

CHAPTER I



INTRODUCTION

1.1 Historical Review¹

The use of a single lens as a magnifier has been known for a long time. The first simple microscope was invented in Holland by Antony van Leeuwenhoek (1632-1723). He developed better methods for the grinding and polishing of small lenses.

It is believed that compound microscope was invented by Giambattista della Porta. However Zacharias Jansen and Lippershey of Middelburg are credited with the actual introduction of the instrument around the year 1610.

The practice of microscopy was developed by an Englishman named Robert Hooke, whose Micrographia was published in 1665. The discovery of achromatic lens during the years 1733-1758 has made a great improvement of optical instruments. Achromatic lens was not used for a microscope until 1830. Carl Zeiss, the famous German optical firm, is the first to produce fine modern optical instruments.

¹ L.C. Martin, An Introduction to Applied Optics (London: Sir Isaac Pitman & Sons, Ltd., 1932), vol. 2, p. 75.

A traveling microscope is a kind of low-power microscope which can be pushed to slide on a graduated mechanical stage by means of a micrometer screw. The microscope serves as an optical pointer as well as a magnifier. To measure the object size the microscope is pointed toward a certain edge of the object and then slid to another edge. The distance traveled by the microscope is equal to the separation between the edges.

1.2 Experimental Purpose

A traveling microscope was designed to have 30 times magnification and the vernier scale which could be read to 0.01 cm.

The traveling microscope consists of 4 parts which are described in the following:

1. The objective is a lens combination of flint glass ($n_D = 1.68881$, $v_D = 30.97$ at 24.5°C) and dense barium crown glass ($n_D = 1.6229$, $v_D = 56.89$ at 24.5°C) in Fraunhofer type. The aperture of objective is 1.0 cm of diameter for the design. The magnification is 3 times.

2. The eyepiece or ocular is Ramsden type, consisting of two plano-convex lenses, and is made from extra light flint glass ($n_D = 1.54082$, $v_D = 47.19$ at 24.5°C). The magnification is 10 times.

3. The mechanical part was designed for easy use. It can be used in 2 positions: horizontal and vertical. The optical tube length is 160 mm, and a pair of cross-hairs are made from tungsten wire of 0.015 mm diameter. The pair of cross-hairs are introduced into the ocular focal plane at field stop. The diameter of field stop is 12 mm while the diameter of the exit pupil is 5 mm.

4. The vernier scale was designed so that one division is equal to 4.9 mm.

The radii of curvature of lens system required were determined by using a computer. The lens making, the instrument construction and testing will be described in the later sections.