

Activities of the ICRU – Past and Future!

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Points to be Covered:

- **Brief Historical Perspective**
- **Major Programs & Activities**
- **ICRU Report Organization**
- **Specific Report Activities**

ICRU Mission Statement:

To develop and promulgate internationally accepted recommendations on radiation related quantities and units, terminology, measurement procedures, and reference data for the safe and efficient application of ionizing radiation to medical diagnosis and therapy, radiation science and technology, and radiation protection of individuals and populations.

ICRU History & Leadership:

- First International Congress of Radiology
1925: International X-ray Unit Committee
- Stockholm 1928 Officially Recognized
- Propose and Develop Unit for Medical Radiation Applications
- Laurie Taylor 1953 - 1969
- H.O. Wyckoff 1969 - 1987
- A. Allisy 1987 - 1994
- A.W. Wambersie 1994 - 2006
- P.M. DeLuca 2006 - Present

ICRU Current Members:

P M DeLuca Jr (USA), Chair

A Wambersie (Belgium), Vice-Chair

S M Seltzer (USA), Secretary

P Dawson (UK)

K Doi (USA)

R A Gahbauer (USA)

M Inokuti (USA)

D T L Jones (South Africa)

H-G Menzel (Switzerland)

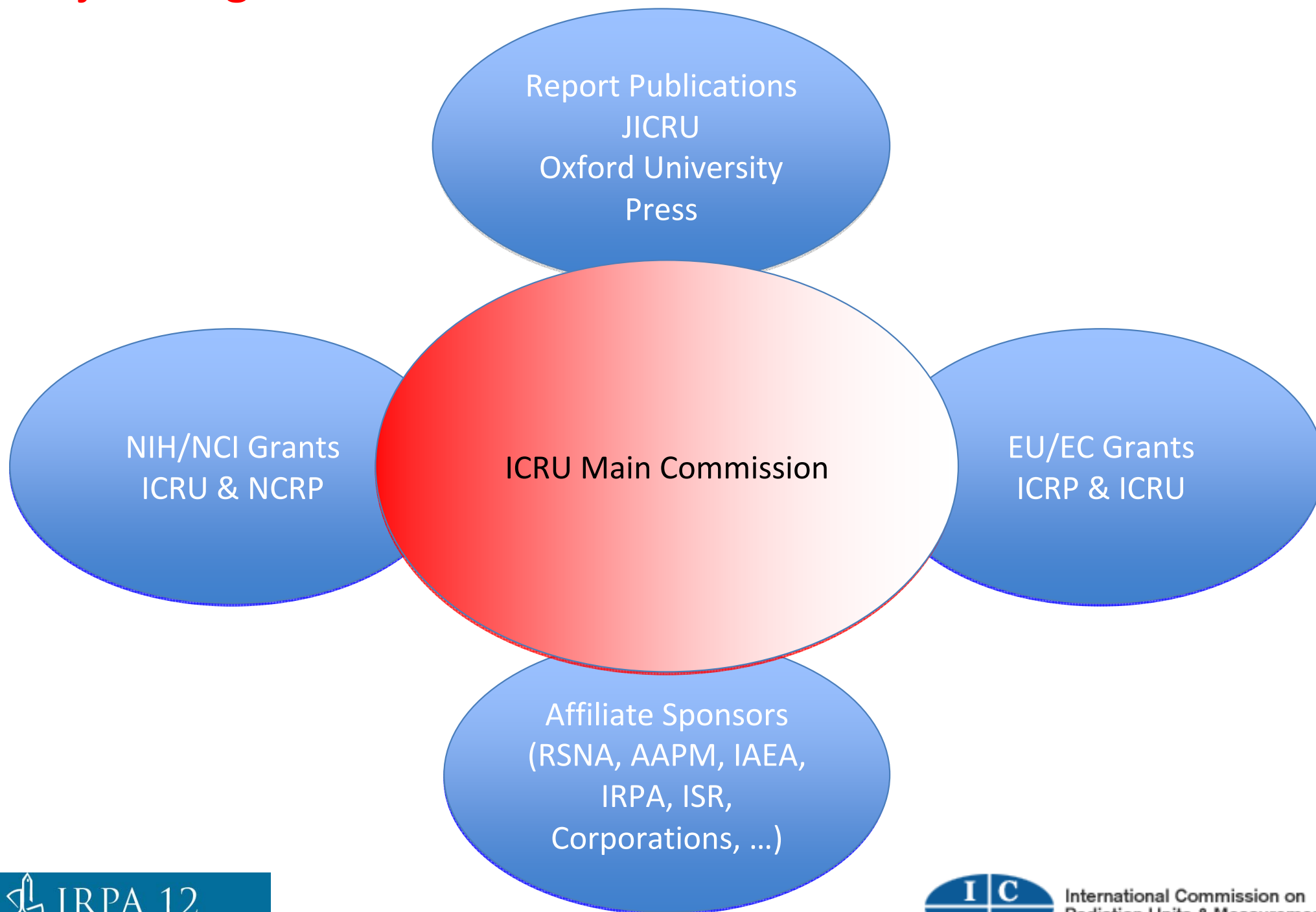
B D Michael (UK)

