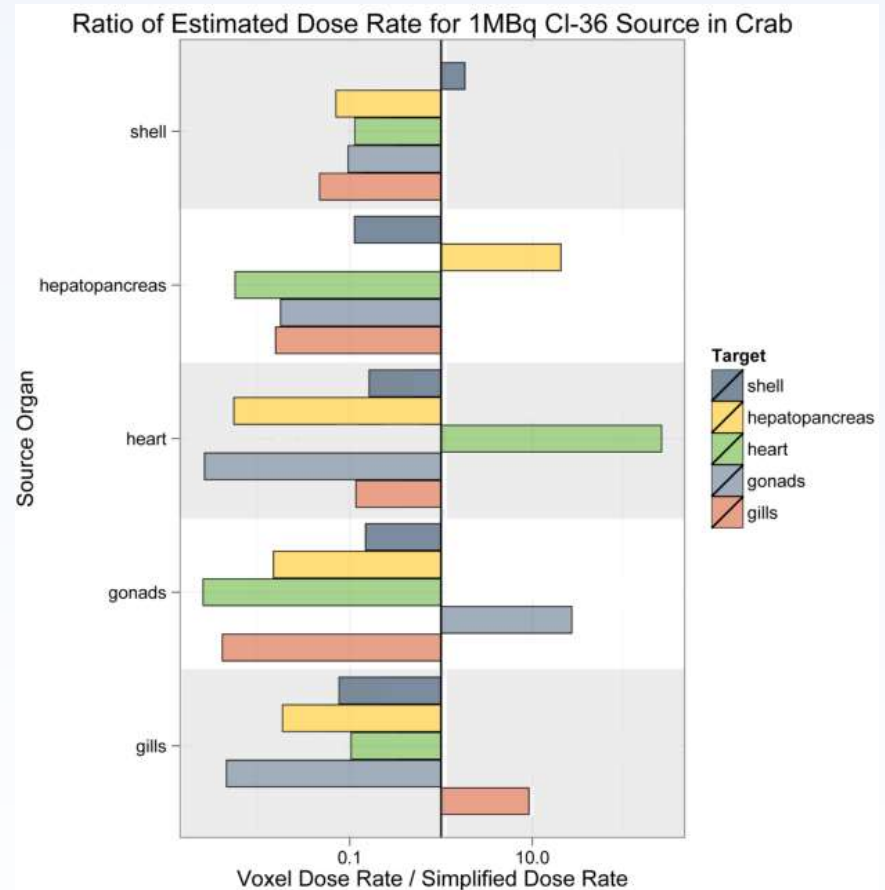
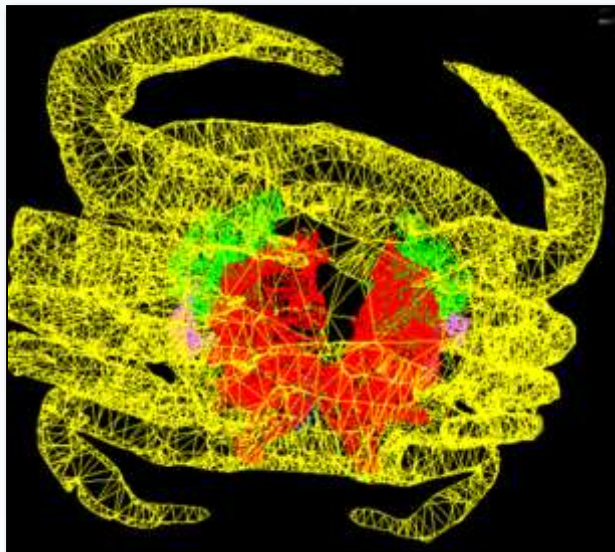
- *Publication 136* (in press)
 - Pub 107 nuclear data
 - New exposure scenarios
 - Developed software tool
- RBE and RAPs in the context of animals and plants (in review)
 - Considers tritium beta particles and alpha emitters





Task Group 99 'monographs'

Compile **new** data on biology, life cycle, stable element ratios, exposure scenarios, transfer, effects, models, conclusions.



Higley et al. *Ann ICRP* 44 (2015) pp 313-330



Task Group 105 Considering the Environment when Applying the System of Radiological Protection

Representative Organism:

A typical organism representative of its environment (Bouquetin).



