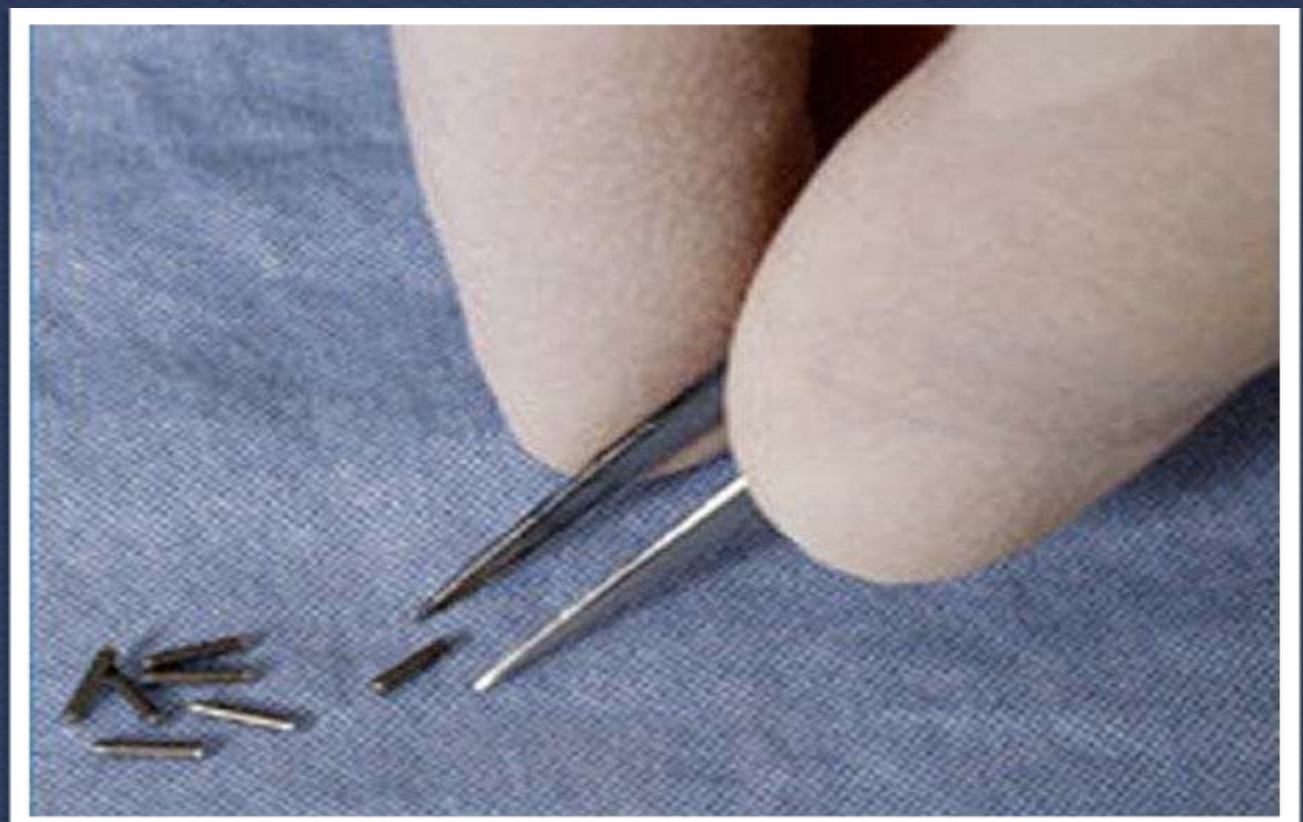


Research and Relevance of Brachytherapy Dose Calculation Advancements

Intro by Geoffrey S. Ibbott, Ph.D

Origins of Brachytherapy

- First medical experience with radium in 1901 and subsequent years, in Paris, London and New York