H G Paretzke (Germany)

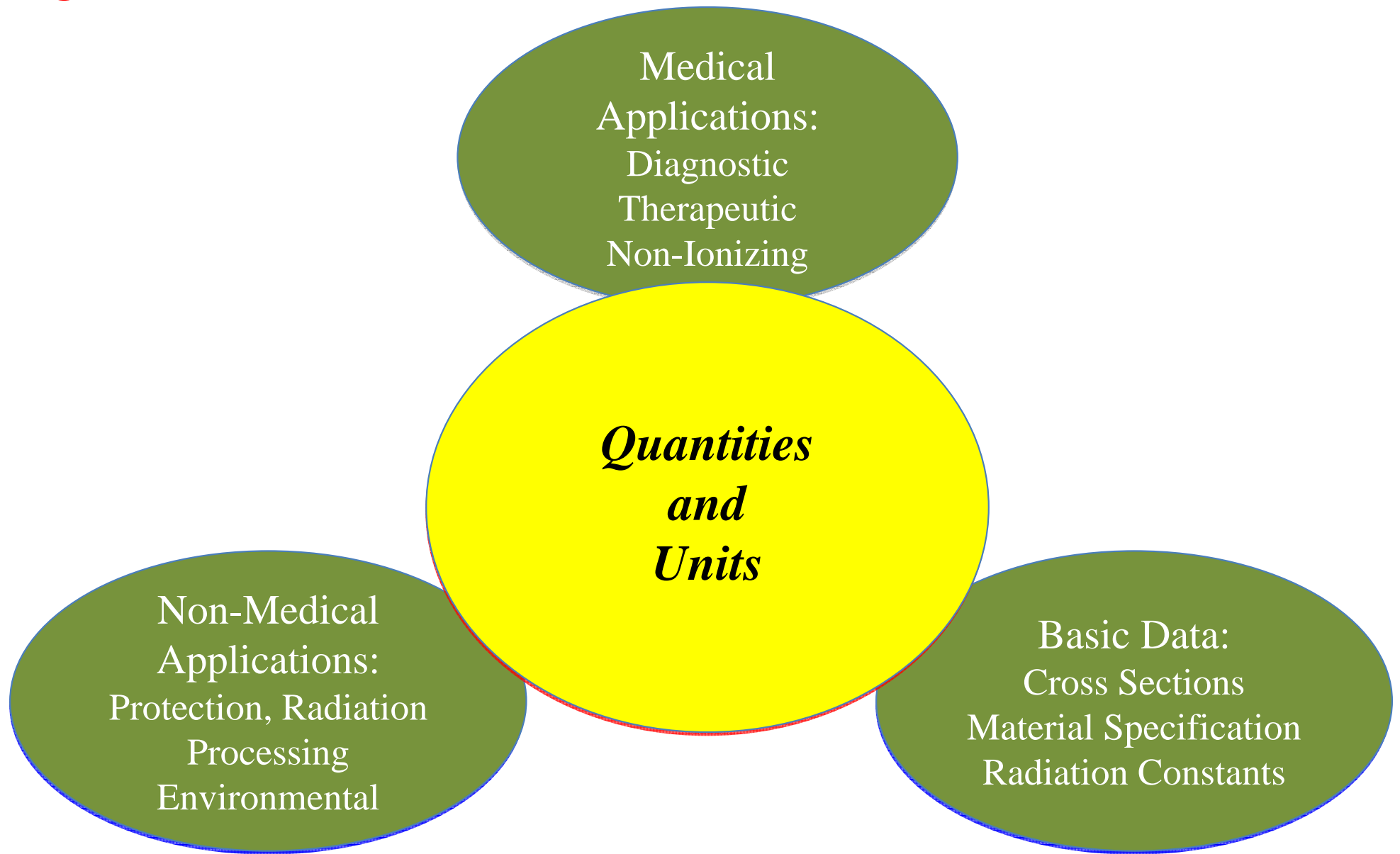
H Tatsuzaki (Japan)

