

# **FOUR LECTURES ON STATIC ELECTRIC INDUCTION**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649504817

Four Lectures on Static Electric Induction by J. E. H. Gordon

Except for use in any review, the reproduction or utilisation of this work in whole or in part in any form by any electronic, mechanical or other means, now known or hereafter invented, including xerography, photocopying and recording, or in any information storage or retrieval system, is forbidden without the permission of the publisher, Trieste Publishing Pty Ltd, PO Box 1576 Collingwood, Victoria 3066 Australia.

All rights reserved.

Edited by Trieste Publishing Pty Ltd.  
Cover @ 2017

This book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, re-sold, hired out, or otherwise circulated without the publisher's prior consent in any form or binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser.

[www.triestepublishing.com](http://www.triestepublishing.com)

**J. E. H. GORDON**

**FOUR LECTURES ON  
STATIC ELECTRIC  
INDUCTION**



21895

FOUR LECTURES  
ON  
STATIC ELECTRIC INDUCTION.

*miss Edward* BY  
J. E. H. GORDON, B.A.,  
*Miss* Assistant Secretary of the British Association.

DELIVERED AT THE  
ROYAL INSTITUTION OF GREAT BRITAIN, 1879.

Illud in his rebus non est mirabile, quare,  
omnia cum rerum primordia sint in motu,  
summa tamen summa videatur stare quiete,  
præterquam siquid proprio dat corpore motus,  
omnis enim longe nostris ab sensibus infra  
primorum natura jacet.

Lucretius, II, 308.

New York :

D. VAN NOSTRAND, PUBLISHER,  
23, WARREN AND 27, MURRAY STREETS.

1881.

Andrews D. 9-15-98

# CONTENTS.

## LECTURE I.

THURSDAY, *January 16th*, 1879.

	PAGE
Introductory . . . . .	1
Preliminary Experiments . . . . .	4
Conductors and Insulators . . . . .	8
Equal quantities of the two electricities are always induced . . . . .	12
Statement of the problem, "When induction takes place between two bodies, what is the nature of the action across the intervening space?" . . . . .	14
Induction is a state of strain; in conductors this state is continually giving way . . . . .	16
Mechanical illustration . . . . .	16
When current passes, strain gives way, and in- duction ceases . . . . .	20
Strain of glass released by heating it. . . . .	21
Impossibility of producing one kind of elec- tricity only . . . . .	22

## LECTURE II.

THURSDAY, *January 23rd.*

	PAGE
Continuation of arguments for supposing induction to be a state of strain.	
The Leyden jar . . . . .	25
Residual charge . . . . .	29
Mechanical experiment to explain it . . . . .	30
Phenomena caused by straining of glass of jar . . . . .	31
Hopkinson's experiment, showing that the recovery from the state of strain is hastened by mechanical tapping . . . . .	34
How is the electric strain propagated? . . . . .	39
Faraday's study of induction in curved lines . . . . .	40
Experiments showing that induction can turn a corner, and is therefore not a direct action at a distance . . . . .	40
Induction must precede discharge . . . . .	44
Curved discharge . . . . .	45
Faraday and Maxwell's theory of lateral pressure accompanying tension force of induction . . . . .	47
De la Rue's observation of a lateral pressure in vacuum tubes . . . . .	48

## LECTURE III.

THURSDAY, *January 30th.*

If induction is a state of strain of the medium through which it is propagated, different

## CONTENTS.

V

	PAGE
media should propagate it with different strengths; that is, should show differences of specific inductive capacity. Faraday's experiments show that they do so. . . .	49
Faraday's measurements . . . . .	53
His results . . . . .	60
Reasons for accurate measurements . . . .	61
Recent measurements by the Lecturer . . .	63
Theory of the new experiments . . . . .	65
Experimental details:—	
The induction balance . . . . .	73
The coil . . . . .	79
The rapid break . . . . .	80
The secondary reversing engine . . . .	83
Plan of the laboratory . . . . .	84
Experiment made before the audience . . .	86
Table of results . . . . .	90

## LECTURE IV.

THURSDAY, *February 6th.*

Specific inductive capacities of gases:—	
Faraday's experiments . . . . .	92
Ayrton and Perry's experiments . . . .	93
The open condenser . . . . .	95
The closed condenser . . . . .	95
Table of results . . . . .	99
Clerk Maxwell's electro-magnetic theory of light	100



	PAGE
Arguments for supposing electric induction and light to be strains of the same ether . . . . .	105
In both cases the energy is partly potential and partly kinetic . . . . .	107
Vibrations of electric induction are like those of light at right angles to the direction of the ray . . . . .	110
The theory accounts for the fact that conductors are opaque . . . . .	113
Comparison of velocity of light with that of electro-magnetic induction . . . . .	114
Table of velocities . . . . .	118
In air and vacuum velocities sensibly equal	120
Determination of velocities in other media:—	
Of light . . . . .	120
Of electro-magnetic induction . . . . .	122
Comparison . . . . .	123
Experiments showing actions of electricity on light and <i>vice versa</i> . . . . .	126
Electro-magnetic action on polarized light discovered by Faraday . . . . .	127
Electro-static action on polarized light discovered by Dr. Kerr . . . . .	133
Effect of light on selenium:—	
Increases the conductivity . . . . .	139
Produces a current . . . . .	140
Conclusion . . . . .	140

FOUR LECTURES  
ON  
ELECTROSTATIC INDUCTION,  
DELIVERED AT THE ROYAL INSTITUTION,  
JAN. 16, 23, 30, AND FEB. 6,  
1879,

BY J. E. H. GORDON, B.A.  
(Assistant Secretary of the British Association).

---

LECTURE I.

JAN. 16.

INTRODUCTORY.

“ Amongst the actions of different kinds into which electricity has conventionally been subdivided, there is, I think, none which excels, or even equals, in importance that called *Induction*. It is of the most general influence in electrical phenomena, appearing to be concerned in every one of them, and has in reality the character of a first, essential, and fundamental principle. Its comprehension is so important that I think we cannot proceed much further in the investigation of

the laws of electricity without a more thorough understanding of its nature. How otherwise can we hope to comprehend the harmony and even unity of action which doubtless governs electrical excitement by friction, by chemical means, by heat, by magnetic influence, by evaporation, and even by the living being ?”

So, forty-two years ago, wrote the Master whose memory is honoured wherever the study of natural laws is loved, and whom in this place we should more especially remember, as the Royal Institution was his home and workshop during all the best years of his life. Need I add that the passage I have just read is from the “ Experimental Researches ” of Faraday ?

The subject of our study to-day and in the other lectures of this course will be such of the laws of induction as are now clearly known. I shall first endeavour to show you what the term induction means, and what is the problem about it which for fifty years students of nature have been trying to solve. The problem is partly