

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

The RESEARCH LABORATORY *of* ELECTRONICS

PROGRESS REPORT

NO. 139

JANUARY 1 – DECEMBER 31, 1996



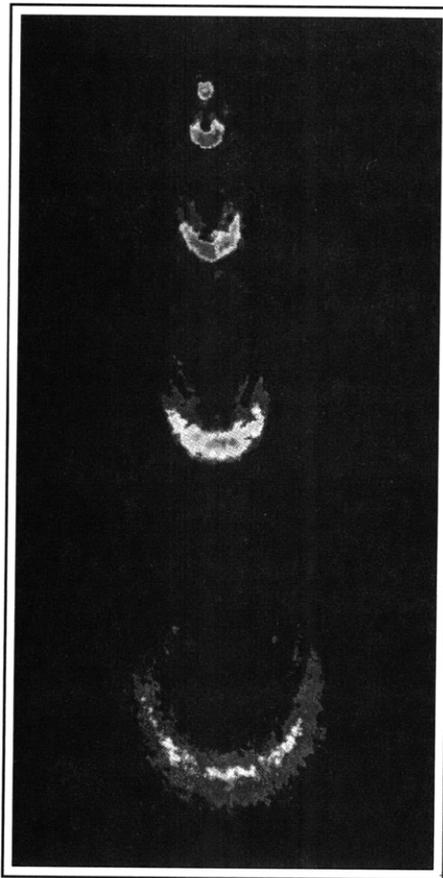
RLE Progress Report

No. 139

January 1 – December 31, 1996

Submitted by

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Professor Daniel Kleppner



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Cover and title page.

An atom laser in operation. The picture shows pulses of coherent sodium atoms coupled out from a Bose-Einstein condensate confined in a magnetic trap. Every five milliseconds, a short rf pulse rotated the magnetic moment of the trapped atoms, transferring a fraction of these atoms into a quantum state which is no longer confined. These atoms were accelerated downward by gravity. The atom pulses were observed by illuminating them with resonant laser light and imaging their shadows which were caused by absorption of the light.

For more information about Professor Wolfgang Ketterle's research see the section on cooling and trapping neutral atoms beginning on page 222 of this book. *RLE currents* (Spring 1997) discusses Bose-Einstein condensation (BEC) and other research being done by RLE's Atomic, Molecular, and Optical Physics Group. Also see :<http://amo.mit.edu/Ketterle.html> and :<http://bink.mit.edu/dallin/nat.html>.

Our special thanks to the following people: Julian G.R. Maynard for organizational support, formatting, and proofreading; Ben Richardson for graphics processing, editorial assistance, and formatting; John F. Cook for design of the cover, title, and divider pages; Wendy E. Owens for formatting, graphics processing, copyediting, and proofreading; Ahsaki S. Hardy for formatting, inputting information, and proofreading; Nia M. Jetter for formatting; and Donna L. Gale for proofreading. We also want to thank David W. Foss, Computer System Manager, for his time and invaluable technical assistance.

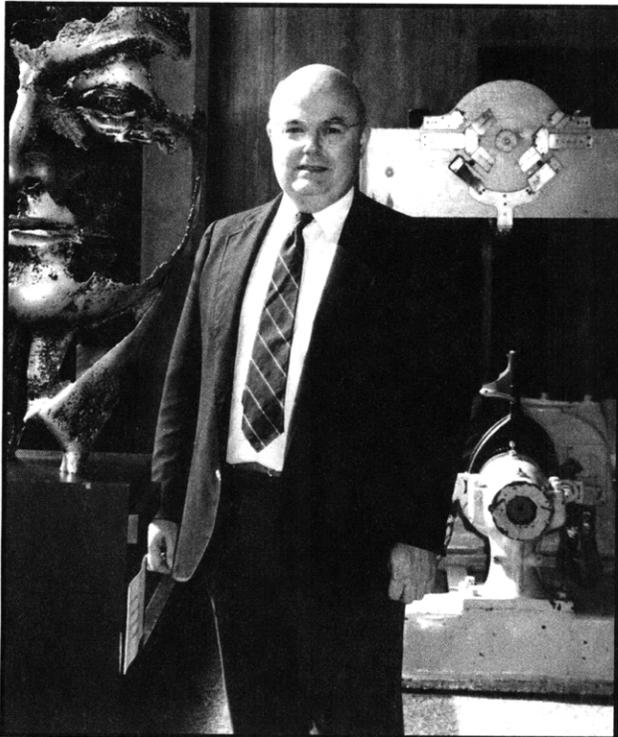
We thank the faculty, staff, and students of RLE for their generous cooperation.

Editor:	Barbara Passero
Design and photography:	John F. Cook
Illustration/Design:	Robert H. Priest
Printer:	Glidway Printing
Typesetting:	This report was produced with IBM BookMaster Software.

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The Research Laboratory of Electronics

The Research Laboratory of Electronics (RLE) was established in 1946 as the Institute's first interdepartmental laboratory. Originally organized under the joint sponsorship of the Departments of Physics and Electrical Engineering, RLE has broadened its interests to cover a wide range of research.



Professor Jonathan Allen, Director, Research Laboratory of Electronics (Photo by John F. Cook)

RLE's 50th Anniversary

In November 1996, RLE celebrated 50 years of technological impact and innovation with a technical conference, special exhibit, activities for alumni, and other events. Two special issues of *RLE currents* described the achievements of twenty of RLE's entrepreneurial alumni. See RLE's 50th anniversary page on the World Wide Web for photos of the event or contact RLE Headquarters, telephone: (617) 253-2509; fax (617) 253-1301.

RLE Progress Report

RLE Progress Report Number 139 describes research programs at RLE for the period January 1 through December 31, 1996. Each chapter of the *Progress Report* includes a summary of research efforts for research projects listed. Faculty, research staff, students and others who participated in these projects are identified at the beginning of each project, along with sources of funding.

There are four appendices at the end of the report: Appendix A is a bibliography of RLE publications and papers presented by RLE staff during 1996; Appendix B is a roster of current RLE staff; Appendix C is a list of RLE faculty and staff milestones and honors received during 1996; and Appendix D is an index of RLE sponsors. The Project Staff and Subject Index provides additional access to the information in this report.

RLE on the World Wide Web

RLE has a presence on the World Wide Web (<http://rleweb.mit.edu>). RLE web pages include an introduction to RLE research and services; information about RLE's history, research groups, staff, and publications along with news of RLE events, and a history of the Radiation Laboratory (1940-1945).

RLE Publications

RLE also publishes *RLE currents*, a biannual newsletter which focuses on RLE research interests; a technical report series; *Speech Group Working Papers*; and other information related to the Laboratory.

For more information, write Massachusetts Institute of Technology, Research Laboratory of Electronics, Communications Office, Room 36-412, 77 Massachusetts Avenue, Cambridge, Massachusetts 02139-4307, Tel. (617) 253-2566, Fax (617) 258-7864.

