

GOLDEN'S DIAGNOSTIC RADIOLOGY
Laurence L. Robbins, M.D. Editor

Section 20:

**DIAGNOSTIC
NUCLEAR MEDICINE**

edited by

ALEXANDER GOTTSCHALK, M.D.

and

E. JAMES POTCHEN, M.D.

067448

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The Williams & Wilkins Company Baltimore



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The Williams & Wilkins Company
428 E. Preston Street
Baltimore, Md. 21202, U.S.A.

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Made in the United States of America

Library of Congress Cataloging in Publication Data

Gottschalk, Alexander, 1932-
Diagnostic nuclear medicine.

(Golden's diagnostic radiology; section 20)

1. Radioisotopes in medical diagnosis. I. Potchen, E. James, joint author. II. Title. III. Series.
[DNLM: 1. Diagnosis. 2. Nuclear medicine. WN200 G6181 Sect. 20]
RC78.G6 sect. 20 [RC78.7.R4] 616.07'572'08s [616.07'575]
ISBN 0-683-03669-6

75-4602

Composed and printed at the
Waverly Press, Inc.
Mt. Royal and Guilford Aves.
Baltimore, Md. 21202, U.S.A.

PREFACE

This book is designed to be useful to the practicing radiologist with a significant commitment to nuclear medicine. Many of the chapters about the current practice of nuclear radiology, such as those related to the use of cameras and scanners as well as those describing imaging of various organ systems, have a decided pragmatic nature. Hopefully, they will succeed in being both a combination of useful "tricks of the trade," and a miniatlas with key illustrations available for study or reference.

It is inevitable, however, that nuclear medicine will become progressively more inclusive and therefore more complicated. As a result, several chapters have a more sophisticated bent. It is difficult, if not impossible, to take topics like collimator design; compartments, pools and spaces; and flow measurements; and couch them in terms of " 2×2 " arithmetic. In spite of this, it seems to us that these chapters are necessary both as reference material and for those instances in which the radiologist may be actually involved in utilizing the techniques or principles described. In short, this volume was written to help the radiologists practice better nuclear radiology now, and in the future.

ALEXANDER GOTTSCHALK, M.D.

E. JAMES POTCHEN, M.D.

VOLUMES OF GOLDEN'S DIAGNOSTIC RADIOLOGY SERIES

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- Section 2: **Roentgen Ray Examination of the Paranasal Sinuses and Mastoids** (*Grier*)
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- Section 18: **Selective Angiography** (*Hanafee et al.*)
- Section 19: **Mammography and Breast Diseases** (*Egan*)
- Section 20: **Diagnostic Nuclear Medicine** (*Gottschalk & Potchen et al.*)

PREFACE

EDITOR'S INTRODUCTION—1975

The primary authors and editors indicate this book is designed to be useful to the practicing radiologist who has a significant commitment to Nuclear Radiology.

The editor considers that most of this material is new or practical, and all is current at the time of the writing. The authors prepared the material as a result of long and difficult hours of work. The volume will be of reference value to medical students, residents in Radiology, residents in Nuclear Medicine, and practitioners of Nuclear Radiology or Nuclear Medicine. It is expected that it will be a ready source of provocative and yet practical information to all of the above. It is recognized that some of this material may be controversial and yet will be practical for most practitioners.

The editor wishes to extend his appreciation to Alexander Gottschalk and James Potchen for their tremendous, diligent application to the development of this presentation.

In addition, The Williams & Wilkins Company has supplied tremendous help from Mrs. Ruby Richardson and her associates.

It is hoped that you, as a reader, will not only enjoy but learn from the material presented.

LAURENCE L. ROBBINS, M.D.

