Appendix CV

June A. Munford
Curriculum Vitae

Education

University of Wisconsin-Milwaukee - MS, Library & Information Science, 2009
Milwaukee, WI

- Coursework included cataloging, metadata, data analysis, library systems, management strategies and collection development.
- Specialized in library advocacy, cataloging and public administration.

Grand Valley State University - BA, English Language & Literature, 2008
Allendale, MI

- Coursework included linguistics, documentation and literary analysis.
- Minor in political science with a focus in local-level economics and government.

Professional Experience

Researcher / Expert Witness, October 2017 – present
Freelance ● Pittsburgh, Pennsylvania & Grand Rapids, Michigan

- Material authentication and public accessibility determination. Declarations of authenticity and/or public accessibility provided upon research completion. Experienced with appeals and deposition process.

- Research provided on topics of public library operations, material publication history, digital database services and legacy web resources.

- Past clients include Alston & Bird, Arnold & Porter, Baker Botts, Fish & Richardson, Erise IP, Irell & Manella, O'Melveny & Myers, Perkins-Coie, Pillsbury Winthrop Shaw Pittman and Slayden Grubert Beard.

Library Director, February 2013 - March 2015
Dowagiac District Library ● Dowagiac, Michigan

- Executive administrator of the Dowagiac District Library. Located in

Southwest Michigan, this library has a service area of 13,000, an annual operating budget of over $400,000 and total assets of approximately $1,300,000.

● Developed careful budgeting guidelines to produce a 15% surplus during the 2013-2014 & 2014-2015 fiscal years while being audited.

● Using this budget surplus, oversaw significant library investments including the purchase of property for a future building site, demolition of existing buildings and building renovation projects on the current facility.

● Led the organization and digitization of the library's archival records.

● Served as the public representative for the library, developing business relationships with local school, museum and tribal government entities.

● Developed an objective-based analysis system for measuring library services - including a full collection analysis of the library's 50,000+ circulating items and their records.

November 2010 - January 2013
Librarian & Branch Manager, Anchorage Public Library ● Anchorage, Alaska

● Headed the 2013 Anchorage Reads community reading campaign including event planning, staging public performances and creating marketing materials for mass distribution.

● Co-led the social media department of the library's marketing team, drafting social media guidelines, creating original content and instituting long-term planning via content calendars.

● Developed business relationships with The Boys & Girls Club, Anchorage School District and the US Army to establish summer reading programs for children.

June 2004 - September 2005, September 2006 - October 2013
Library Assistant, Hart Area Public Library
Hart, MI

● Responsible for verifying imported MARC records and original MARC

cataloging for the local-level collection as well as the Michigan Electronic Library.

● Handled OCLC Worldcat interlibrary loan requests & fulfillment via ongoing communication with lending libraries.

Professional Involvement

Alaska Library Association - Anchorage Chapter
- Treasurer, 2012

Library Of Michigan
- Level VII Certification, 2008
- Level II Certification, 2013

Michigan Library Association Annual Conference 2014
- New Directors Conference Panel Member

Southwest Michigan Library Cooperative
- Represented the Dowagiac District Library, 2013-2015

Professional Development

Library Of Michigan Beginning Workshop, May 2008
Petoskey, MI
- Received training in cataloging, local history, collection management, children's literacy and reference service.

Public Library Association Intensive Library Management Training, October 2011
Nashville, TN
- Attended a five-day workshop focused on strategic planning, staff management, statistical analysis, collections and cataloging theory.

Alaska Library Association Annual Conference 2012 - Fairbanks, February 2012
Fairbanks, AK
- Attended seminars on EBSCO advanced search methods, budgeting, cataloging, database usage and marketing.

Depositions

2019 ● Fish & Richardson

Apple v. Qualcomm (IPR2018-001281, 39521-00421IP, IPR2018-01282 and 39521-00421IP2)

2019 ● Erise IP

Implicit, LLC v. Netscout Systems, Inc (Civil Action No. 2:18-cv-53-JRG)

2019 ● Perkins-Coie

Adobe Inc. v. RAH Color Technologies LLC (Cases IPR2019-00627, IPR2019-00628, IPR2019-00629 and IPR2019-00646)

2020 ● O'Melveny & Myers

Maxell, Ltd. v. Apple Inc. (Case No. 5:19-cv-00036-RWS)

2021 ● Pillsbury Winthrop Shaw Pittman LLP

Intel v. SRC (IPR2020-1449)

2022 ● Perkins-Coie

Realtek v. Future Link (IPR2021-01182)

2023 ● Fish & Richardson

Neuroderm Ltd. v. Abbvie, Inc (Case No. PGR2022-00040)

2023 ● Fish & Richardson

Nearmap US Inc. v. Pictometry International Corp. (IPR2022-00735)

