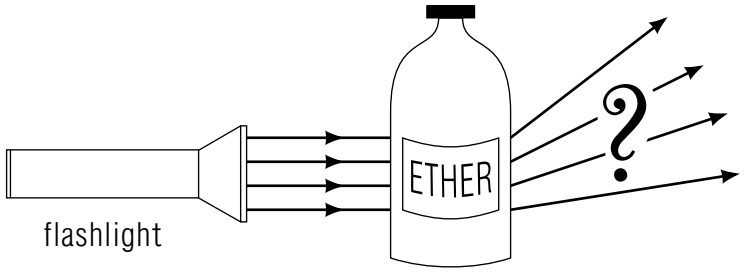
PHYSNET

MISN-0-73

# SPECIAL RELATIVITY: THE MICHELSON-MORLEY Experiment




Project PHYSNET Physics Bldg. Michigan State University East Lansing, MI

SPECIAL RELATIVITY: THE MICHELSON-MORLEY Experiment

by

Frank Zerilli

Title: **Special Relativity: The Michelson-Morley Experiment**

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Length: 1 hr; 8 pages

**Input Skills**:

1. Solve simple problems involving relative motion, using the Galilean transformation (MISN-0-11).
2. Expand a function around a point using Taylor's series (MISN-0-4).

**Output Skills (Knowledge)**:

K1. State the two postulates upon which special relativity is based.

K2. Derive the Michelson-Morley fringe shift in terms of the velocity of the earth with respect to a presumed ether.

K3. State how the results of the Michelson-Morley experiment help to justify one of the postulates of special relativity.

**External Resources (Required)**:

1. R.T. Weidner and R.L. Sells, *Elementary Modern Physics*, Allyn and Bacon, Boston (1980). For availability, see this module's *Local Guide*.



THIS IS A DEVELOPMENTAL-STAGE PUBLICATION
OF PROJECT PHYSNET

The goal of our project is to assist a network of educators and scientists in transferring physics from one person to another. We support manuscript processing and distribution, along with communication and information systems. We also work with employers to identify basic scientific skills as well as physics topics that are needed in science and technology. A number of our publications are aimed at assisting users in acquiring such skills.

Our publications are designed: (i) to be updated quickly in response to field tests and new scientific developments; (ii) to be used in both classroom and professional settings; (iii) to show the prerequisite dependencies existing among the various chunks of physics knowledge and skill, as a guide both to mental organization and to use of the materials; and (iv) to be adapted quickly to specific user needs ranging from single-skill instruction to complete custom textbooks.

New authors, reviewers and field testers are welcome.

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## 1. Study Guide

Unless otherwise stated, the references below are to WSM[1]

- Study Sections 2-1 and the first paragraph of Section 2-5 for Output Skill K1.
- Sections 2-2 and 2-3 are also helpful in understanding the significance of the first postulate of special relativity.
- Study Section 2-4 and Appendix I for Output Skills K2 and K3. For another description of the Michelson-Morley experiment (Skill K2), this reference may be helpful: A. Beiser, *Perspectives of Modern Physics*, McGraw-Hill (1969) (see this module's Local Guide for details on obtaining this reference), Section 1.1 on the Michelson-Morley experiment.
- For an interesting brief biography of one of the first great American experimental physicist, Albert Michelson, and a reprint of the original paper describing the Michelson-Morley experiment, read this excerpt: "Albert Abraham Michelson" from *Selected Papers of Great American Physicists*, ed. by S. . Weart (American Institute of Physics: New York, 1976), pp. 63 - 80 (see this module's Local Guide for details on obtaining this reference).

## Acknowledgments

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[1] R. Weidner and R. Sells, *Elementary Modern Physics*, 3rd Edition, Allyn and Bacon (1980). For availability, see this module's *Local Guide*.





# LOCAL GUIDE

The readings for this unit are on reserve for you in the Physics-Astronomy Library, Room 230 in the Physics-Astronomy Building. Ask for them as "The readings for CBI Unit 73." Do **not** ask for them by book title.