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CONTENTS

Section I

HISTORICAL CONSIDERATIONS

1. The Beginnings of Nuclear Medicine—*E. R. N. Grigg, M.D.*
Definition and Nomenclature . . . 1
2. The Recent History of Nuclear Medicine—*J. F. Lindeman, M.D.* . . . 5
3. The Recent History of Clinical Procedures in Nuclear Medicine—*J. F. Lindeman, M.D., and J. L. Quint III, M.D.* . . . 8

Section II

ISOTOPES

4. Some Essential Characteristics of Radioactive Materials—*R. N. Beck, B.S.* . . . 14
 - Introduction . . . 14
 - Structure of Matter . . . 14
 - Stability of the Nucleus . . . 15
 - Modes of Decay and Subsequent Processes . . . 15
 - α^{++} Emission . . . 15
 - β^{-} Emission . . . 15
 - β^{+} Emission . . . 16
 - Electron Capture . . . 16
 - γ -Ray Emission . . . 16
 - Internal Conversion . . . 17
 - X-ray Photon Emission . . . 18
 - Auger Electron Emission . . . 18
 - Units of Radioactivity . . . 18
 - Patient Irradiation . . . 19
 - Particle Interactions with Matter . . . 19
 - Photon Interactions with Matter . . . 19
 - Choice of Radionuclide for Imaging . . . 20
 - Production of Radioactive Materials . . . 20
5. Factors which Influence the Choice of an Isotope—*P. V. Harper, M.D.* . . . 22

- Availability and Cost . . . 22
- Half-life . . . 22
- Radioactive Emissions . . . 23
 - Nonpenetrating Radiation . . . 23
 - Penetrating Radiation . . . 23
- Chemical and Biologic Considerations . . . 25
- 6. Radiopharmaceuticals—*P. O. Alderson, M.D., K. A. Krohn, Ph.D., and M. J. Welch, Ph.D.* . . . 26
 - Introduction . . . 26
 - Source of Radionuclides:
 - Where Do They Come From? . . . 26
 - Ionic Radiopharmaceuticals . . . 27
 - Colloids and Particles . . . 27
 - Radiopharmaceutical Compounds . . . 27
 - Technetium . . . 28
 - Indium . . . 32
 - Iodine . . . 35
 - Bone-seeking Radionuclides . . . 37
 - Tumor-seeking Radionuclides . . . 39
 - Iron . . . 42
 - Mercury . . . 42
 - Chromium . . . 44
 - Cobalt . . . 45
 - Conclusion . . . 46

Section III

INSTRUMENTS

7. Collimators for Radionuclide Imaging Systems—*R. N. Beck, B.S.* . . . 51
 - Introduction . . . 51
 - Single-Hole Collimators . . . 51
 - Geometrical Response to a Point Source . . . 51
 - Geometrical Response to a Uniform Planar Source . . . 53
 - Geometrical Response to a Uniform Volume Distribution . . . 54
 - Multihole Collimators . . . 54

Geometry Factor	55	A Trap for the Unwary	83
Geometrical Efficiency for Planar and Volume Distribution	56	Principles of Good Image Production	85
Spatial Resolution	58	Positioning	85
Effects of Septal Penetration	61	Procedure, General	85
Effects of Scattered Radiation	61	Procedure, Counting Rate Survey, and Speed Setting	86
Summary and Conclusions	61	Procedure, Photorecorder Settings	88
8. The Scintillation Detector— <i>B. E. Oppenheim, M.D., and R. N. Beck, B. S.</i>	63	A Return to the Rate Meter Problem	90
Introduction	63	Summary	92
Scintillation Crystal	64	11. Stationary Detectors— <i>A. Gottschalk, M.D., and P. B. Hoffer, M.D.</i>	94
Photomultiplier Tube	66	Anger Scintillation Camera	94
Electronic Processing Unit	67	General Concepts	94
Amplification and Pulse Shaping	67	Inherent Resolution	95
Pulse Height Analyzer	68	Overall Resolution	96
Recording Devices	69	Camera Sensitivity	96
Pulse Height Spectrum	69	Whole Body Imaging with Gamma Camera	96
Practical Considerations	72	Optimizing Camera Images	97
9. The Gamma Well Counter— <i>C. C. Harris</i>	74	Use of Phantoms	98
Introduction—Rationale	74	Speed and Variable Positioning	99
Physical Considerations	74	Practical Considerations	100
Construction	74	Care of Camera Crystal	100
Handling Precautions	75	Temperature Control	101
System Electronic Components	75	Leave It On	101
Configuration	75	Photopeak Check	101
System Limitations	75	Stockpile Relevant Items	101
Applications	76	Mosaic Stationary Detector Systems	101
System Response to Commonly Used Radionuclides	76	Future Devices—Semiconductor Detector Cameras	102
Effect of Sample Volume	76	12. Factors Which Influence the Choice of an Instrument— <i>P. B. Hoffer, M.D., A. Gottschalk, M.D., and C. C. Harris</i>	104
Assay of Two or More Radionuclides	78	Instrument Comparison	104
Special Effects—Coincidence Summing	78	Resolution	104
Operating Considerations	79	Sensitivity and Imaging Efficiency	105
Performance and Calibration	79	Utility for Dynamic Studies	105
Pitfalls	80	Image Distortion	105
Summary	80	Correlation with Anatomic Features	106
10. Image Production with Rectilinear Scanners— <i>C. C. Harris</i>	81		
Introduction	81		
Influence of Collimation on Image	82		
Energy-Selective Counting to Reject Scattered Radiation	82		

