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# Introduction to Workshop on Physics Teaching and the Development of Reasoning

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# **WORKSHOP ON PHYSICS TEACHING AND THE DEVELOPMENT OF REASONING**

BY

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## Preface

Are physics teachers in high schools, colleges, and universities knowledgeable concerning the reasoning patterns their students use? The personal experiences of many instructors and research carried out during the last few years indicate that a substantial fraction of physics students have difficulty applying functional relationships among variables, considering all necessary combinations of experimental and theoretical conditions in a problem, and examining their own reasoning critically to locate possible errors. The theory of intellectual development formulated by the Swiss psychologist and epistemologist Jean Piaget deals with these matters and can therefore be of help to physics teachers.

We have prepared these individualized workshop materials to present the two principal concepts of Piaget's theory, stages of development and self-regulation, with background and illustrations that will make clear their relevance for physics teaching. The complete workshop includes audio-visual materials, laboratory activities, and discussions among groups of participants and workshop leaders, as described more fully in the "Guide for Workshop Leaders" also available from AAPT.

The titles of the eleven workshop modules are as follows:

1. How Students Think
2. Concrete and Formal Thought
3. Proportional Reasoning of College Students (Videotape)
4. "Formal Thought" (Film)
5. Analysis of Physics Problems
6. Analysis of Instructional Materials
7. Self-Regulation
8. Learning Activities for Self-Regulation
9. Analysis of Physics Concepts
10. Teaching Goals and Strategies
11. Suggested Reading

You will begin your workshop experience by studying the Orientation Module prepared by your workshop leader to describe the procedures and schedule that will be followed in your workshop.

We are grateful for many thoughtful comments and suggestions to the more than one hundred participants in the workshop held at Anaheim, CA using the trial edition of these materials. We are also indebted to Arnold A. Strassenburg, Warren Wollman, and Anton E. Lawson for reviewing our drafts and providing extensive assistance in the preparation of these materials.