Subsec. (a). Pub. L. 111–383, §901(b)(8)(A), (B), redesignated subsec. (b) as (a), substituted "The Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs" for "The Assistant to the Secretary" in introductory provisions, and struck out former subsec. (a) which read as follows: "There is an Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs, appointed by the President, by and with the advice and consent of the Senate."

Subsec. (b). Pub. L. 111–383, §901(b)(8)(C), added subsec. (b). Former subsec. (b) redesignated (a).

Subsec. (c). Pub. L. 111–383, §901(b)(8)(C), struck out subsec. (c), which read as follows: "The Assistant to the Secretary shall be considered an Assistant Secretary of Defense for purposes of section 138(d) of this title."

2008—Subsec. (c). Pub. L. 110-417 added subsec. (c).

1996—Pub. L. 104–106, $\S904(a)(1)(A)$, substituted "Nuclear and Chemical and Biological Defense Programs" for "Atomic Energy" in section catchline.

Pub. L. 104–106, \$903(a), (c)(4), which directed repeal of this section eff. Jan. 31, 1997, was repealed by Pub. L. 104–201.

Subsec. (a). Pub. L. 104–106, §904(a)(1)(B), substituted "Nuclear and Chemical and Biological Defense Programs" for "Atomic Energy".

Subsec. (b). Pub. L. 104-106, §904(a)(1)(C), added subsec. (b) and struck out former subsec. (b) which read as follows: "The Assistant to the Secretary shall advise the Secretary of Defense and the Nuclear Weapons Council on nuclear energy and nuclear weapons matters."

1993—Pub. L. 103–160 renumbered section 141 of this title as this section.

EFFECTIVE DATE OF 2011 AMENDMENT

Amendment by Pub. L. 111–383 effective Jan. 1, 2011, see section 901(p) of Pub. L. 111–383, set out as a note under section 131 of this title.

EXCEPTION TO SENATE CONFIRMATION REQUIREMENT

Pub. L. 100–180, div. A, title XII, §1245(b), Dec. 4, 1987, 101 Stat. 1165, provided that the person serving as Chairman of the Military Liaison Committee, Department of Defense, on Oct. 16, 1986, could be appointed as the Assistant to the Secretary of Defense for Atomic Energy without the advice and consent of the Senate.

§ 139. Director of Operational Test and Evaluation

- (a)(1) There is a Director of Operational Test and Evaluation in the Department of Defense, appointed from civilian life by the President, by and with the advice and consent of the Senate. The Director shall be appointed without regard to political affiliation and solely on the basis of fitness to perform the duties of the office of Director. The Director may be removed from office by the President. The President shall communicate the reasons for any such removal to both Houses of Congress.
 - (2) In this section:
 - (A) The term "operational test and evaluation" means—
 - (i) the field test, under realistic combat conditions, of any item of (or key component of) weapons, equipment, or munitions for the purpose of determining the effectiveness and suitability of the weapons, equipment, or munitions for use in combat by typical military users; and
 - (ii) the evaluation of the results of such
 - (B) The term "major defense acquisition program" means a Department of Defense acqui-

- sition program that is a major defense acquisition program for purposes of section 2430 of this title or that is designated as such a program by the Director for purposes of this section.
- (b) The Director is the principal adviser to the Secretary of Defense and the Under Secretary of Defense for Acquisition, Technology, and Logistics on operational test and evaluation in the Department of Defense and the principal operational test and evaluation official within the senior management of the Department of Defense. The Director shall—
 - (1) prescribe, by authority of the Secretary of Defense, policies and procedures for the conduct of operational test and evaluation in the Department of Defense;
 - (2) provide guidance to and consult with the Secretary of Defense and the Under Secretary of Defense for Acquisition, Technology, and Logistics and the Secretaries of the military departments with respect to operational test and evaluation in the Department of Defense in general and with respect to specific operational test and evaluation to be conducted in connection with a major defense acquisition program;
 - (3) monitor and review all operational test and evaluation in the Department of Defense;
 - (4) coordinate operational testing conducted jointly by more than one military department or defense agency;
 - (5) review and make recommendations to the Secretary of Defense on all budgetary and financial matters relating to operational test and evaluation, including operational test facilities and equipment, in the Department of Defense; and
 - (6) monitor and review the live fire testing activities of the Department of Defense provided for under section 2366 of this title.
- (c) The Director may communicate views on matters within the responsibility of the Director directly to the Secretary of Defense and the Deputy Secretary of Defense without obtaining the approval or concurrence of any other official within the Department of Defense. The Director shall consult closely with, but the Director and the Director's staff are independent of, the Under Secretary of Defense for Acquisition, Technology, and Logistics and all other officers and entities of the Department of Defense responsible for acquisition.
- (d) The Director may not be assigned any responsibility for developmental test and evaluation, other than the provision of advice to officials responsible for such testing.
- (e)(1) The Secretary of a military department shall report promptly to the Director the results of all operational test and evaluation conducted by the military department and of all studies conducted by the military department in connection with operational test and evaluation in the military department.
- (2) The Director may require that such observers as he designates be present during the preparation for and the conduct of the test part of any operational test and evaluation conducted in the Department of Defense.
- (3) The Director shall have access to all records and data in the Department of Defense