Adaptability	106
Ease of Operation	106
Clinical Comparison	106
Brain	106
Cisternography	106
Thyroid	107
Lung	107
Heart	107
Liver and Pancreas	108
Renal	108
Bone	108
Tumor and Abscess Scanning with Gallium-67	108

Section IV

**METHODOLOGY FOR TRACER
KINETICS**

13. Theoretical Basis for Blood Flow Measurement— <i>B. J. McNeil, M.D., Ph.D., B. L. Holman, M.D., and S. J. Adelstein, M.D., Ph.D.</i>	109
Diffusible Indicator Method for Measuring Blood Flow	109
Compartmental Analysis: Sin- gle Compartment	110
Compartmental Analysis: Multicompartment	110
Initial Slope Method: Rationale and Use	112
Stochastic Analysis	113
Transit Time Measurement	114
14. Quantitative Tracer Kinetics— <i>B. L. Holman, M.D., B. J. McNeil, M.D., Ph.D., and S. J. Adelstein, M.D., Ph.D.</i>	116
Mathematic Models as Applied to Blood Flow	116
Specific Flow	116
Fractional Blood Flow: Micro- spheres and Particles in the Study of the Circulation	118
Absolute Blood Flow Measure- ments: Cardiac Output and Intracardiac Shunt Calcula- tions	120
Empirical Signatures	122
Intravascular Transit	122
Salivary Gland Studies	123

Section V

**SPACES, POOLS, AND BODY
COMPOSITION**

15. Principles of Isotope Dilution— <i>B. A. Siegel, M.D., and R. K. Studer, M.S.</i>	126
Definitions	126
Fundamental Considerations in Dilution Studies	128
16. Blood Volume— <i>J. E. Arnold, M.B., B.S., M.R.A.C.P.</i>	130
Principle of Blood Volume Mea- surement	130
Plasma Volume	130
Measurement of Plasma Volume with Radioiodinated Albumin ...	131
Precautions	131
Preparation of Sterile Stock Solution of Albumin Io- dine-125 or Iodine-131	131
Procedure for Plasma Volume Measurement	131
Measurement of Red Cell Volume ..	132
Procedure for Labeling Red Cells with Chromium-51 ...	132
Procedure for Red Blood Cell Volume Measurement	133
Simultaneous Measurement of Red Cell and Plasma Volumes ..	134
Normal Values	135
Indications and Clinical Utility ..	135
17. Isotope Dilution Methods— <i>D. M. Welch, M.D.</i>	139
Introduction	139
Total Body Water	139
Extracellular Water	140
Intracellular Water	143
Total Exchangeable Potassium ..	143
Total Exchangeable Sodium	144
Other Ions	145