2023 ● Fish & Richardson

Samsung Electronics v. MemoryWeb LLC (Case No. 39843-0136PS1)

2023 ● Pillsbury Winthrop Shaw Whitman LLP

Gravel Rating Systems v. Costco Wholesale Corp. (Civil Action No. 4:21-cv-149-ALM)

2024 ● Willkie-Farr

Netflix, Inc. v. VideoLabs. Inc. (IPR2023-00628)

Limited Case and Clientele History

Alston & Bird

- Ericsson

  v. Collision Communications (IPR2022-01233)

- Nokia

  v. Neptune Subsea, Xtera (Case No. 1:17-cv-01876)

- Universal Electronics Inc

  v. Roku Inc (IPR2022-00818)

Arnold & Porter

- Ivantis

  v. Glaukos (Case No. 8:18-cv-00620)

- Samsung

  v. Jawbone (Case No. 2:21-cv-00186)

Benesch Friedlander Coplan & Aronoff

- Voyis

  v. Cathx (Case No. 5:21-cv-00077-RWS)

Deschert LLP

- Smaxtec Animal Care

  v. ST Reproductive Technologies, LLC (IPR2024-00885)

Erise I.P.

- Apple

  v. Ericsson Inc. (IPR2022-00715)

  v. Future Link Systems (IPRs 6317804, 6622108, 6807505, and 7917680)

  v. INVT (Case No. 20-1881)

  v. Navblazer LLC (IPR2020-01253)

  v. Qualcomm (IPR2018-001281, 39521-00421IP, IPR2018-01282, 39521-00421IP2)

  v. Quest Nettech Corp (Case No. 2:19-cv-00118-JRG)

  v. Telefonaktiebolaget LM Ericsson (IPR2022-00275)

  v. Theta IP, LLC (IPR2024-00818)

- Fanduel

  v. CGT (Case No. 19-1393)

- Garmin

  v. Phillips North America LLC (Case No. 2:19-cv-6301-AB-KS)

- Netscout
    - v. Longhorn HD LLC (Case No. 2:20-cv-00349)
    - v. Implicit, LLC (Civil Action No. 2:18-cv-53-JRG)

- Sony Interactive Entertainment LLC
    - v. Bot M8 LLC (IPR2020-01288)
    - v. Infernal Technology LLC (Case No. 2:19-CV-00248-JRG)

- Unified Patents
    - v. GE Video Compression (Civil Action No. 2:19-cv-248)

Fish & Richardson

- Apple
    - v. AliveCor (3:21-cv-03958)
    - v. LBS Innovations (Case No. 2:19-cv-00119-JRG-RSP)
    - v. Koss Corporation (IPR2021-00305)
    - v. Masimo (IPR 50095-0012IP1, 50095-0012IP2, 50095-0013IP1, 50095-0013IP2, 50095-0006IP1, 50095-0135IP1)
    - v. Neonode (Case No. 21-cv-08872-EMC)
    - v. Qualcomm (IPR2018-001281, 39521-00421IP, IPR2018-01282, 39521-00421IP2)

- Dell
    - v. Neo Wireless (IPR2022-00616)

- Dish Network
    - v. Entropic Communications, LLC (Case No. 2:2023-CV-01043)

v. Realtime Adaptive Streaming (Case No. 1:17-CV-02097-RBJ)

v. TQ Delta LLC (Case No. 18-1798)

- Evapco Dry Cooling

v. SPG Dry Cooling (IPR2021-00688)

- Genetec

v. Sensormatic Electronics (Case No. 1:20-CV-00760)

- Huawei

v. Bell Northern Research LLC (IPR2019-01174)

- Kianxis

v. Blue Yonder (Case No. 3:20-cv-03636)

- LG Electronics

v. Bell Northern Research LLC (Case No. 3:18-cv-2864-CAB-BLM)

- Metaswitch

v. Sonus Networks (IPR2018-01719)

- Microsoft

v. Throughputer Inc (IPR2022-00757)

- Mom Enterprises

v. Ddrops Company (Case No. 1:22-cv-00332)

- MLC Intellectual Property

v. MicronTech (Case No. 3:14-cv-03657-SI)

- Nearmap Inc

  v. EagleView Technologies (IPR2022-01009)

- Neuroderm Ltd.

  v. Abbvie, Inc (Case No. PGR2022-00040)

- Realtek Semiconductor

  v. Future Link (IPR2021-01182)

- Quectel

  v. Koninklijke Philips (Case No. 1:20-cv-01710)

- Samsung

  v. Aire Technology (IPR2022-00877)

  v. Bell Northern Research (Case No. 2:19-cv-00286-JRG)

  v. Communication Technologies Inc (IPR2022-01221)

  v. Jawbone Innovations (IPR2022-00865)

  v. MemoryWeb LLC (IPR2022-00885)

  v. Dodots Licensing Solutions (IPR2023-00701)

  v. Telefonaktiebolaget LM Ericsson (IPR2021-00615)