(including the records and data of each military department) that the Director considers necessary to review in order to carry out his duties under this section.

(f)(1) The Director of the Missile Defense Agency shall make available to the Director of Operational Test and Evaluation the results of all tests and evaluations conducted by the Missile Defense Agency and of all studies conducted by the Missile Defense Agency in connection with tests and evaluations in the Missile Defense Agency.

(2) The Director of Operational Test and Evaluation may require that such observers as the Director designates be present during the preparation for and the conducting of any test and evaluation conducted by the Missile Defense

Agency.

- (3) The Director of Operational Test and Evaluation shall have access to all records and data in the Department of Defense (including the records and data of the Missile Defense Agency) that the Director considers necessary to review in order to carry out his duties under this subsection.
- (g) The Director shall ensure that safety concerns developed during the operational test and evaluation of a weapon system under a major defense acquisition program are communicated in a timely manner to the program manager for that program for consideration in the acquisition decisionmaking process.

(h)(1) The Director shall prepare an annual report summarizing the operational test and evaluation activities (including live fire testing activities) of the Department of Defense during the preceding fiscal year.

- (2) Each such report shall be submitted concurrently to the Secretary of Defense, the Under Secretary of Defense for Acquisition, Technology, and Logistics, and the Congress not later than 10 days after the transmission of the budget for the next fiscal year under section 1105 of title 31.
- (3) If the Director submits the report to Congress in a classified form, the Director shall concurrently submit an unclassified version of the report to Congress.
- (4) The report shall include such comments and recommendations as the Director considers appropriate, including comments and recommendations on resources and facilities available for operational test and evaluation and levels of funding made available for operational test and evaluation activities. The report for a fiscal year shall also include an assessment of the waivers of and deviations from requirements in test and evaluation master plans and other testing requirements that occurred during the fiscal year, any concerns raised by the waivers or deviations, and the actions that have been taken or are planned to be taken to address the concerns.
- (5) The Secretary may comment on any report of the Director to Congress under this subsection
- (i) The Director shall comply with requests from Congress (or any committee of either House of Congress) for information relating to operational test and evaluation in the Department of Defense.
- (j) The President shall include in the Budget transmitted to Congress pursuant to section 1105

of title 31 for each fiscal year a separate statement of estimated expenditures and proposed appropriations for that fiscal year for the activities of the Director of Operational Test and Evaluation in carrying out the duties and responsibilities of the Director under this section.

(k) The Director shall have sufficient professional staff of military and civilian personnel to enable the Director to carry out the duties and responsibilities of the Director prescribed by law.

