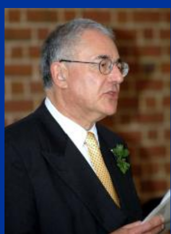
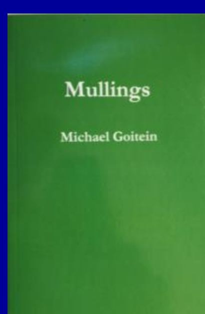
"Mulling" over the early Contributions of M Goitein



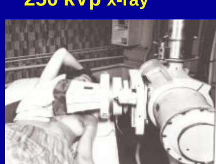
C Clifton Ling

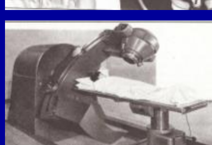
Varian Medical Systems
Stanford U (Adj. Prof. Rad Onc)
Memorial Sloan Kettering (Emeritus)



Michael Goitein, PhD

250 kVp x-ray

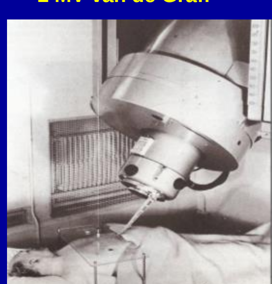


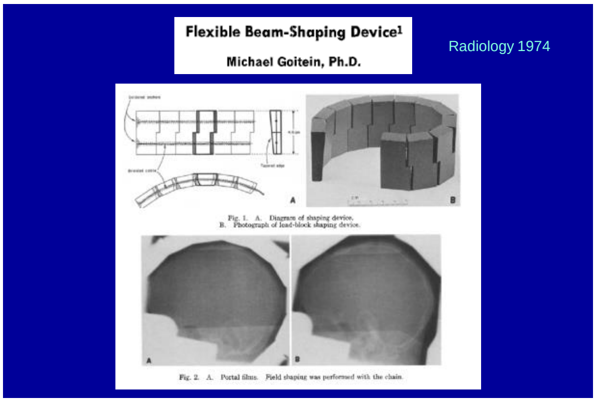


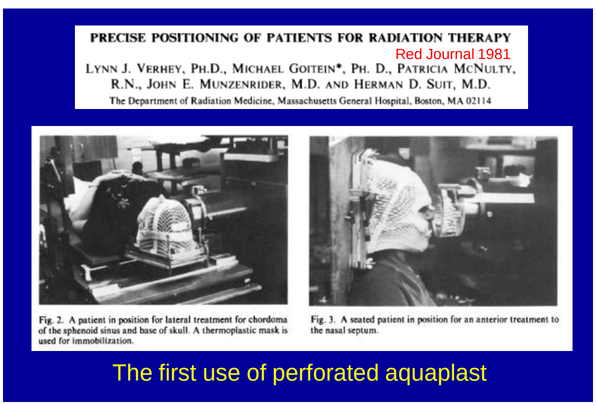
Co-60 55 cm SAD 源轴距

Harvard / Mass Gen Hosp, 1974

2 MV van de Graff




Flexible Beam-Shaping Device[1]
Michael Goitein, Ph.D.
Radiology 1974
Fig. 1. A. Diagram of shaping device.
B. Photograph of lead-block shaping device.
Fig. 2. A. Portal films. Field shaping was performed with the chain.


PRECISE POSITIONING OF PATIENTS FOR RADIATION THERAPY
Red Journal 1981
Lynn J. Verhey, Ph.D., Michael Goitein*, Ph. D., Patricia McNulty, R.N., John E. Munzenrider, M.D. and Herman D. Suit, M.D.
The Department of Radiation Medicine, Massachusetts General Hospital, Boston, MA 02114
Fig. 2. A patient in position for lateral treatment for chordoma of the sphenoid sinus and base of skull. A thermoplastic mask is used for immobilization.
Fig. 3. A seated patient in position for an anterior treatment to the nasal septum.
The first use of perforated aquaplast

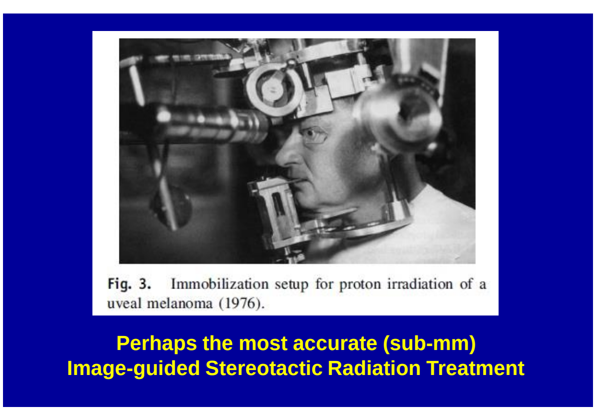
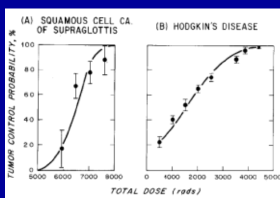