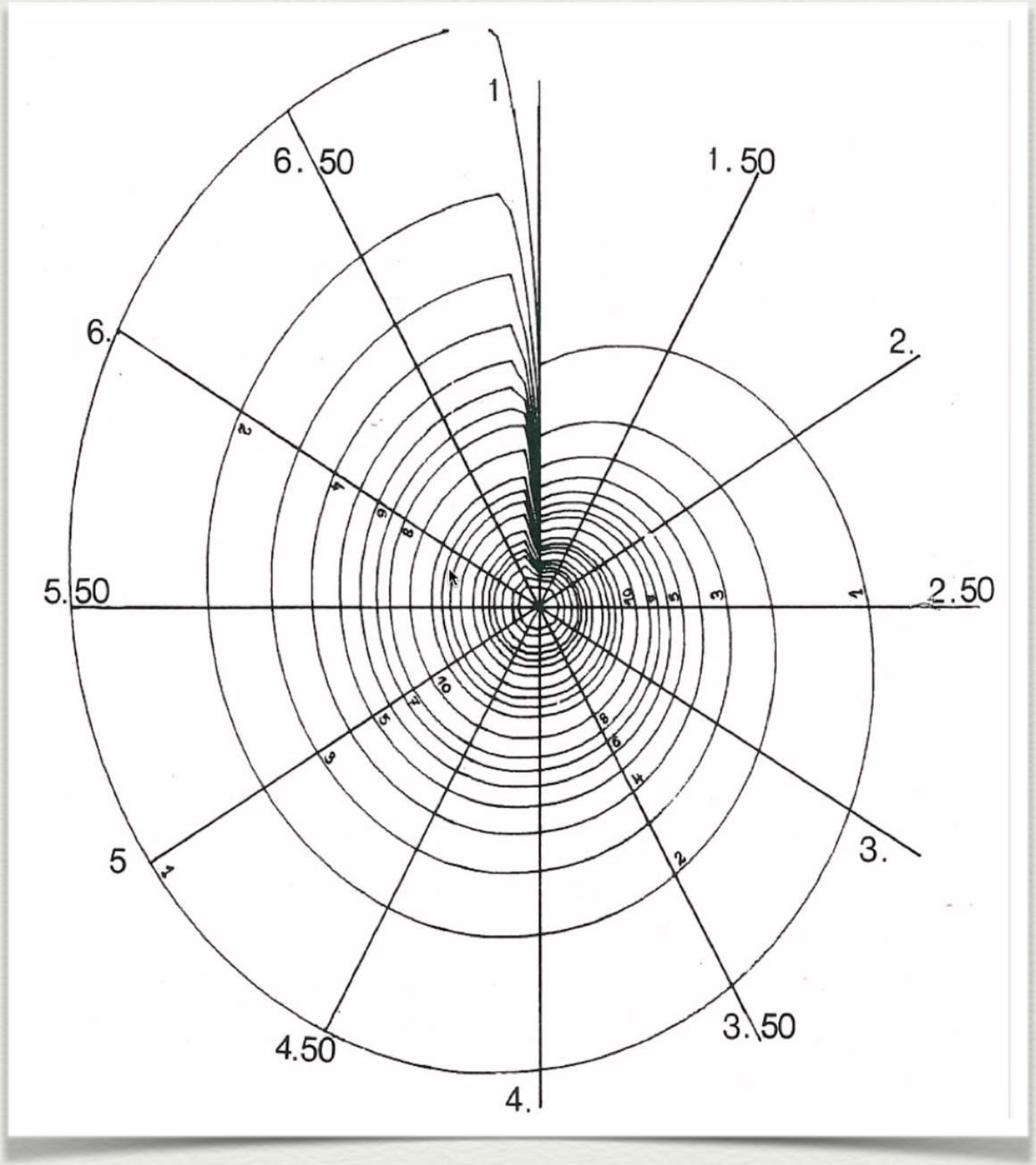
- Cancer treatments started in 1909 in London

Early Brachytherapy Dosimetry

- Early techniques were based on rules
    - Stockholm system
    - Paris system
    - Quimby system
    - Manchester system (Patterson-Parker)
- Rules generally described placement of sources to achieve a uniform dose distribution
- Dose rate was predicted at a reference point, generally 0.5 cm from plane of sources

Dose Calculations

- Escargot Diagram (Paris System)



Along-and-Away Tables

Distance along length of source (cm from center)	Transverse distance from center of source (cm)									
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
0.0	21.052	6.808	3.241	1.866	1.204	0.837	0.614	0.468	0.368	0.296
0.5	17.445	5.997	2.996	1.773	1.162	0.816	0.602	0.461	0.364	0.293
1.0	8.404	4.177	2.409	1.536	1.051	0.758	0.569	0.441	0.351	0.285
1.5	3.663	2.597	1.777	1.245	0.902	0.676	0.521	0.411	0.331	0.271
2.0	1.943	1.639	1.275	0.975	0.750	0.585	0.464	0.375	0.307	0.255
2.5	1.187	1.093	0.925	0.757	0.613	0.498	0.407	0.336	0.280	0.236
3.0	0.794	0.768	0.686	0.591	0.500	0.420	0.353	0.298	0.253	0.216
3.5	0.566	0.564	0.522	0.466	0.408	0.353	0.304	0.262	0.226	0.196
4.0	0.422	0.429	0.407	0.374	0.336	0.298	0.262	0.230	0.202	0.177
4.5	0.326	0.335	0.325	0.304	0.279	0.252	0.226	0.201	0.179	0.159
5.0	0.258	0.268	0.263	0.250	0.233	0.214	0.195	0.177	0.159	0.143