G F Whitmore (Canada)

Major Program Activities:



Organization of Activities:



Medical Imaging Science:

- **Modulation Transfer Function of Screen-Film Systems (Report 41) 1986**
- **Phantoms and Computational Models in Therapy, Diagnosis and Protection (Report 48) 1993**
- **Medical Imaging - Assessment of Image Quality (Report 54) 1995**
- **Tissue Substitutes, Phantoms, and Computational Modeling in Medical Ultrasound (Report 61) 1998**
- **Absorbed Dose Specification in Nuclear Medicine (Report 67) 2002**
- **Image Quality in Chest Radiography (Report 70) 2003**
- **Patient Dosimetry of X Rays used in Medical Imaging (Report 74) 2005**

Medical Radiation Oncology – Dosimetry:

- **Radiation Dosimetry: X Rays Generated at Potentials of 5 to 150 keV (Report 17) 1970**
- **Measurement of Absorbed Dose in a Phantom Irradiated by a Single Beam of X or Gamma Rays (Report 23) 1973**
- **Determination of Absorbed Dose in a Patient Irradiated by Beams of X or Gamma Rays in Radiotherapy Procedures (Report 24) 1976**
- **Clinical Neutron Dosimetry – Part I: Determination of Absorbed Dose in a Patient Treated by External Beams of Fast Neutrons (Report 45) 1989**
- **Clinical Proton Dosimetry – Part I: Beam Production, Beam Delivery and Measurement of Absorbed Dose (Report 59) 1998**
- **Dosimetry of High Energy Photon Beams Based on Standards of Absorbed Dose to Water (Report 64) 2001**
- **Dosimetry of Beta Rays and Low-Energy Photons for Brachytherapy with Sealed Sources (Report 72) 2004**

Critical Data for Medical Radiation Oncology:

- **Average Energy Required to Produce an Ion Pair (Report 31) 1979**
- **Stopping Powers for Electrons and Positrons (Report 37) 1984**
- **Stopping Powers and Ranges of Protons and Alpha Particles (with Data Disk) (Report 49) 1993**
- **Stopping of Ions Heavier than Helium (Report 73) 2005**

Reporting Aspects for Medical Radiation Oncology:

- **Prescribing, Recording, and Reporting Photon-Beam Therapy (Report 50) 1993**
- **Prescribing, Recording, and Reporting Photon-Beam Therapy – Supplement (Report 62) 1999**
- **Prescribing, Recording, and Reporting Electron Beam Therapy (Report 71) 2004**
- **Prescribing, Recording, and Reporting Proton-Beam Therapy (Report 78) 2007**
- **Dose and Volume Specification for Reporting Intracavitary Therapy in Gynecology** (Report 38) 1985**
- **Dose and Volume Specification for Reporting Interstitial Therapy (Report 58) 1997**

**** In Revision ****

Reports with Radiation Protection Focus:

- **Determination of Dose Equivalents Resulting from External Radiation Sources, Part 1, (Report 39) 1985**
- **Determination of Dose Equivalents Resulting from External Radiation Sources, Part 2, (Report 43) 1988**
- **Quantities and Units in Radiation Protection Dosimetry (Report 51) 1993**
- **Photon, Electron, Proton and Neutron Interaction Data for Body Tissues (w/ Data Disk) (Report 46) 1992**
- **Conversion Coefficients for Use in Radiological Protection against External Radiation (Report 57) 1998**
- **Gamma-Ray Spectrometry in the Environment (Report 53) 1994**
- **Quantities, Units, and Terms in Radioecology (Report 65) 2001**
- **Sampling for Radionuclides in the Environment (Report 75) 2006**
- **Dosimetry of External Beta Rays for Radiation Protection (Report 56) 1997**
- **Determination of Operational Dose-Equivalent Quantities for Neutrons (Report 66) 2001**
- **Retrospective Assessment of Exposure to Ionizing Radiation (Report 68) 2002**
- **Direct Determination of the Body Content of Radionuclides (Report 69) 2003**