Fig. 3. Immobilization setup for proton irradiation of a uveal melanoma (1976).
Perhaps the most accurate (sub-mm)
Image-guided Stereotactic Radiation Treatment

Immobilization Error: Some Theoretical Considerations[1]

Michael Goitein, Ph.D., and Joel Busse, M.D.[2]

Radiology 117:407–412, November 1975



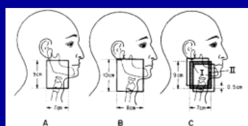
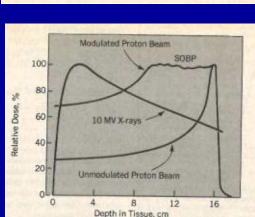


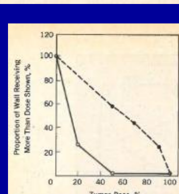
Fig. 2. Treatment fields considered typical for treatment of squamous-cell carcinoma of the supraglottis. A. The tight field used with good immobilization.
B. The loose field used with less careful immobilization. The volume of this field is (10 × 8)/(9 × 7) = 27% larger than that of the tight field.
C. A region of reduced dose (II) within the margins of a 9 × 7-cm field due to random ±5 mm immobilization error.

Proton Radiation as Boost Therapy for Localized Prostatic Carcinoma

JAMA1979

William U. Shipley, MD; Joel E. Tepper, MD; George R. Prout, Jr, MD; Lynn J. Verhey, PhD; Oscar A. Mendiondo, MD; Michael Goitein, PhD; Andreas M. Koehler, PhD; Herman D. Suit, MD





The first use of DVH

DOSE-VOLUME HISTOGRAMS

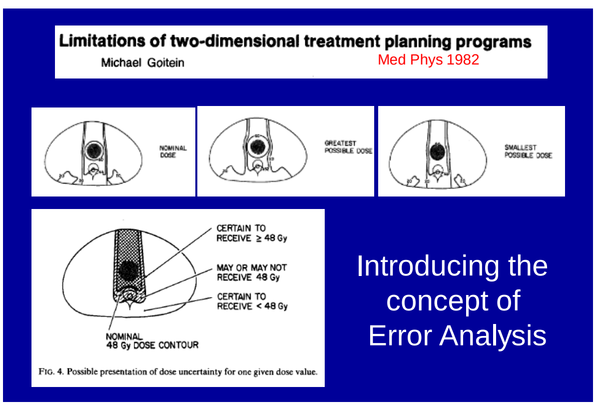
Red Journal 1991

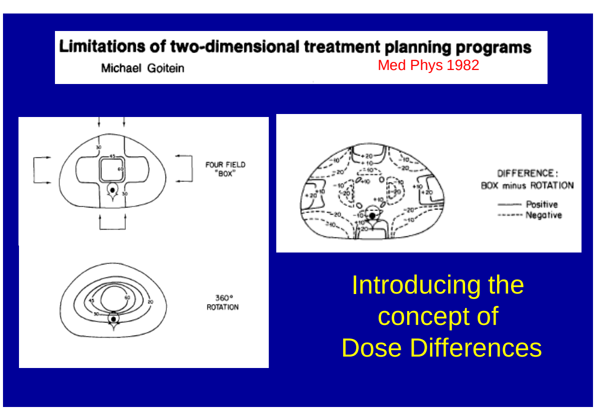
R. E. Drzymala, Ph.D.,[1] R. Mohan, Ph.D.,[2] L. Brewster, M.S.,[2] J. Chu, Ph.D.,[3]
M. Goitein, Ph.D.,[4] W. Harms, B.S.[1] and M. Urie, Ph.D.[4]

[1]Mallinckrodt Institute of Radiology, Washington University School of Medicine, St. Louis, MO 63110; [2]Memorial Sloan-Kettering Cancer Center, New York, NY 10021; [3]University of Pennsylvania School of Medicine and the Fox Chase Cancer Center, Philadelphia, PA 19111; and [4]Massachusetts General Hospital, Department of Radiation Medicine, Boston, MA 02114 and Harvard Medical School