- Texas Instruments

  v. Vantage Micro LLC (IPR2020-01261)

- Xilinx

  v. Sentient Sensors LCC (Case No. 1:22-cv-00173)

Groombridge Wu

- Nearmap

  v. Eagle View Technologies Inc. and Pictometry International Corp. (Case No. 2:21-cv-00283-TS-DAO)

Irell & Manella

- Curium

O'Melveny & Myers

- Apple

  v. Maxell (Case No. 5:19-cv-00036-RWS)

- Disney Media & Entertainment Distribution LLC

  v. Digital Media Technology Holdings, LLC (Case No. 2:22-cv-01642)

- Micron Technology Inc.

  v. Besang Inc (IPR2023-00900)

- Samsung

  v. Daedalus Prime LLC (1335 Investigation)

Perkins-Coie

- Amazon

  v. Nokia (IPR2024-00847 and IPR2024-00848)

- Heru Industries

  v. The UAB Research Foundation (IPR2022-01148)

- Intel Corporation

  v. BeSang Inc. (IPR2023-00991)

  v. BitMICRO (Case No. 5:23-cv-00625)

  v. Telefonaktiebolaget L M Ericsson (IPR2024-00610)

- Realtek Semiconductor

  v. Future Link (IPR2021-01182)

- Twitter Inc

  v. VOIP-Pal.com (Case No. 3:20-cv-02397-JD)

- TCL Industries

  v. Koninklijke Philips NV (IPR2021-00495, IPR2021-00496 and IPR2021-00497)

Pillsbury Winthrop Shaw Pittman

- Intel

  v. FG SRC LLC (Case No. 6:20-cv-00315)

- Gravel Rating Systems

  v. Costco (Case No. 4:21-cv-149)
  v. Lowe's Home Centers (Case No. 4:21-cv-150)
  v. T-Mobile USA (Case No. 4:21-cv-152)
  v. Kohl's Inc. (Case No. 4:21-cv-258)
  v. Under Armor (Case No. 4:21-cv-356)

Quinn Emanuel

- ServiceNow, Inc.

  v. InQuisient, Inc. (Case No. 22-900-CJB)

- Wolfspeed

  v. The Trustees of Purdue University (Case No. 1:2021-cv-00840)

Sheppard, Mullin, Richter & Hampton LLP

- Cadence Design Systems Inc.

  v. Semiconductor Design Technologies (Case No. 3:23-cv-01001)

Stern, Kessler, Goldstein & Fox

- Preliminary Research

Willkie, Farr & Gallagher LLP

- Neurent

  v. The Foundry, LLC (IPR2024-00669)

- Netflix, Inc.

  v. VideoLabs, Inc. (IPR2023-00628)

Appendix WINAWER01

MARC Bibliographic Record

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246	18	$aGastrointestinal endoscopy
260		$aPhiladelphia :$bW.B. Saunders Co.,$cc1991-
300		$avolumes :$billustrations ;$c24 cm
310		$aQuarterly
336		$atext$btxt$2rdacontent
337		$aunmediated$bn$2rdamedia
338		$avolume$bnc$2rdacarrier

362	0_	$aVol. 1, no. 1 (May 1991)-
500		$aEach issue has also a distinctive title.
510	1_	$aIndex medicus$x0019-3879$b1994-
530		$aAlso published in a Spanish translation.
650	_2	$aEndoscopy, Gastrointestinal$vperiodicals.
997		$aMARCIVE

MMS IDs

Document ID:

999763870502121

Network Electronic IDs:

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Network Physical IDs:

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Gastrointestinal endoscopy clinics of North America

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v.19:no.1(2009)

Publication Details

OTHER TITLE	Gastrointestinal endoscopy
FORMAT	Journals, Magazines, Newspapers
LANGUAGE	English
PUBLICATION	Philadelphia : W.B. Saunders Co., c1991-
PUBLICATION DATES	Vol. 1, no. 1 (May 1991)-
PHYSICAL DETAILS	volumes : illustrations ; 24 cm
ISSNS	1558-1950, 1052-5157
OCLC	ocm60626388, ocm22298969

Notes

Subjects

Endoscopy, Gastrointestinal -- periodicals.
Medical Subject Heading

Content Types

periodicals

Each issue has also a distinctive title.
Index medicus 1994-
Also published in a Spanish translation.