(Added Pub. L. 98-94, title XII, §1211(a)(1), Sept. 24, 1983, 97 Stat. 684, §136a; amended Pub. L. 99-348, title V, §501(c), July 1, 1986, 100 Stat. 708; renumbered §138 and amended Pub. L. 99-433, title I, §§ 101(a)(7), 110(d)(10), (g)(1), Oct. 1, 1986, 100 Stat. 995, 1003, 1004; Pub. L. 99–500, §101(c) [title X, §§ 903(c), 910(c)], Oct. 18, 1986, 100 Stat. 1783-82, 1783-132, 1783-145, and Pub. L. 99-591, §101(c) [title X, §§903(c), 910(c)], Oct. 30, 1986, 100 Stat. 3341-82, 3341-132, 3341-145; Pub. L. 99-661, div. A, title IX, formerly title IV, §§ 903(c), 910(c), Nov. 14, 1986, 100 Stat. 3912, 3924, renumbered title IX, Pub. L. 100-26, §3(5), Apr. 21, 1987, 101 Stat. 273; Pub. L. 100-26, §7(a)(1), (c)(2), Apr. 21, 1987, 101 Stat. 275, 280; Pub. L. 100-180, div. A, title VIII, §801, Dec. 4, 1987, 101 Stat. 1123; Pub. L. 101-189, div. A, title VIII, §802(b), title XVI, §1622(e)(1), Nov. 29, 1989, 103 Stat. 1486, 1605; Pub. L. 101-510, div. A, title XIV, §1484(k)(1), Nov. 5, 1990, 104 Stat. 1719; renumbered §139 and amended Pub. L. 103-160, div. A, title IX, $\S 901(a)(1)$, 904(d)(1), 907, Nov. 30, 1993, 107 Stat. 1726, 1728, 1730; Pub. L. 103-355, title III, §§ 3011-3013, Oct. 13, 1994, 108 Stat. 3331, 3332; Pub. L. 106-65, div. A, title IX, §911(d)(1), Oct. 5, 1999, 113 Stat. 719; Pub. L. 107-107, div. A, title II, §263, title X, §1048(b)(2), Dec. 28, 2001, 115 Stat. 1044, 1225; Pub. L. 107-314, div. A, title II, §235, Dec. 2, 2002, 116 Stat. 2491; Pub. L. 109-364, div. A, title II, §231(f), Oct. 17, 2006, 120 Stat. 2133; Pub. L. 110-181, div. A, title II, §221, Jan. 28, 2008, 122 Stat. 37; Pub. L. 110-417, [div. A], title II, §251(c), Oct. 14, 2008, 122 Stat. 4400.)

CODIFICATION

Pub. L. 99-591 is a corrected version of Pub. L. 99-500.

PRIOR PROVISIONS

A prior section 139 was renumbered section 140 of this title

Another prior section 139 was renumbered section 2431 of this title.

AMENDMENTS

2008—Subsec. (b)(3) to (7). Pub. L. 110–417 redesignated pars. (4) to (7) as (3) to (6), respectively, and struck out former par. (3) which required the Director to provide guidance to and consult with the officials described in par. (2) of subsec. (b) with respect to operational test and evaluation or survivability testing (or both) within the Department of Defense of force protection equipment.

Subsecs. (f) to (k). Pub. L. 110–181 added subsec. (f) and redesignated former subsecs. (f) to (j) as (g) to (k), respectively.

2006—Subsec. (b)(3) to (7). Pub. L. 109-364 added par. (3) and redesignated former pars. (3) to (6) as (4) to (7), respectively.

2002—Subsec. (g). Pub. L. 107–314, §235(b), designated first sentence as par. (1), second sentence as par. (2), third sentence as par. (3), fourth and fifth sentences as par. (4), and sixth sentence as par. (5).

Pub. L. 107–314, § 235(a), inserted after fourth sentence "The report for a fiscal year shall also include an assessment of the waivers of and deviations from requirements in test and evaluation master plans and other testing requirements that occurred during the fiscal year, any concerns raised by the waivers or deviations, and the actions that have been taken or are planned to be taken to address the concerns."

2001—Subsec. (c). Pub. L. 107–107, §1048(b)(2), substituted "Under Secretary of Defense for Acquisition, Technology, and Logistics" for "Under Secretary of Defense for Acquisition and Technology".

Subsec. (f). Pub. L. 107–107, §263(2), added subsec. (f). Former subsec. (f) redesignated (g).

Subsec. (g). Pub. L. 107-107, §1048(b)(2), substituted "Under Secretary of Defense for Acquisition, Technology, and Logistics" for "Under Secretary of Defense for Acquisition and Technology".

Pub. L. 107–107, §263(1), redesignated subsec. (f) as (g). Former subsec. (g) redesignated (h).

Subsecs. (h) to (j). Pub. L. 107–107, §263(1), redesignated subsecs. (g) to (i) as (h) to (j), respectively.