Section VI

BLOOD POOL IMAGING

18. Cardiovascular Imaging with Radionuclides— <i>F. J. Bonte, M.D.</i>	149
Introduction	149
Radiopharmaceuticals	149

Method	150	Methods of Study	192
Normal Transit Study	151	Indications for Performance of Study	193
Thoracic Mass Lesions	151	Determination of Sites of Erythropoiesis	193
Pericardial Effusion	159	Methods of Study	193
19. Transit Studies in Diagnostic Angiography— <i>F. J. Bonte, M.D., and J. P. Kriss, M.D.</i>	164	Indications for Performance of Study	193
Interpretation	164	Determination of Sites of Red Blood Cell Sequestration	193
Data Quantification in Cardiovascular Imaging	166	Methods of Study	193
Radionuclide Peripheral Angiography	168	Indications for Performance of Study	194
20. Imaging of the Myocardium— <i>F. J. Bonte, M.D., and R. W. Parkey, M.D.</i>	169	Determination of Rate and Sites of Deposition of Iron in Hepatic Stores	194
Labeling Normal Myocardium ..	169	Method of Study	194
Labeling Abnormal Myocardium ..	170	Indications for Performance of Study	194
21. The Use of Radionuclides for Placental Imaging— <i>K. A. Lathrop, B.S., M.S.</i>	177	24. Bone Marrow Scanning— <i>R. E. Henry, M.D., and L. H. Resnick, M.D.</i>	195
Use of Technetium-99m-Per technetate for Placental Imaging ..	178	Radiopharmaceuticals	195
Use of Indium-113-Trichloride for Placental Imaging	180	Reticuloendothelial System ..	195
Summary	184	Erythropoietic System	196
<i>Section VII</i>		Technique and Instrumentation ..	196
NUCLEAR HEMATOLOGY		Interpretation	196
22. Radioactive Vitamin B ₁₂ Absorption Test and Other Studies— <i>F. A. Goswitz, M.D.</i>	186	Clinical Applications	199
Methods and Mechanisms	186	Myeloproliferative Disorders ..	199
Indications	188	Leukemia	200
Results	188	Lymphoproliferative Disease ..	200
Clinical Utility	190	Multiple Myeloma and Metastatic Malignancy	201
Summary	190	Nonmalignant Focal Defects ..	201
23. Radioisotopic Studies of Red Cell and Iron Kinetics in Clinical Nuclear Medicine— <i>H. S. Winchell, M.D., Ph.D.</i>	191	Miscellaneous Disorders	202
Introduction	191	Summary	203
Determination of Red Cell Mass		25. Spleen Scanning— <i>L. H. Resnick, M.D., and R. G. Evens, M.D.</i> ...	205
Methods of Study	191	Radiopharmaceutical Considerations	205
Indications for Performance of Study	192	Technique	206
Determination of Red Cell Survival and Rate of Erythropoiesis ..	192	Clinical Considerations	207
<i>Section VIII</i>		NUCLEAR ENDOCRINOLOGY	
		26. Principles of Competitive Binding Assay and Radioimmunoassay— <i>S. Refetoff, M.D.</i>	215