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MARC View

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338			a| volume b| nc 2| rdacarrier
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515			a| Issue for v. 119, no. 5 (Nov. 2000) mismarked on cover as v. 119, no. 4 (Nov. 2000).
550			a| Official journal of the American Gastroenterological Association.
590			a| Hershey material includes American Gastroenterological Association Presidential Addresses 1902-1982
650		2	a| Gastroenterology.
650		0	a| Stomach x| Diseases v| Periodicals.
650		0	a| Digestive organs x| Diseases v| Periodicals.
655		2	a| Periodicals.
710	2		a| American Gastroenterological Association.
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949 a| RC799.A634 v.124 no.3 2003 w| LCPER c| 1 i| 000051878733 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 5/15/2003
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949 a| RC799.A634 v.125 no.2 2003 w| LCPER c| 1 i| 000052577383 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/31/2003
949 a| RC799.A634 v.125 no.5 2003 w| LCPER c| 1 i| 000052777158 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 1/16/2004
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949 a| RC799.A634 v.126 no.5-6 2004 w| LCPER c| 1 i| 000054867505 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/15/2004
949 a| RC799.A634 v.126 no.7 2004 w| LCPER c| 1 i| 000054867499 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/15/2004
949 a| RC799.A634 v.127 no.6 2004 w| LCPER c| 1 i| 000054991606 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 5/19/2005
949 a| RC799.A634 v.127 no.5 2004 & suppl.1 w| LCPER c| 1 i| 000054991408 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 5/19/2005
949 a| RC799.A634 v.127 no.4 2004 w| LCPER c| 1 i| 000054991583 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 5/19/2005
949 a| RC799.A634 v.127 no.3 2004 w| LCPER c| 1 i| 000054991590 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 5/19/2005
949 a| RC799.A634 v.127 no.2 2004 w| LCPER c| 1 i| 000054991569 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 5/19/2005
949 a| RC799.A634 v.127 no.1 2004 w| LCPER c| 1 i| 000054991576 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 5/19/2005
949 a| RC799.A634 v.128 no.1-2 2005 w| LCPER c| 1 i| 000054999527 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 6/9/2005
949 a| RC799.A634 v.128 no.4 2005 & suppl.1 w| LCPER c| 1 i| 000055010856 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 7/1/2005
949 a| RC799.A634 v.128 no.3 2005 w| LCPER c| 1 i| 000055010535 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 7/1/2005
949 a| RC799.A634 v.128 no.4 2005 suppl.2 w| LCPER c| 1 i| 000055023481 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/4/2005
949 a| RC799.A634 v.128 no.7 2005 w| LCPER c| 1 i| 000055049528 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 11/3/2005
949 a| RC799.A634 v.128 no.5-6 2005 w| LCPER c| 1 i| 000055049320 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 11/3/2005
949 a| RC799.A634 v.129 no.2 2005 w| LCPER c| 1 i| 000054954168 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 2/2/2006
949 a| RC799.A634 v.129 no.1 2005 w| LCPER c| 1 i| 000054954175 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 2/2/2006
949 a| RC799.A634 v.129 no.3-4 2005 w| LCPER c| 1 i| 000054961562 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 2/24/2006
949 a| RC799.A634 v.129 no.5-6 2005 w| LCPER c| 1 i| 000055117975 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 6/12/2006
949 a| RC799.A634 v.130 no.1-2 2006 & suppl.1 w| LCPER c| 1 i| 000055134347 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 7/27/2006
949 a| RC799.A634 v.130 no.3-5 2006 w| LCPER c| 1 i| 000055212335 d| 11/5/2014 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 9/15/2006
949 a| RC799.A634 v.130 no.4 2006 suppl.2 w| LCPER c| 1 i| 000055075947 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/12/2006
949 a| RC799.A634 v.130 no.6-7 2006 w| LCPER c| 1 i| 000055091077 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 12/15/2006
949 a| RC799.A634 v.131 no.1-2 2006 w| LCPER c| 1 i| 000055209298 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 4/17/2007
949 a| RC799.A634 v.131 no.3-4 2006 w| LCPER c| 1 i| 000055215664 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 5/25/2007
949 a| RC799.A634 v.132 no.4 2007 suppl.2 w| LCPER c| 1 i| 000061747944 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 12/3/2007
949 a| RC799.A634 v.132 no.3-4 2007 w| LCPER c| 1 i| 000061747951 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 12/3/2007
949 a| RC799.A634 v.132 no.1-2 2007 w| LCPER c| 1 i| 000061748194 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 12/3/2007
949 a| RC799.A634 v.131 no.5-6 2006 w| LCPER c| 1 i| 000061748200 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 12/3/2007
949 a| RC799.A634 v.132 no.5-7 2007 w| LCPER c| 1 i| 000061759268 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 1/25/2008
949 a| RC799.A634 v.133 no.1-2 2007 w| LCPER c| 1 i| 000059600190 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 1/25/2008
949 a| RC799.A634 v.133 no.5-6 2007 w| LCPER c| 1 i| 000059630050 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 4/18/2008
949 a| RC799.A634 v.133 no.3-4 2007 w| LCPER c| 1 i| 000059633198 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 4/22/2008
949 a| PO-3578 w| ASIS c| 1 i| PO-3578 l| ON-ORDER m| ONLINE r| Y s| Y t| ONLINE u| 10/16/2008
949 a| RC799.A634 v.105 no.3 1993 w| LCPER c| 1 i| 000067947133 d| 12/12/2010 e| 12/11/2010 l| PATERNO-4 m| UP-PAT n| 2 r| Y s| Y t| PERIODICAL u| 12/10/2010
949 a| RC799.A634 v.91 no.5-6 1986 w| LCPER c| 1 i| 000067947034 d| 1/28/2013 e| 12/11/2010 l| PATERNO-4 m| UP-PAT n| 2 q| 1 r| Y s| Y t| PERIODICAL u| 12/10/2010
949 a| RC799.A634 v.91 no.3-4 1986 w| LCPER c| 1 i| 000067947126 d| 3/18/2019 e| 12/12/2010 l| PATERNO-4 m| UP-PAT n| 1 q| 1 r| Y s| Y t| PERIODICAL u| 12/12/2010
