

MEDICAL X-RAY TECHNIQUES
IN DIAGNOSTIC RADIOLOGY



MEDICAL X-RAY TECHNIQUES IN DIAGNOSTIC RADIOLOGY

A Textbook for Radiographers and Radiological Technicians

G.J. VAN DER PLAATS

Former Chief Radiologist, St Annadal Hospital, Maastricht

with the assistance of

P. VIJLBRIEF

*Radiologist, Research Laboratory,
Radiological Clinic, University of Leiden*



1980

MARTINUS NIJHOFF PUBLISHERS

The Hague / Boston / London

Distributors for Martinus Nijhoff:

for the United States and Canada

Kluwer Boston, Inc.
160 Old Derby Street
Hingham, MA 02043
USA

*for Europe (excluding the United Kingdom,
Eire, and Comecon countries)*

Kluwer Academic Publishers Group
Distribution Center
P.O. Box 322
3300 AH Dordrecht
The Netherlands

ISBN-13: 978-94-009-8787-6 e-ISBN-13: 978-94-009-8785-2
DOI: 10.1007/978-94-009-8785-2

First edition published by Centrex Publishing Company,
Eindhoven, The Netherlands, 1959
Second edition 1961
Third edition 1969

Fourth edition first published 1980
in Europe (excluding the United Kingdom, Eire,
and Comecon countries) the United States and Canada,
by Martinus Nijhoff Publishers
The Hague, The Netherlands

Published in the rest of the World by
The Macmillan Press Ltd
London and Basingstoke
Associated companies in Delhi Dublin
Hong Kong Johannesburg Lagos Melbourne
New York Singapore and Tokyo

Copyright © G. J. van der Plaats 1959, 1961, 1969, 1980
Softcover reprint of the hardcover 1st edition 1980
*All rights reserved. No part of this publication may be reproduced, stored in a retrieval
system, or transmitted in any form or by any means, mechanical, photocopying, recording,
or otherwise, without prior permission.*

Contents

	<i>Foreword</i>	vii
1	Discovery and production of X-rays; construction and function of the X-ray tube	1
2	Formation and properties of X-rays	35
3	Dosimetry, radiation hazards and protective measures	58
4	Methods of image formation and laws of projection	85
5	Sharpness and unsharpness	104
6	Contrast	114
7	Perceptibility of detail in the radiographic image; Image quality	131
8	Properties of fluoroscopic screens, radiographic films, intensifying screens and cassettes	143
9	Image intensification and X-ray television	171
10	Processing technique	192
11	Fluoroscopy and radiographic technique in general	237
12	Special radiographic techniques	260
13	Radiographic examinations using contrast media	329
14	Exposure, exposure tables, automatic density control	337
15	Diagnostic X-ray apparatus	378
16	Diagnostic stands and accessories	412
	<i>Index</i>	445

Foreword

*by Professor J. H. Middlemiss,
Department of Radiodiagnosis,
The Medical School,
University of Bristol*

This book, for so long and so deservedly, has been a favourite and reliable guide for any person undergoing training in diagnostic radiology whether that person be doctor or technician. This new, largely re-written edition is even more comprehensive. And yet throughout the book simplicity of presentation is maintained.

Professor G. J. van der Plaats has been well known to radiologists in the English-speaking world for more than three decades. He has been, and still is, respected by them for his vision, his thoroughness, determination and meticulous attention to detail and for his unremitting enthusiasm. The standard of radiography in the Netherlands throughout this period has been recognised as being of the highest quality, and this has, in no small measure, been due to the pattern set by Professor van der Plaats and his colleagues.

As radiology has developed and grown, as new techniques have been devised, as apparatus has become more complex and sophisticated, as automation has been introduced, so has there been a tendency for both radiologist and radiographer, especially those in training, to become divorced from the fundamental essentials of their work. The exotic attracts and often there does not seem to be any glamour in the basic concepts and the basic practices through which radiology has passed and out of which modern radiology has grown. Yet it is only by having a complete understanding of the basic practices that modern radiology can exist or can expect to develop even further. In this book Professor van der Plaats guides the beginner with great expertise and with consummate interest through all the fundamental problems step by step, dealing in turn with every aspect of the technical factors involved in the production of X-ray images. As automation has invaded our dark-rooms there are radiographers qualifying in some industrialised countries who have never performed and in some cases have never even seen hand processing. The author has forgotten nothing. He takes the learner through all the fundamental aspects of processing with a wealth of practical wisdom and experience.

As radiology continues to grow and as its uses are spreading further and further into the remote areas of non-industrialised countries, so is simple X-ray apparatus being designed and manufactured for use in those places. This type of X-ray service is likely to be termed a primary radiological service. In such a service there will be no place for image intensifiers, or television chains, probably no place for fluoroscopy; there certainly will not be automatic processing. It is unlikely that there will be enough trained radiologists to give constant radiological cover in such a service. Yet there must be trained radiographers and there must be facilities for the training of technicians to operate these machines and to provide a service to the clinician. Professor van der Plaats' book will provide all the knowledge required by persons undergoing such training, and provide it in such a way that it is understood. For this reason alone this book deserves the widest circulation possible in those parts of the world where a primary radiological service is being developed and where the training of X-ray operators is being undertaken.

Yet, let it not be thought that this book is only for use where rudimentary use of radiology is contemplated or where only a primary radiological service is provided. As mentioned earlier the book is comprehensive. It includes adequate presentation and discussion on such subjects as contrast media, routine radiographic techniques, special techniques, tomography, macro-radiography, stereoscopic fluoroscopy, cine-radiography and even C.T. scanning; it gives details of exposures and exposure tables, and density control; it gives details of apparatus construction. It truly is a compendium.

I recommend it to all training schools where radiographers and radiologists are trained. And many experienced radiologists will benefit from browsing through its pages and will wish to keep it on the bookshelf in their departments where they can refer to it when some technical problem occurs, as inevitably they do occur in everyday life. This book is about everyday life in a Department of Diagnostic Radiology.