1999—Subsec. (b). Pub. L. 106–65 substituted "Under Secretary of Defense for Acquisition, Technology, and Logistics" for "Under Secretary of Defense for Acquisition and Technology" in introductory provisions and in par. (2).

1994—Subsec. (b)(6). Pub. L. 103–355, §3012(a), added par. (6).

Subsec. (c). Pub. L. 103–355, §3011, inserted "The Director may communicate views on matters within the responsibility of the Director directly to the Secretary of Defense and the Deputy Secretary of Defense without obtaining the approval or concurrence of any other official within the Department of Defense." after "(c)".

Subsec. (f). Pub. L. 103-355, §§3012(b), 3013, in first sentence inserted "(including live fire testing activities)" after "operational test and evaluation activities" and after second sentence inserted "If the Director submits the report to Congress in a classified form, the Director shall concurrently submit an unclassified version of the report to Congress."

1993—Pub. L. 103–160, $\S 901(a)(1)$, renumbered section 138 of this title as this section.

Subsec. (b). Pub. L. 103-160, §904(d)(1), substituted "Under Secretary of Defense for Acquisition and Technology" for "Under Secretary of Defense for Acquisition" in introductory provisions and in par. (2).

Subsec. (c). Pub. L. 103-160, §907, struck out "The Director reports directly, without intervening review or approval, to the Secretary of Defense personally." after "(c)" and substituted "Under Secretary of Defense for Acquisition and Technology" for "Director of Defense Research and Engineering" and "responsible for acquisition" for "responsible for research and development".

Subsec. (f). Pub. L. 103-160, §904(d)(1), substituted "Under Secretary of Defense for Acquisition and Technology" for "Under Secretary of Defense for Acquisition"

1990—Subsec. (a)(2)(A). Pub. L. 101–510, §1484(k)(1)(A), substituted "(A) The term 'operational test and evaluation" for "(A) 'Operational test and evaluation".

Subsec. (a)(2)(\hat{B}). Pub. L. 101–510, 1484(k)(1)(B), substituted "(B) The term 'major defense acquisition program" for "(B) 'Major defense acquisition program".

gram for (B) Major detense acquisition program.

1989—Subsec. (a)(2)(A). Pub. L. 101–189, §1622(e)(1)(A), which directed amendment of subpar. (A) by substituting "(A) The term 'operational'" for "(A) 'Operational'", could not be executed because a closing quotation mark did not follow "Operational".

Subsec. (a)(2)(B). Pub. L. 101–189, §1622(e)(1)(B), which directed amendment of subpar. (B) by substituting "(B) The term 'major'" for "(B) 'Major'", could not be executed because a closing quotation mark did not follow "Major".

Subsec. (b)(4). Pub. L. 101-189, §802(b)(1)(A), inserted "and" after "defense agency;".

Subsec. (b)(5), (6). Pub. L. 101–189, §802(b)(1)(B), (C), redesignated par. (6) as (5) and struck out former par. (5) which read as follows: "analyze the results of the

operational test and evaluation conducted for each major defense acquisition program and, at the conclusion of such operational test and evaluation, report to the Secretary of Defense, to the Under Secretary of Defense for Acquisition, and to the Committees on Armed Services and on Appropriations of the Senate and House of Representatives as provided in subsection (c)

``(A) whether the test and evaluation performed was adequate; and

"(B) whether the test and evaluation results confirm that the items or components actually tested are effective and suitable for combat; and".

Subsec. (c). Pub. L. 101–189, \$802(b)(2), (3), redesignated subsec. (d)(1) as (c) and struck out former subsec. (c) which read as follows: "Each report of the Director required under subsection (b)(5) shall be submitted to the committees specified in that subsection in precisely the same form and with precisely the same content as the report originally was submitted to the Secretary of Defense and the Under Secretary of Defense for Acquisition and shall be accompanied by such comments as the Secretary may wish to make on the report."

Subsec. (d). Pub. L. 101–189, §802(b)(4), redesignated former par. (2) of subsec. (d) as entire subsec. Former par. (1) of subsec. (d) redesignated subsec. (c).

Subsec. (f). Pub. L. 101–189, §802(b)(5)–(7), redesignated subsec. (g)(1) as (f), substituted "this subsection" for "this paragraph", and struck out former subsec. (f) which read as follows:

"(1) Operational testing of a major defense acquisition program may not be conducted until the Director has approved in writing the adequacy of the plans (including the adequacy of projected levels of funding) for operational test and evaluation to be conducted in connection with that program.