Simple Calculations

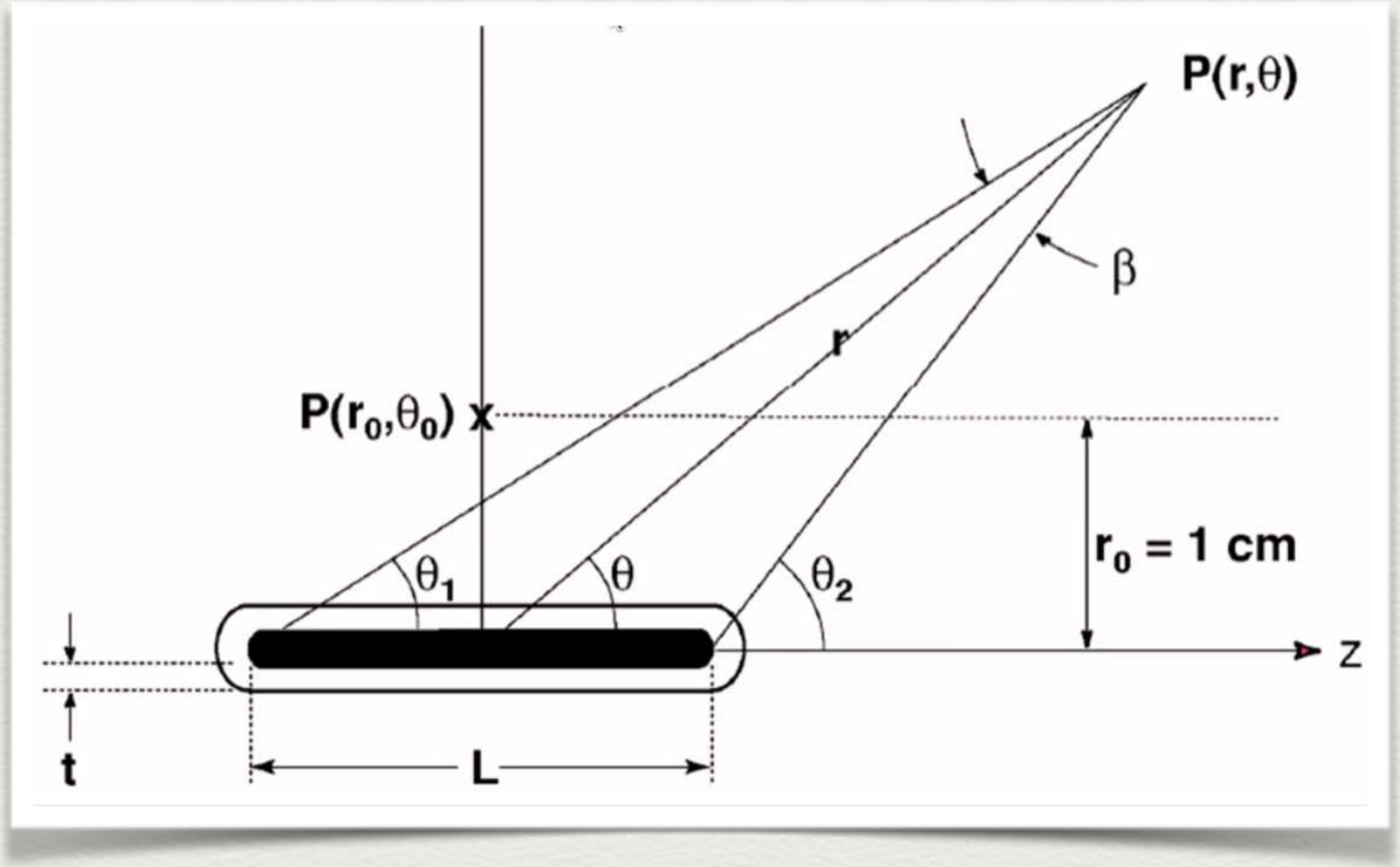
$$\dot{D}_W(r) = \frac{A \cdot \Gamma \cdot f_{as,W}(r) \cdot F_m}{r^2}$$