Work Just Published:

Medical Imaging
Science Area:

ICRU REPORT 79

Volume 8 No 1 2008

ISSN 1473-6691

Journal of the ICRU

ICRU REPORT 79

Receiver Operating Characteristic
Analysis in Medical Imaging

Journal of the ICRU Volume 8 No 1 2008



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INTERNATIONAL COMMISSION ON
RADIATION UNITS AND
MEASUREMENTS

Work Almost
Published:

General Radiation
Sciences:



New Work in Medical in Oncology and Imaging Science:

- **RC 04 - Bone Densitometry - Kalendar**
 - Major diagnostic devices and performance
 - Quality assurance and feature detectability
- **RC 11 - Mammography - Yaffe**
 - Focus on relationships between image quality and needed X-ray fluence
 - Manufacture specifications and new phantoms
- **RC 14 - Prescribing, Recording and Reporting Conformal Photon Beam Therapy - Gregoire & Mackie**
 - Full 3D approach
 - Revision of reporting and dose specifications to CTV/PTV
=> DVH
- **RC 19 - CT Dose/Image Quality - Boone**
 - Focus on 2D NPS and relationship with image quality
 - Provide DVH for heavily irradiated sites
 - Manufacturer specifications and new phantoms
- **RC 22 - Carbon Ion - W. Chu – joint with IAEA**
 - New modality
 - Strong need for dose modification process

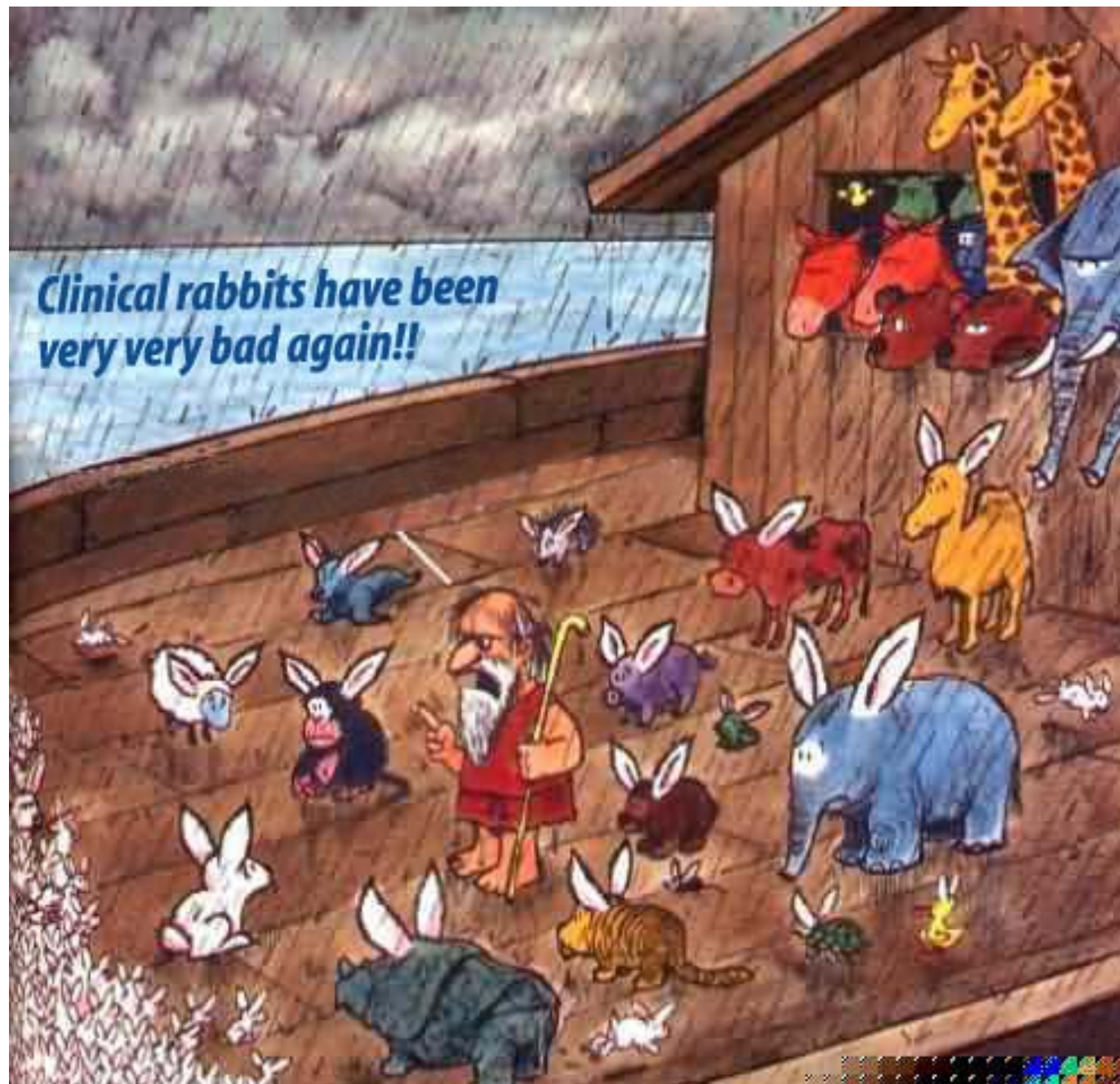
New Work in Radiation Sciences:

