## Science for the Curious PHOTOGRAPHER

Charles S. Johnson, Jr.<br>Department of Chemistry University of North Carolina at Chapel Hill



## CHAPTERS

1. What is photography? $\quad 1$
2. What is light? 5
3. The camera - an introduction 11
4. Images: What is perspective? 18
5. Why does a camera need a lens? 22
6. Elementary optics. How do lenses work? 25
7. The simple thin lens and what it does 30
8. How to make lenses that are good enough for photography 36
9. Coming to terms with real camera lenses 48
10. Fisheye lenses and how they can capture the whole sky 58
11. What is an equivalent image? 67
12. How to get really high magnification 76
13. Filters: Absorption, polarization, and possibilities for UV/IR photography 95
14. The limits of human vision - How good does a photographic image need to be? 114
15. The perception of color - How can color be managed? 123
16. Image capture and processing 147
17. All about resolution, contrast, and perceived image quality 162
18. The creation and appreciation of art in photography 178

## Appendices

A. Historical note on enlargers 194
B. What is behind the rules of optics? 195
C. Derivation of the lens maker's equation 200
D. Gaussian optics and principal planes 202
E. Characteristics of the Sigma 105mm macro lens with attachments 203
F. Capturing photons with photographic film 205
G. Historical note on microelectronics and the path to digital sensors 211
H. Irradiance and illuminance units 213

This is a course in the understanding of photography. It is suitable for self study, continuing education, and science seminar courses at the college level. The requirements are an interest in science and a tolerance for graphs and a few equations.

The book is available as a CD for \$20. For corrections, updates, feedback see: photophys.com