949 a| RC799.A634 v.56 no.1-3 1969 w| LCPER c| 1 i| 000074416929 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.56 no.4-6 1969 w| LCPER c| 1 i| 000074416912 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.58 no.1-3 1970 w| LCPER c| 1 i| 000074417087 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.58 no.4-6 1970 w| LCPER c| 1 i| 000074417070 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.59 no.1-3 1970 w| LCPER c| 1 i| 000074417063 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.59 no.4-6 1970 w| LCPER c| 1 i| 000074417056 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.60 no.1-3 1971 w| LCPER c| 1 i| 000074417049 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.60 no.4-6 1971 w| LCPER c| 1 i| 000074417032 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.61 no.1-3 1971 w| LCPER c| 1 i| 000074417025 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.61 no.4-6 1971 w| LCPER c| 1 i| 000074417018 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.64 no.1-3 1973 w| LCPER c| 1 i| 000074417001 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.64 no.4-6 1973 w| LCPER c| 1 i| 000074417094 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.65 no.1-3 1973 w| LCPER c| 1 i| 000074417100 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.65 no.4-6 1973 w| LCPER c| 1 i| 000074417117 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.66 no.1-3 1974 w| LCPER c| 1 i| 000074417124 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.66 no.4-6 1974 w| LCPER c| 1 i| 000074417131 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.67 no.1-3 1974 w| LCPER c| 1 i| 000074417148 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.67 no.4-6 1974 w| LCPER c| 1 i| 000074417155 d| 2/18/2019 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.68 no.1-3 1975 w| LCPER c| 1 i| 000074417162 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.68 no.4-6 1975 w| LCPER c| 1 i| 000074417179 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.69 no.1-3 1975 w| LCPER c| 1 i| 000074417261 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.69 no.4-6 1975 w| LCPER c| 1 i| 000074417254 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.70 no.1-3 1976 w| LCPER c| 1 i| 000074417247 d| 5/12/2016 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.70 no.4-6 1976 w| LCPER c| 1 i| 000074417230 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.71 no.1-3 1976 w| LCPER c| 1 i| 000074417223 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.71 no.4-6 1976 w| LCPER c| 1 i| 000074417216 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.72 no.1-3 1977 w| LCPER c| 1 i| 000074417209 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.72 no.4-6 1977 w| LCPER c| 1 i| 000074417193 d| 8/1/2023 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.73 no.1-3 1977 w| LCPER c| 1 i| 000074417186 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.73 no.4-6 1977 w| LCPER c| 1 i| 000074417278 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.74 no.4-6 1978 w| LCPER c| 1 i| 000074417285 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.75 no.1-3 1978 w| LCPER c| 1 i| 000074417292 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.75 no.4-6 1978 w| LCPER c| 1 i| 000074417308 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.76 no.1-3 1979 w| LCPER c| 1 i| 000074417315 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.76 no.4-6 1979 w| LCPER c| 1 i| 000074417322 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.77 no.1-3 1979 w| LCPER c| 1 i| 000074417339 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.77 no.4-6 1979 w| LCPER c| 1 i| 000074417346 d| 2/26/2024 l| PATERNO-4 m| UP-PAT q| 2 r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.78 no.1-3 1980 w| LCPER c| 1 i| 000074417353 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.78 no.4-6 1980 w| LCPER c| 1 i| 000074417445 d| 11/6/2017 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.79 no.1-3 1980 w| LCPER c| 1 i| 000074417438 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.79 no.4-6 1980 w| LCPER c| 1 i| 000074417421 d| 3/26/2014 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.80 no.1-3 1981 w| LCPER c| 1 i| 000074417414 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.80 no.4-5 1981 w| LCPER c| 1 i| 000074417407 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.80 no.6 1981 w| LCPER c| 1 i| 000074417391 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.81 no.1-2 1981 w| LCPER c| 1 i| 000074417384 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.81 no.3-4 1981 w| LCPER c| 1 i| 000074417377 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.81 no.5-6 1981 w| LCPER c| 1 i| 000074417360 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.82 no.1-2 1982 w| LCPER c| 1 i| 000074417537 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.82 no.3-4 1982 w| LCPER c| 1 i| 000074417520 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.82 no.5-6 1982 w| LCPER c| 1 i| 000074417513 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.83 no.1-2 1982 w| LCPER c| 1 i| 000074417506 d| 4/17/2014 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.83 no.3-4 1982 w| LCPER c| 1 i| 000074417490 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.83 no.5-6 1982 w| LCPER c| 1 i| 000074417483 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.84 no.1-2 1983 w| LCPER c| 1 i| 000074417476 d| 4/28/2017 l| PATERNO-4 m| UP-PAT q| 3 r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.84 no.3-4 1983 w| LCPER c| 1 i| 000074417469 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.84 no.5-6 1983 w| LCPER c| 1 i| 000074417452 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.85 no.1-2 1983 w| LCPER c| 1 i| 000074417544 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.85 no.3-4 1983 w| LCPER