Competitive Binding Assay	216	28. Thyroid in Vivo Studies— <i>P. B. Hoffer, M.D., A. Gottschalk, M.D., and J. L. Quinn III, M.D.</i>	255
Binding Protein	216	Anatomy	255
Labeled Ligand	217	Thyroid Physiology	255
Preparation of Unknown Samples	217	Metabolism of Iodine	255
Equilibration of Reaction Mixture	218	Intrathyroidal Iodide Metabolism	255
Separation of "Bound" from "Free" Ligand	218	Hormonal Control of Thyroid Activity	257
Standard Curve	219	Radioiodine Uptake Determination	257
Advantages and Pitfalls	220	Standard 24-Hour Radioactive Iodine Uptake Test	258
Commonly Used Assays Utilizing Principle of Competitive Binding	221	Perchlorate Discharge Test	258
Radioimmunoassay	222	T ₃ Suppression Test	259
Purification of Antigenic Substance	222	TSH Stimulation Study	259
Labeled Antigen	222	Pertechnetate-99m Uptake	259
Antiserum	223	Choice of Radiopharmaceutical for Scanning	259
Separation of Antibody Bound from Free Substrate	225	Isotopes of Iodine	259
Immunoradiometric Assay	227	Pertechnetate-99m	261
27. Tests of Thyroid Function— <i>S. Refetoff, M.D.</i>	237	Fluorescent Thyroid Scanning	261
Thyroid Physiology		Multiple Isotopes for Thyroid Scanning	263
Hormone Synthesis and Secretion	237	Thyroid Scanning—Technical Factors	263
Hormone Transport in Blood	237	Thyroid Scanning, Clinical Indications	265
Hormone Transfer to Tissues. Metabolism, Action, Degradation, and Excretion	239	Normal Appearance of Thyroid Gland on Scan	265
Regulation of Hormone Synthesis and Secretion	239	Diffuse Hypertrophy of Thyroid Gland	266
Thyroid Function Tests	240	Nonvisualization of Thyroid Gland	266
Measurement of Hormone Concentration and Its Transport in Blood	241	Evaluation of Thyroid Nodules	267
Tests Assessing Effect of Thyroid Hormone on Body Tissues	247	Further Clinical Evaluation of Patients with Cold Nodules	270
Measurement of Abnormal Substances in Blood	247	Diagnosis and Diagnostic Management of Thyroid Cancer	271
Evaluation of Integrity of Hypothalamo-Pituitary-Thyroid Axis	249	Role of Scan in Diagnosis of Thyroid Carcinoma	273
Special Tests of Thyroid Function	251	Thyroiditis	275
Choice of Thyroid Function Tests	251	Conclusion	275
		Section IX	
		NEURONUCLEAR MEDICINE	
		29. Static and Dynamic Brain Imaging— <i>L. L. Heck, M.D., A. Gott-</i>	

<i>schalk, M.D., and P. B. Hoffer, M.D.</i>	278	Section X	
Introduction	278	PULMONARY NUCLEAR	
Historical Considerations	278	MEDICINE	
Indications and Contraindications	279	32. Lung Scanning— <i>R. H. Secker-Walker, M.B., M.R.C.P.</i>	341
Approach to Imaging	279	Introduction	341
Rationale	279	Anatomy	341
Radiopharmaceuticals	280	Airways and Alveoli	341
Instrumentation	281	Blood Vessels	342
Clinical Technique	284	Physiology	343
Normal Scan and Its Variations	288	Blood Flow	343
Interpretation and Results	290	Ventilation	343
General Approach	290	Perfusion Lung Scans	344
Principles of Interpretation	291	Agents Used for Lung Scanning	344
Evaluation of Dynamic Studies	293	Technique for Perfusion Scans	345
Accuracy of Brain Scanning	293	Precautions	346
Correlation with Other Neuro-radiologic Procedures	294	Imaging	346
Diagnostic Capabilities	295	Ventilation Studies	346
Congenital	295	Apparatus	347
Neoplastic	295	Apparatus for Xenon Administration	347
Inflammatory	296	Techniques for Ventilation Studies	348
Vascular	296	Measurement of Ventilation	348
30. Cerebrospinal Fluid Imaging (Cisternography)— <i>A. E. James, Jr., Sc.M., M.D.</i>	303	Aerosol Scans	349
Normal Image Patterns	304	Agents Used	349
Abnormal Flow Patterns in Hydrocephalus	305	Technique	350
Obstructive (Noncommunicating) Hydrocephalus	305	Transmission	350
Communicating Hydrocephalus	306	Clinical Applications	350
Other Uses of Cisternography	321	Normal Findings	350
Injection Problems	325	Ventilation Studies	351
Relation to Pneumoencephalography and Computerized Axial Tomography	325	Pulmonary Embolism	351
Quantification Techniques	328	Postoperative Studies	360
31. Cerebral Blood Flow— <i>B. L. Holman, M.D., and S. J. Adelstein, M.D.</i>	332	Chronic Obstructive Lung Disease	362
Kety-Schmidt Technique	332	Surgery for Emphysematous Bullae	364
Inert Gas Washout Technique	333	Bronchial Asthma	364
Physiology	336	Bronchiectasis	371
		Localized Bronchial Obstruction	371
		Carcinoma of Bronchus	374
		Inflammatory and Other Conditions	381
		Lung Transplantation	384
		Congestive Heart Failure and Other Cardiac Conditions	384
		Congenital Heart Disease	388