in Ci, deduced from dose rate me

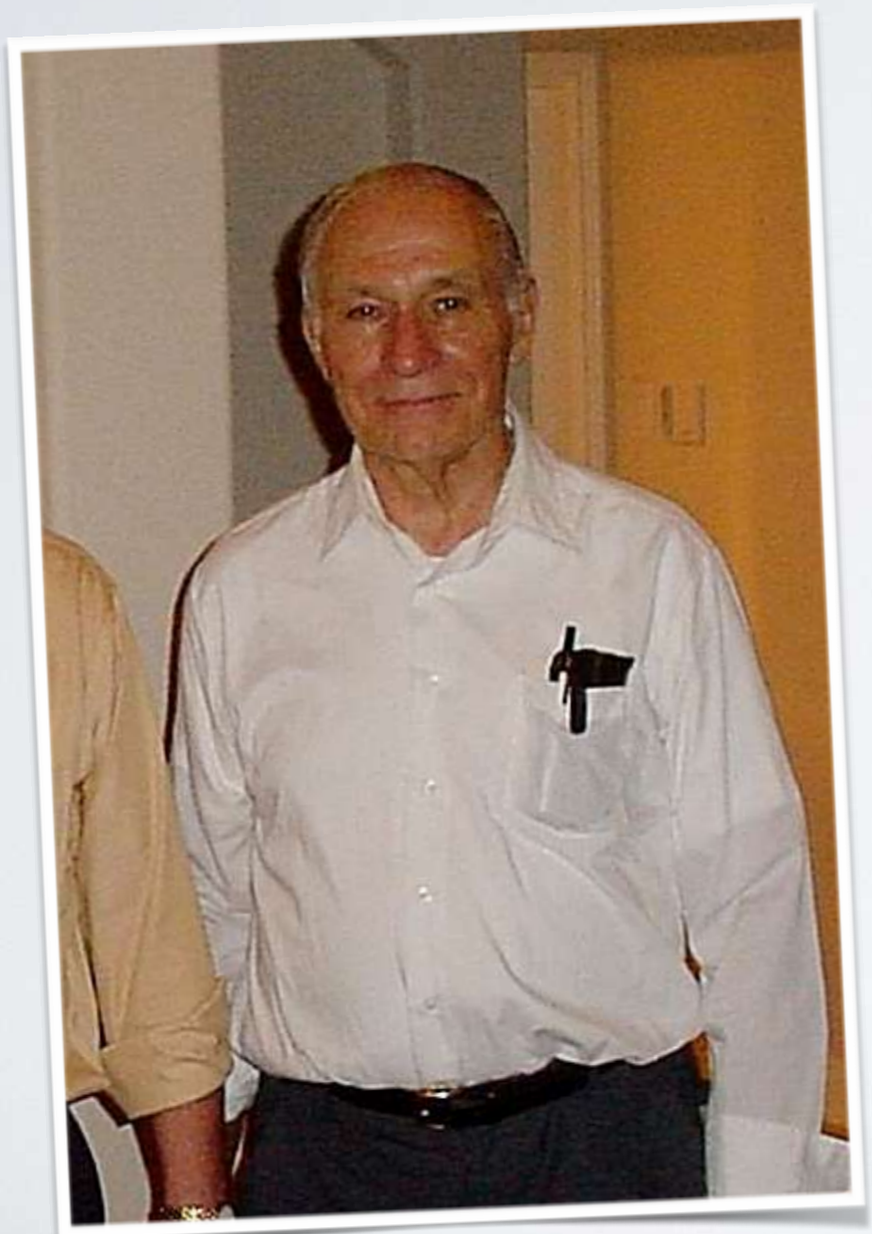
dionuclide in air at 1 m, $f_{as,W}(r)$ is the