"(2) A final decision within the Department of Defense to proceed with a major defense acquisition program beyond low-rate initial production may not be made until the Director has submitted to the Secretary of Defense the report with respect to that program required by subsection (b)(5) and the Committees on Armed Services and on Appropriations of the Senate and House of Representatives have received that report."

Subsec. (g). Pub. L. 101–189, \$802(b)(6), (8), redesignated former par. (2) of subsec. (g) as entire subsec. (g), and redesignated former par. (1) of subsec. (g) as subsec. (f)

1987—Subsec. (a)(2)(B). Pub. L. 100–26, §7(c)(2), substituted "section 2430" for "section 2432(a)(1)".

Subsec. (c). Pub. L. 100-26, §7(a)(1), substituted "to the Secretary of Defense and the Under Secretary of Defense for Acquisition and shall be accompanied by such comments as the Secretary may wish to make on the report." for "to the Secretary, to the Under Secretary of Defense for Acquisition, and shall be accompanied by such comments as the Secretary of Defense may wish to make on such report."

Subsec. (d). Pub. L. 100-180 designated existing provisions as par. (1) and added par. (2).

1986—Pub. L. 99-433, §§101(a)(7), 110(d)(10), renumbered section 136a of this title as this section, and struck out ": appointment; powers and duties" at end of section catchline

Subsec. (a)(2)(B). Pub. L. 99–433, §110(g)(1), substituted "section 2432(a)(1)" for "section 139a(a)(1)".

Subsec. (b). Pub. L. 99-500 and Pub. L. 99-591, §101(c) [§903(c)(1)-(3)] and Pub. L. 99-661, §903(c)(1)-(3), amended subsec. (b) identically, in provisions preceding par. (1) and in par. (2), inserting "and the Under Secretary of Defense for Acquisition" and, in par. (5), inserting ", to the Under Secretary of Defense for Acquisition," Subsec. (c). Pub. L. 99-500 and Pub. L. 99-591, §101(c)

Subsec. (c). Pub. L. 99-500 and Pub. L. 99-591, §101(c) [§903(c)(4)], and Pub. L. 99-661, §903(c)(4), amended subsec. (c) identically by directing the insertion of ", to the Under Secretary of Defense for Acquisition," after "Secretary of Defense" the first place it appears which was executed by making the insertion after "the Sec-

retary" the first place it appears as the probable intent of Congress.

Subsec. (d). Pub. L. 99-500 and Pub. L. 99-591, \$101(c) [\$903(c)(5)], and Pub. L. 99-661, \$903(c)(5), amended subsec. (d) identically inserting "personally" after "Secretary of Defense".

Pub. L. 99-348 substituted "Director of Defense Research and Engineering" for "Under Secretary of Defense for Research and Engineering".

Subsec. (g)(1). Pub. L. 99–500 and Pub. L. 99–591, §101(c) [§§ 903(c)(6), 910(c)], and Pub. L. 99–661, §§ 903(c)(6), 910(c), amended par. (1) identically, inserting ", the Under Secretary of Defense for Acquisition," and substituting "10 days after transmission of the budget for the next fiscal year under section 1105 of title 31" for "January 15 immediately following the end of the fiscal year for which the report is prepared".

Subsec. (i). Pub. L. 99-500 and Pub. L. 99-591, §101(c) [§903(c)(7)], and Pub. L. 99-661, §903(c)(7), amended section identically adding subsec. (i).

EFFECTIVE DATE

Section 1211(c) of Pub. L. 98–94 provided that: "The amendments made by this section [enacting this section and amending section 5315 of Title 5, Government Organization and Employees] shall take effect on November 1, 1983."

REVIEW AND REVISION OF POLICIES AND PRACTICES ON TEST AND EVALUATION; INCLUSION IN STRATEGIC PLAN; REPORT

Pub. L. 109–364, div. A, title II, \$231(b)-(e), Oct. 17, 2006, 120 Stat. 2132, 2133, provided that:

"(b) REVIEW AND REVISION OF POLICIES AND PRACTICES.—

"(1) REVIEW.—During fiscal year 2007, the Under Secretary of Defense for Acquisition, Technology, and Logistics and the Director of Operational Test and Evaluation shall review Department of Defense policies and practices on test and evaluation in order to—

"(A) reaffirm the test and evaluation principles that should guide traditional acquisition programs; and

"(B) determine how best to apply appropriate test and evaluation principles to emerging acquisition approaches.