Pediatric Applications	389	<i>Blaufox, M.D., Ph.D., and</i>	
Cystic Fibrosis	389	<i>E. G. Bell, M.D., Ph.D.</i>	464
Quantitative Aspects of Ventilation and Perfusion Scanning	391	Introduction	464
Section XI		Basic Concepts of Renal Function	465
GASTROINTESTINAL NUCLEAR MEDICINE		Glomerular Filtration	465
33. Liver Scanning— <i>B. E. Oppenheim, M.D., A. Gottschalk, M.D., and P. B. Hoffer, M.D.</i>	399	Tubular Secretion and Effective Renal Plasma	466
Introduction	399	Renal Blood Flow	466
Radiopharmaceuticals	399	Clearance Measurements with Radiocompounds	467
Instrumentation	400	Continuous Infusion Clearance	467
Procedure	400	Single Injection Clearance	467
Special Techniques	403	Simplified Single Injection Clearance	468
Normal Liver Scan	407	Radiorenography	468
Variants and Artifacts	412	Compounds Available	468
Diseases of Liver	415	Methods	469
Diseases Producing Discrete Defects	416	Analysis	470
Metastasis	416	Clinical Application	472
Hepatoma	418	Radioimmunoassay of Angiotensin-I	474
Abscess	418	36. Clinical Applications of Renal Imaging— <i>E. G. Bell, M.D., Ph.D., and M. D. Blaufox, M.D., Ph.D.</i>	476
Pseudotumor	424	Autoradiographic Studies	476
Radiation Injury	427	Radiopharmaceuticals for Renal Imaging	477
Extrahepatic Masses	428	Mercury Chlormerodrin	477
Other Causes of Discrete Defects	429	Technetium Compounds	477
Diseases Producing Diffuse Involvement	429	Iodine-131- <i>o</i> -Iodohippurate ...	481
Cirrhosis	436	Clinical Indications for Studies ..	481
Hepatitis	438	Anomalies	481
Other Diffuse Diseases	438	Urinary Outflow Tract	481
Biliary Obstruction	438	Urinary Tract Infection	483
Accuracy of Liver Scan	452	Renal Vascular Diseases	483
34. Pancreas Scanning— <i>S. Landman, M.D., and A. Gottschalk, M.D.</i>	456	Renal Tumors	485
Methods and Mechanisms	456	Traumatic Lesions	486
Technique	457	Diffuse Renal Diseases	486
Indications	459	Renal Transplantation Evaluation	488
Results	460	Conclusion	490
Clinical Utility	461	37. The Use of Radionuclides in Diseases of the Lower Urinary Tract— <i>M. D. Blaufox, M.D., Ph.D., and E. G. Bell, M.D., Ph.D.</i>	492
Section XII		Prostatic Imaging	492
NUCLEAR NEPHROLOGY			
35. General Principles of Renal Evaluation with Radionuclides— <i>M. D.</i>			