Computerized Dose Calculations

- Sievert Integral and subsequent solutions



The Shalek and Stovall Calculation Method



The Shalek and Stovall Calculation Method

MARCH, 1968

THE M. D. ANDERSON METHOD FOR THE COMPUTATION OF ISODOSE CURVES AROUND INTERSTITIAL AND INTRACAVITARY RADIATION SOURCES*

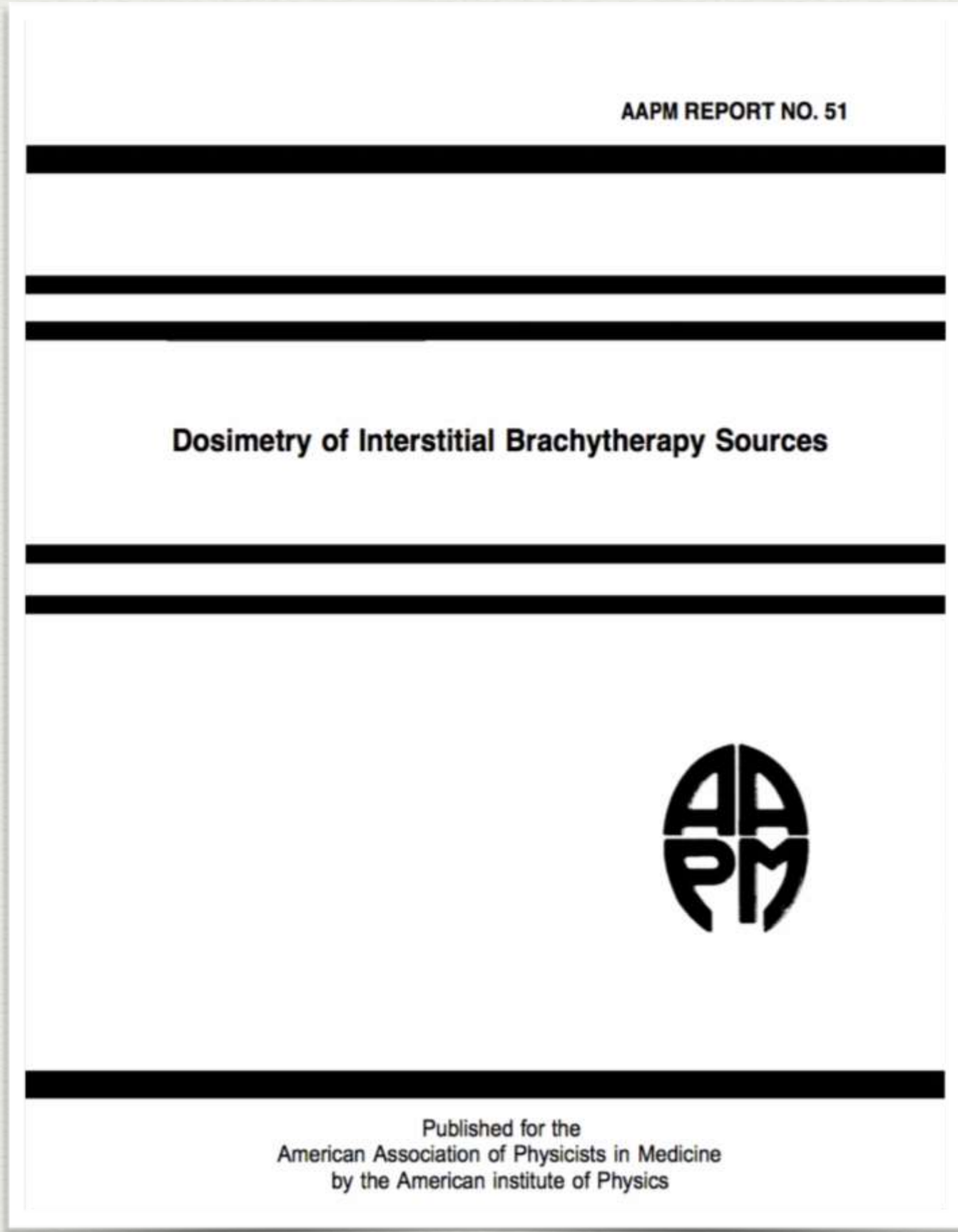
I. DOSE FROM LINEAR SOURCES

By ROBERT J. SHALEK, PH.D., *and* MARILYN STOVALL, B.A.
HOUSTON, TEXAS

IN THE nearly 70 years that radium has been used for the treatment of malignancy, the methods of dose control have progressed toward a more detailed description of the radiation distribution as permitted by the knowledge and technology of the time. The early unit of milligram-hour reveals nothing of the dose distribution, but continues to have some usefulness as a rough

matics of the RADCOMP computer program. This program can be utilized for linear or point sources of any isotope. No limiting assumptions are required concerning the position of the sources or the planes of calculation. Full isodose distributions are automatically plotted and labelled. In the third paper,[47] the computer input from roentgenograms and the relation of com-

TG43 (1995)



AAPM REPORT NO. 51

Dosimetry of Interstitial Brachytherapy Sources

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by the American institute of Physics

Recent Advances

- Monte Carlo
- Grid-Based Boltzmann Solvers
- Collapsed Cone Convolution
- …and other Model Based Dose Calculation Algorithms (MBDCAs)

MBDCAs

- Accuracy and methods of use have not been established
- Consortium to establish clinical benchmark cases and enable evaluation of MBDCAs
    - AAPM
    - ESTRO
    - Australasian Brachytherapy Group (ABG)

Speakers

- Current status of benchmark cases
    - Facundo Ballester, Ph.D.
- Background and rationale for MBDCAs
    - Åsa Carlsson Tedgren, Ph.D.
- Advances in brachytherapy dose calculation
    - Firas Mourtada, Ph.D.
- Q&A