c| 1 i| 000074417551 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.85 no.5-6 1983 w| LCPER c| 1 i| 000074417568 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.76-85 1979-83 index w| LCPER c| 1 i| 000074417575 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.86 no.1-2 1984 w| LCPER c| 1 i| 000074417582 d| 5/8/2023 l| PATERNO-4 m| UP-PAT q| 2 r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.86 no.3-4 1984 w| LCPER c| 1 i| 000074417599 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.86 no.5 1984 w| LCPER c| 1 i| 000074417605 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.86 no.6 1984 w| LCPER c| 1 i| 000074417612 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.87 no.1-2 1984 w| LCPER c| 1 i| 000074417629 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.87 no.3-4 1984 w| LCPER c| 1 i| 000074417711 d| 8/16/2023 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.87 no.5-6 1984 w| LCPER c| 1 i| 000074417704 d| 11/14/2013 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.88 no.1-2 1985 w| LCPER c| 1 i| 000074417698 d| 3/16/2023 l| PATERNO-4 m| UP-PAT q| 2 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.88 no.5 1985 w| LCPER c| 1 i| 000074417674 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.88 no.6 1985 w| LCPER c| 1 i| 000074417667 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.89 no.1-2 1985 w| LCPER c| 1 i| 000074417650 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.89 no.3 1985 w| LCPER c| 1 i| 000074417643 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.89 no.4-6 1985 w| LCPER c| 1 i| 000074417636 d| 9/24/2021 l| PATERNO-4 m| UP-PAT q| 2 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.90 no.1-2 1986 w| LCPER c| 1 i| 000074417728 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.90 no.3-4 1986 w| LCPER c| 1 i| 000074417735 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.90 no.5 1986 w| LCPER c| 1 i| 000074417742 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.90 no.6 1986 w| LCPER c| 1 i| 000074417759 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.91 no.1-2 1986 w| LCPER c| 1 i| 000074417766 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.92 no.1-3 1987 w| LCPER c| 1 i| 000074417773 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.92 no.4-6 1987 w| LCPER c| 1 i| 000074417780 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.93 no.1-3 1987 w| LCPER c| 1 i| 000074417797 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.93 no.4-6 1987 w| LCPER c| 1 i| 000074417803 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.94 no.1-2 1988 w| LCPER c| 1 i| 000074417896 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.94 no.3-4 1988 w| LCPER c| 1 i| 000074417889 d| 10/12/2023 l| PATERNO-4 m| UP-PAT q| 2 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.94 no.5 1988 w| LCPER c| 1 i| 000074417872 d| 9/28/2022 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.94 no.6 1988 w| LCPER c| 1 i| 000074417865 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.95 no.1-2 1988 w| LCPER c| 1 i| 000074417858 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.95 no.3-4 1988 w| LCPER c| 1 i| 000074417841 d| 7/19/2016 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.95 no.5-6 1988 w| LCPER c| 1 i| 000074417834 d| 3/22/2017 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.86-95 1984-88 index w| LCPER c| 1 i| 000074417827 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.96 no.1-2 1989 w| LCPER c| 1 i| 000074417810 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.96 no.3-4 1989 w| LCPER c| 1 i| 000074417988 d| 1/3/2022 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.96 no.5 1989 w| LCPER c| 1 i| 000074417971 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.96 no.6 1989 w| LCPER c| 1 i| 000074417964 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.97 no.1-2 1989 w| LCPER c| 1 i| 000074417957 d| 5/23/2017 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.97 no.3-4 1989 w| LCPER c| 1 i| 000074417940 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.97 no.5-6 1989 w| LCPER c| 1 i| 000074417933 d| 5/3/2023 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.98 no.1-2 1990 w| LCPER c| 1 i| 000074417926 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.98 no.3-4 1990 w| LCPER c| 1 i| 000074417919 d| 11/2/2022 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.98 no.5 pt.1 1990 w| LCPER c| 1 i| 000074417902 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.98 no.5 pt.2 1990 w| LCPER c| 1 i| 000074417995 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.98 no.6 1990 w| LCPER c| 1 i| 000074418008 d| 6/30/2021 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.99 no.1 1990 w| LCPER c| 1 i| 000074418015 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.99 no.3 1990 w| LCPER c| 1 i| 000074418039 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.99 no.4 1990 w| LCPER c| 1 i| 000074418046 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.99 no.2 1990 w| LCPER c| 1 i| 000074418022 d| 11/11/2015 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.99 no.5 1990 w| LCPER c| 1 i| 000074418053 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.99 no.6 1990 w| LCPER c| 1 i| 000074418060 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.100 no.1 1991 w| LCPER c| 1 i| 000074418077 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.100 no.2 1991 w| LCPER c| 1 i| 000074418169 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.100 no.3 1991 w| LCPER c| 1 i| 000074418152 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.100 no.4 1991 w| LCPER c| 1 i| 000074418145 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.100 no.5 pt.1 1991 w| LCPER c| 1 i| 000074418138 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.100 no.5 pt.2 1991 w| LCPER c| 1 i| 000074418121 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013