Reference Animal:

A numerical approximation of organisms within a certain group of wildlife (large herbivorous mammal)

Providing case studies to illustrate protection of humans and biota



Integration of Radiation Protection: Reflected in new Committee mandates

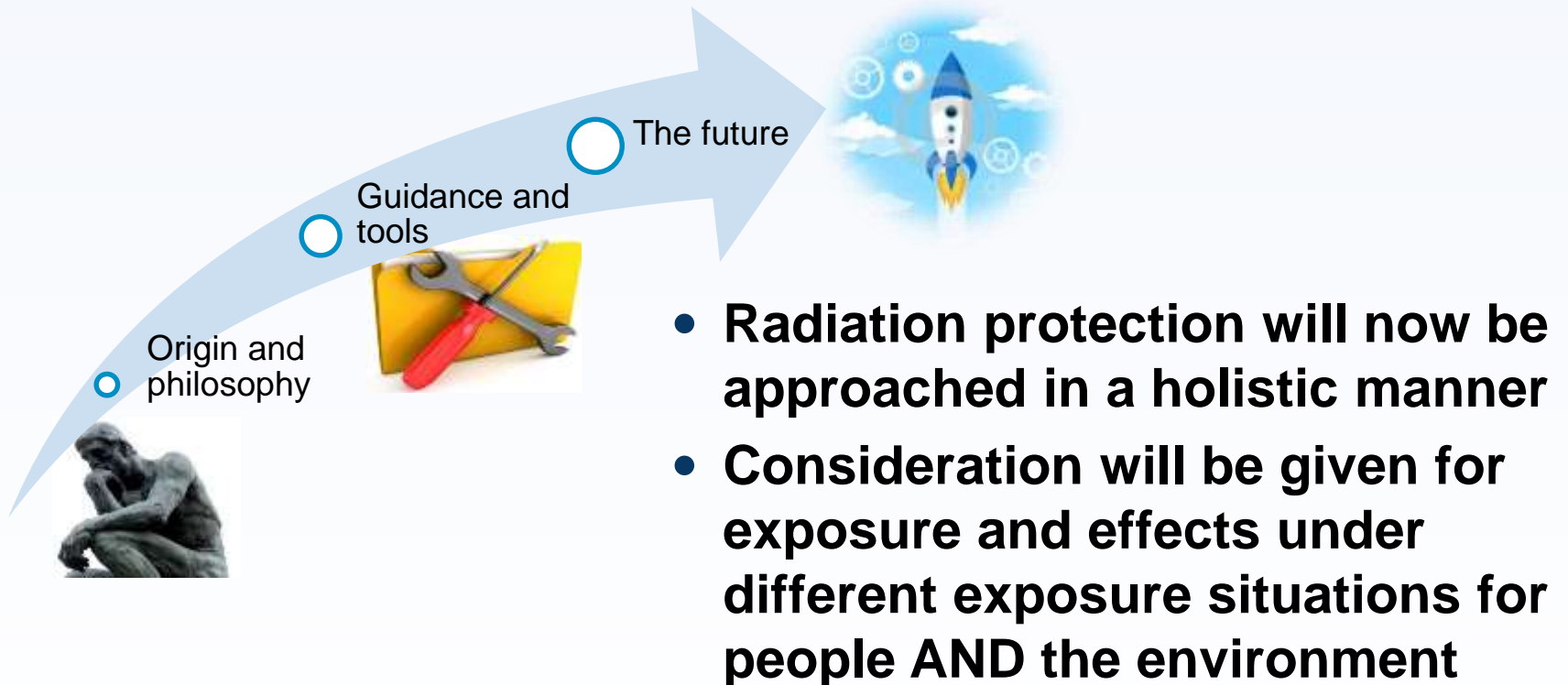
- C1 – Radiation effects from subcellular *to ecosystem levels*
- C2- Doses from radiation exposure, for both people *and environment*
- C3 – Radiation protection in medicine (*including veterinary medicine*)
- C4 – Application of the Commissions' recommendations, *in an integrated manner*



By University of Liverpool Faculty of Health from Liverpool, United Kingdom - dog xray Uploaded by AlbertHerring, CC BY 2.0, <https://commons.wikimedia.org/w/index.php?curid=29695943>

Integration of the system of RP

- **Alignment (people and environment) was there from the beginning**
- **Critical elements of guidance available and being used**



ICRP

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