- **Fundamental Quantities and Units – Steve Seltzer**
 - **Minor revisions and updates (radioactivity!)**
 - **More organized presentation**
 - **NOT didactic!**
- **RC 01 - Approaches to the Dosimetry of Low-Dose Exposures to Ionizing Radiation – Les Braby**
 - **When absorbed dose loses meaning!**
 - **Application driven**
- **Computational Phantoms –Menzel and Paretzke**
 - **Joint with ICRP, ICRP lead**
 - **Principal applications in protection, QA and imaging**
 - **Follow-on publication for Conversion Coefficients**
- **RC 20 - Key Data – Fernandez-Varea**

Very Very New Work of Any Type:

- **RC 07 - Doses from Cosmic Ray Exposure for Aircrew – H. Menzel**
 - **Published jointly with ICRP**
 - **Requires Computational Phantom and Dose Conversion Coefficients**
- **ISO Effective Dose – Wambersie**
 - **Major concern in modern oncology**
 - **Fundamental to new HZE particle beams, but important to small field irradiations**
- **Second Cancers at Heavily Irradiated Sites – Wambersie**
 - **Joint with ICRP – ICRP lead**
- **Doses Distant from Irradiated Site – Wambersie**
 - **Joint with ICRP/NCRP – ICRU lead**

Yet another clinical challenge!



New Scientific Challenge: *Iso-Effective Dose*

- **Iso-Effective Dose – External Beam**
 - changes in fractionation, dose per fraction
 - changes in beam quality – OER RBE
 - relationship to “transitional tissue”
- **Iso-Effective Dose – Internal Dosimetry**
 - inhomogeneous dose distributions – partial volume irradiation
 - variable and decreasing absorbed dose rate
 - microdosimetric effects associated with decay products
- **Iso-Effective Dose – Small field irradiation**
 - lack of CPE at any point
 - mixture of deterministic and stochastic outcomes

New Scientific Challenge: *Small-Field Dosimetry*

- **Difficult and Un-addressed issues:**
 - **no primary standards that measure dose in non-standard fields**
 - **no standard protocols established for such beams!**
 - **connection between standard and non-standard absent and introduces uncertainties**
- **ICRU Issues of Relevance:**
 - ***reference conditions* unrelated to actual irradiation conditions**
 - **treatment planning systems VERY dependent upon detection systems used**
 - **treatment planning systems accuracy especially for small fields VERY uncertain**
 - **IMRT is in effect small field dosimetry!**

Keep very very still – look straight ahead!