949 a| RC799.A634 v.100 no.6 1991 w| LCPER c| 1 i| 000074418114 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.101 no.1 1991 w| LCPER c| 1 i| 000074418107 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.101 no.2 1991 w| LCPER c| 1 i| 000074418091 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.101 no.3 1991 w| LCPER c| 1 i| 000074418084 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.101 no.4 1991 w| LCPER c| 1 i| 000074418176 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.101 no.5 1991 w| LCPER c| 1 i| 000074418183 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.101 no.6 1991 w| LCPER c| 1 i| 000074418190 d| 11/26/2019 l| PATERNO-4 m| UP-PAT q| 2 r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.102 no.1 1992 w| LCPER c| 1 i| 000074418206 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.102 no.2 1992 w| LCPER c| 1 i| 000074418213 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.102 no.3 1992 w| LCPER c| 1 i| 000074418220 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.102 no.4 1992 w| LCPER c| 1 i| 000074418237 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.102 no.5 1992 w| LCPER c| 1 i| 000074418244 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.102 no.6 1992 w| LCPER c| 1 i| 000074418251 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.103 no.1 1992 w| LCPER c| 1 i| 000074418343 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.103 no.2 1992 w| LCPER c| 1 i| 000074418336 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.103 no.3 1992 w| LCPER c| 1 i| 000074418329 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.103 no.4 1992 w| LCPER c| 1 i| 000074418312 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.103 no.5 1992 w| LCPER c| 1 i| 000074418305 d| 11/15/2019 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.103 no.6 1992 w| LCPER c| 1 i| 000074418299 d| 5/24/2024 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.104 no.1 1993 w| LCPER c| 1 i| 000074418282 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.104 no.2 1993 w| LCPER c| 1 i| 000074418275 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.104 no.3-4 1993 w| LCPER c| 1 i| 000074418268 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.104 no.4 1993 suppl. w| LCPER c| 1 i| 000074418435 d| 11/30/2017 l| PATERNO-4 m| UP-PAT q| 3 r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.104 no.5 1993 w| LCPER c| 1 i| 000074418428 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.104 no.6 1993 w| LCPER c| 1 i| 000074418411 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.105 no.1 1993 w| LCPER c| 1 i| 000074418404 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.105 no.2 1993 w| LCPER c| 1 i| 000074418398 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.105 no.4 1993 w| LCPER c| 1 i| 000074418381 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.105 no.5 1993 w| LCPER c| 1 i| 000074418374 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.105 no.6 1993 w| LCPER c| 1 i| 000074418367 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.106 no.1-2 1994 w| LCPER c| 1 i| 000074418350 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.106 no.3 1994 w| LCPER c| 1 i| 000074418442 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.106 no.5 1994 w| LCPER c| 1 i| 000074418466 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.106 no.4 1994 w| LCPER c| 1 i| 000074418459 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.106 no.6 1994 w| LCPER c| 1 i| 000074418473 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.106 no.4 1994 suppl. w| LCPER c| 1 i| 000074418480 d| 1/4/2016 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.107 no.1 1994 w| LCPER c| 1 i| 000074418497 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.107 no.2 1994 w| LCPER c| 1 i| 000074418503 d| 10/8/2021 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.107 no.3-4 1994 w| LCPER c| 1 i| 000074418510 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.107 no.5 1994 w| LCPER c| 1 i| 000074418527 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.107 no.6 1994 w| LCPER c| 1 i| 000074418619 d| 2/17/2016 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.108 no.1-2 1995 w| LCPER c| 1 i| 000074418602 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.108 no.3 1995 w| LCPER c| 1 i| 000074418596 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.108 no.4 1995 w| LCPER c| 1 i| 000074418589 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.108 no.5 1995 w| LCPER c| 1 i| 000074418572 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.108 no.6 1995 w| LCPER c| 1 i| 000074418565 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.108 no.4 1995 suppl. w| LCPER c| 1 i| 000074418558 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.109 no.1-2 1995 w| LCPER c| 1 i| 000074418541 d| 10/15/2014 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.109 no.3 1995 w| LCPER c| 1 i| 000074418534 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.109 no.4 1995 w| LCPER c| 1 i| 000074418626 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.109 no.5 1995 w| LCPER c| 1 i| 000074418633 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.109 no.6 1995 w| LCPER c| 1 i| 000074418640 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.110 no.1 1996 w| LCPER c| 1 i| 000074418657 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.110 no.2 1996 w| LCPER c| 1 i| 000074418664 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.110 no.3-4 1996 w| LCPER c| 1 i| 000074418671 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.110 no.5 1996 w| LCPER c| 1 i| 000074418688 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.110 no.6 1996 w| LCPER c| 1 i| 000074418695 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.110 no.4 1996 suppl. w| LCPER c| 1 i| 000074418701 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013