Residual Urine	492	Soft Tissue Tumors— <i>P. O. Alderson, M.D.</i>	537
Radionuclide Cystogram	495		
<i>Section XIII</i>			
OSSEOUS NUCLEAR MEDICINE			
38. Bone Scanning— <i>E. W. Fordham, M.D.</i>	497	40. Tumor Scanning of Lymphomas— <i>A. Gottschalk, M.D.</i>	544
Methods and Mechanism	497	Scanning Technique	544
Radiopharmaceuticals	497	Hodgkin's Disease	545
Equipment	498	Other Lymphomas	547
Normal Scan	499	Scanning Patients with Recurrent Disease	547
Indications for Bone Scanning ..	500	<i>Section XV</i>	
Vascular Disease	504	TRAUMA	
Metastatic Disease	505	41. The Use of Radionuclide Imaging in Diagnosis and Management of the "Acute" or Traumatized Patient— <i>B. C. Berg, Jr., M.D.</i> ..	550
Primary Bone Neoplasm	510	General Considerations	551
Paget's Disease	512	Facility Design	551
Fibrous Dysplasia	513	Examination Technique	551
Osteomyelitis	518	Hepatosplenic Imaging	552
Metabolic Bone Disorder	520	Renovascular Imaging	553
Arthritis	522	Interpretation	553
Traumatic and Iatrogenic Lesions	523	Case Presentations	553
Congenital and Developmental Disorders	525	<i>Section XVI</i>	
Stress Effects	525	SPECULATION	
Hypertrophic Pulmonary Osteoarthropathy	526	42. Prospects for the Future— <i>A. Gottschalk, M.D., and E. J. Potchen, M.D.</i>	564
Nonosseous Abnormality and Artifacts	526	Review of Organ Systems	565
Radiation Effects	526	Brain	565
Summary	527	Thyroid	565
<i>Section XIV</i>		Lung	565
TUMOR SCANNING		Liver Scanning	566
39. Scanning of Nonlymphomatous		Bone Scanning	566
		Tumor Scanning	566
		Utilization of Medical Imaging ..	566

Section I

HISTORICAL CONSIDERATIONS

1

The Beginnings of Nuclear Medicine

E. R. N. GRIGG, M.D.

As a rule, basic scientific advances acquire notoriety only after their practical applications. The discovery of x-rays by the college physics teacher Wilhelm Conrad Roentgen (1845-1923) in Germany resulted in both immediate and numerous applications, and thereby achieved almost instant recognition.

But when in a given field the applications are slow in coming, continued pure scientific ad-

vances tend to clutter the chronology in competition for subsequently coveted priorities. If one disregards the "mysterious" darkening of photographic plates by Crookes' tubes prior to 1895 (Grigg, 1965), Radiology started on November 8, 1895, when Roentgen produced the first x-ray image of his wife's hand. There is no such clear-cut starting date for Nuclear Medicine.

DEFINITION AND NOMENCLATURE

To list the cardinal terms or key words (computer people call them "buzz" words) encountered in the discipline under consideration, and to learn their origin and meanings is more than merely desirable. To modern historians this type of etymologic evaluation is a basic tool, mandatory before any other retrospective investigation. The point is readily proved by reference to the paper announcing the discovery of polonium (1898) in which Pierre Curie (1859-1906) and Marja Sklodowska-Curie (1867-1934) coined the words *radioactive* and *radioactivity*.

In a terminologic handbook (Young and Likos, 1972), Nuclear Medicine is defined as that branch which employs radioisotopes in the diagnosis and treatment of diseases. The nucleomedical researcher and historiographer Marshall Herbert Brucer reached a similar definition by exclusion, noting first that Nuclear Medicine is not Radiophysics, not Health Physics, not In-

strument Design, not Radiation Therapy, albeit a bit of each of these and of several more: according to Brucer (1966), Nuclear Medicine is a mixed discipline which emphasizes isotopes in diagnosis and therapy. On the current (1973) application blank of the first American College of Nuclear Medicine incorporated in Texas in 1971, prospective members are called "isotopologists."

By innuendo, the use of the term *isotope* in such definitions implies that Nuclear Medicine utilizes substances which are artificially radioactive. Their largest supplier, the United States Atomic Energy Commission (A.E.C.), coined for these substances the term *by-products* because at the time plutonium (of A-bomb fame) was the main product in breeder reactors.

Isotopes are two or more elements with the same atomic number, the same location on the periodic table of elements, and nearly identical