A plot of a cumulative dose-volume frequency distribution, commonly known as a dose-volume histogram (DVH), graphically summarizes the simulated radiation distribution within a volume of interest of a patient which would result from a proposed radiation treatment plan. DVHs show promise as tools for comparing rival treatment plans for a specific patient by clearly presenting the uniformity of dose in the target volume and any hot spots in adjacent normal organs or tissues. However, because of the loss of positional information in the volume(s) under consideration, it should not be the sole criterion for plan evaluation. DVHs can also be used as input data to estimate tumor control probability (TCP) and normal tissue complication probability (NTCP). The sensitivity of TCP and NTCP calculations to small changes in the DVH shape points to the need for an accurate method for computing DVHs. We present a discussion of the methodology for generating and plotting the DVHs, some caveats, limitations on their use and the general experience of four hospitals using DVHs.

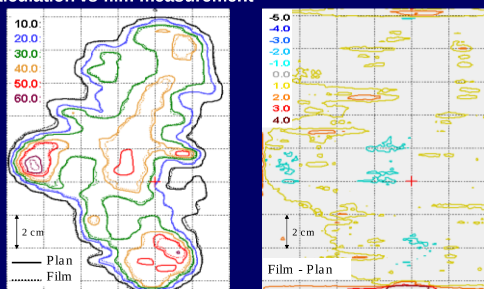

Editorials by M Goitein
COMPUTED TOMOGRAPHY IN PLANNING RADIATION THERAPY
MICHAEL GOITEIN, Ph.D.
Red Journal 1979
Division of Radiation Biophysics, Department of Radiation Medicine, Massachusetts General Hospital, and Harvard Medical School, Boston, MA 02114, U.S.A.
POTENTIAL FOR IMPROVEMENT IN RADIATION THERAPY
HERMAN D. SUIT, M.D. D.PHIL.,* JAMES BECHT, M.D., JOSEPH LEONG, PH.D., MICHAEL STRACHER, B.SC., WILLIAM C. WOOD, M.D.,† LYNN VERHEY, PH.D., AND MICHAEL GOITEIN, PH.D.
Red Journal 1988
Radiation Medicine Service, Massachusetts General Hospital Cancer Center, Harvard Medical School, Boston, MA 02114
THE INVERSE PROBLEM
MICHAEL GOITEIN, PH.D.
Red Journal 1990
Division of Radiation Biophysics, Department of Radiation Therapy, Massachusetts General Hospital, Boston MA 02114, and Harvard Medical School
The Comparison of Treatment Plans
Michael Goitein
Sem Rad Onc 1992
Organ and Tumor Motion: An Overview
Michael Goitein
Sem Rad Onc 2004


Limitations of two-dimensional treatment planning programs
Michael Goitein
Med Phys 1982
NOMINAL DOSE
GREATEST POSSIBLE DOSE
SMALLEST POSSIBLE DOSE
CERTAIN TO RECEIVE ≥ 48 Gy
MAY OR MAY NOT RECEIVE 48 Gy
CERTAIN TO RECEIVE < 48 Gy
NOMINAL 48 Gy DOSE CONTOUR
FIG. 4. Possible presentation of dose uncertainty for one given dose value.
Introducing the concept of Error Analysis


Limitations of two-dimensional treatment planning programs
Michael Goitein
Med Phys 1982
FOUR FIELD "BOX"
360° ROTATION
DIFFERENCE: BOX minus ROTATION
Positive
Negative
Introducing the concept of Dose Differences

DMLC lung field calculation vs film measurement

Tom LoSasso in IMRT Book 2003



Overlay   Difference

1983 Int J Rad Oncol Biol Phys

MULTI-DIMENSIONAL TREATMENT PLANNING: I. DELINEATION OF ANATOMY

MULTI-DIMENSIONAL TREATMENT PLANNING: II. BEAM'S EYE-VIEW, BACK PROJECTION, AND PROJECTION THROUGH CT SECTIONS

MICHAEL GOITEIN, PH.D.[1,3] AND MARK ABRAMS, M.S.[1]
Division of Radiation Biophysics, Department of Radiation Medicine, Massachusetts General Hospital, Boston, MA 02114 and Harvard Medical School

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Major Components of MD Tx Pl System

I. Delineation of Anatomy

- Synthesis of diagnostic information
  - *CT, US, scintigram etc.*
- Appreciation & delineation of anatomy
  - *Display and Markup*
- Simulation of therapy
  - *BEV, non-coplanar tx*
- Dose distrib. calcul. and evaluation
  - *3D display, inhomogen., uncertainties*
- Verification of treatment
  - *Input for 'record/verify', 'sim' film*