"(2) REVISED GUIDANCE.—If the Under Secretary determines as a result of the review under paragraph (1) that a revision of the policies and practices referred to in that paragraph is necessary, the Under Secretary and the Director shall jointly issue new or revised guidance for the Department of Defense on test and evaluation to address that determination.

"(c) ISSUES TO BE ADDRESSED.—In carrying out subsection (b), the Under Secretary shall address policies and practices on test and evaluation in order to—

"(1) ensure the performance of test and evaluation activities with regard to—

"(A) items that are acquired pursuant to the authority for rapid acquisition and deployment of items in section 806 of the Bob Stump National Defense Authorization Act for Fiscal Year 2003 [Pub. L. 107–314] (10 U.S.C. 2302 note);

"(B) programs that are conducted pursuant to the authority for spiral development in section 803 of the Bob Stump National Defense Authorization Act for Fiscal Year 2003 (Public Law 107-314; 116 Stat. 2603; 10 U.S.C. 2430 note), or other authority for the conduct of incremental acquisition programs;

"(C) systems that are acquired pursuant to other emerging acquisition approaches, as approved by the Under Secretary; and

"(D) equipment that is not subject to the operational test and evaluation requirements in sections 2366 and 2399 of title 10, United States Code, but that may require limited operational test and evaluation for the purpose of ensuring the safety and survivability of such equipment and personnel using such equipment; and

"(2) ensure the appropriate use, if any, of operational test and evaluation resources to assess technology readiness levels for the purpose of section 2366a of title 10, United States Code, and other applicable technology readiness requirements.

"(d) INCLUSION OF TESTING NEEDS IN STRATEGIC PLAN.—The Director, Test Resource Management Center, shall ensure that the strategic plan for Department of Defense test and evaluation resources developed pursuant to section 196 of title 10, United States Code—

"(1) reflects any testing needs of the Department of Defense that are identified as a result of activities under subsection (b); and

"(2) includes an assessment of the test and evaluation facilities, resources, and budgets that will be required to meet such needs.

(e) REPORT TO CONGRESS.—Not later than nine months after the date of the enactment of this Act [Oct. 17, 2006], the Under Secretary and the Director of Operational Test and Evaluation shall submit to the congressional defense committees [Committees on Armed Services and Appropriations of the Senate and the House of Representatives] a report on the review conducted under paragraph (1) of subsection (b), including any new or revised guidance issued pursuant to paragraph (2) of that subsection."

§ 139a. Director of Cost Assessment and Program Evaluation

(a) APPOINTMENT.—There is a Director of Cost Assessment and Program Evaluation in the Department of Defense, appointed by the President, by and with the advice and consent of the Senate.

(b) INDEPENDENT ADVICE TO SECRETARY OF DEFENSE.—(1) The Director of Cost Assessment and Program Evaluation is the principal advisor to the Secretary of Defense and other senior officials of the Department of Defense, and shall provide independent analysis and advice to such officials, on the following matters:

(A) Matters assigned to the Director pursuant to this section and section 2334 of this title.

(B) Matters assigned to the Director by the Secretary pursuant to section 113 of this title.

(2) The Director may communicate views on matters within the responsibility of the Director directly to the Secretary of Defense and the Deputy Secretary of Defense without obtaining the approval or concurrence of any other official within the Department of Defense.

(c) DEPUTY DIRECTORS.—There are two Deputy Directors within the Office of the Director of Cost Assessment and Program Evaluation, as follows:

(1) The Deputy Director for Cost Assessment.

(2) The Deputy Director for Program Evaluation.

(d) RESPONSIBILITIES.—The Director of Cost Assessment and Program Evaluation shall serve as the principal official within the senior management of the Department of Defense for the following:

(1) Cost estimation and cost analysis for acquisition programs of the Department of Defense, and carrying out the duties assigned pursuant to section 2334 of this title.

(2) Analysis and advice on matters relating to the planning and programming phases of the Planning, Programming, Budgeting and Execution system, and the preparation of ma-