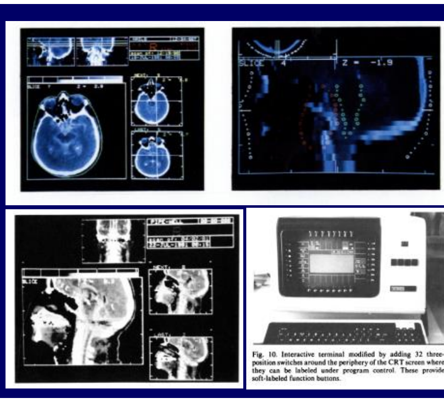

Fig. 10. Interactive terminal modified by adding 32 three-position switches around the periphery of the CRT screen where they can be labeled under program control. These provide soft-labeled function buttons.

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II. BEV, Back Projection, & Proj thru CT

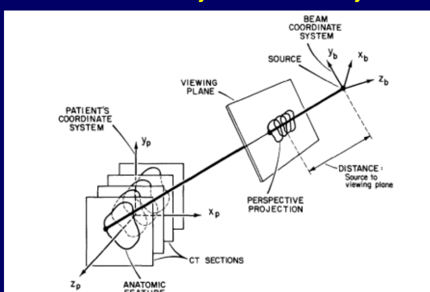

Fig. 1. Schematic diagram of the geometry involved in computing a beam's eye view of anatomic structures.

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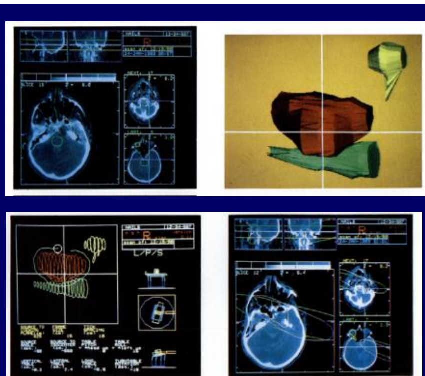

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Back Projection - DRR

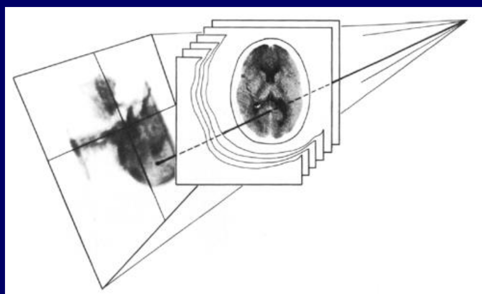
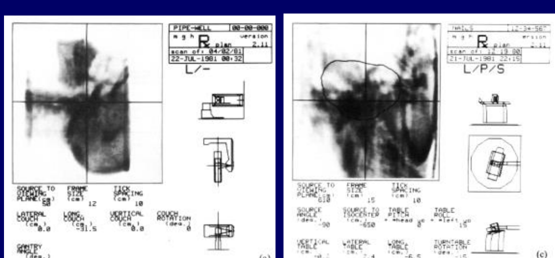


Fig. 6. Geometry of projection through CT data.

DRR with LINAC Orientation



Comparison of DRR and Portal Film

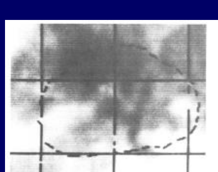
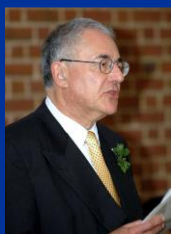


Fig. 8. Actual alignment situation from the viewpoint of a backpointing X ray tube. (a) Computer simulation (magnified); (b) Alignment film from one of the patient's treatments.



"Mulling" over the early Contributions of M Goitein

Critical Review

In Press – Int J Rad Onc Biol Phys 2017

Empowering Intensity Modulated Proton Therapy Through Physics and Technology: An Overview

Radhe Mohan, PhD, FAAPM, FASTRO,* Indra J. Das, PhD, FACR, FASTRO,[†] and Clifton C. Ling, PhD, FAAPM, FASTRO[‡]

*Department of Radiation Physics, MD Anderson Cancer Center, Houston, Texas; [†]Department of Radiation Oncology, New York University Langone Medical Center, New York, New York; and [‡]Varian Medical Systems and Department of Radiation Oncology, Stanford University, Stanford, California

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Thank you for your attention!