949 a| RC799.A634 v.111 no.1-2 1996 w| LCPER c| 1 i| 000074418794 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.111 no.3 1996 w| LCPER c| 1 i| 000074418787 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.111 no.4 1996 w| LCPER c| 1 i| 000074418770 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.111 no.5 1996 w| LCPER c| 1 i| 000074418763 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.111 no.6 1996 w| LCPER c| 1 i| 000074418756 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.112 no.1 1997 w| LCPER c| 1 i| 000074418749 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.112 no.2 1997 w| LCPER c| 1 i| 000074418732 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.112 no.3 1997 w| LCPER c| 1 i| 000074418725 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.112 no.4 1997 w| LCPER c| 1 i| 000074418718 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.112 no.5-6 1997 w| LCPER c| 1 i| 000074418886 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.112 no.4 1997 suppl. w| LCPER c| 1 i| 000074418879 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.113 no.1 1997 w| LCPER c| 1 i| 000074418862 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.113 no.2 1997 w| LCPER c| 1 i| 000074418855 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.113 no.3 1997 w| LCPER c| 1 i| 000074418848 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.113 no.4 1997 w| LCPER c| 1 i| 000074418831 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.113 no.5 1997 w| LCPER c| 1 i| 000074418824 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.113 no.6 1997 & suppl. w| LCPER c| 1 i| 000074418817 d| 1/30/2018 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.114 no.1-2 1998 w| LCPER c| 1 i| 000074418800 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.114 no.3-4 pt.1 1998 w| LCPER c| 1 i| 000074418893 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.114 no.4 pt.2 1998 w| LCPER c| 1 i| 000074418909 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.114 no.5-6 1998 w| LCPER c| 1 i| 000074418916 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.115 no.1-2 1998 w| LCPER c| 1 i| 000074418923 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.115 no.3 1998 w| LCPER c| 1 i| 000074418930 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.115 no.4 1998 w| LCPER c| 1 i| 000074418947 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.115 no.5 1998 w| LCPER c| 1 i| 000074418954 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.115 no.6 1998 w| LCPER c| 1 i| 000074418961 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.116 no.1 1999 w| LCPER c| 1 i| 000074418978 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.116 no.2 1999 w| LCPER c| 1 i| 000074419067 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.116 no.3 1999 w| LCPER c| 1 i| 000074419050 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.116 no.4 pt.1 1999 w| LCPER c| 1 i| 000074419043 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.116 no.4 pt.2 1999 w| LCPER c| 1 i| 000074419036 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.116 no.5 1999 w| LCPER c| 1 i| 000074419029 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.116 no.6 1999 w| LCPER c| 1 i| 000074419012 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.117 no.1 1999 w| LCPER c| 1 i| 000074419005 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.117 no.2-3 1999 w| LCPER c| 1 i| 000074418992 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.117 no.4 1999 w| LCPER c| 1 i| 000074418985 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.117 no.5 1999 w| LCPER c| 1 i| 000074419074 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.117 no.6 1999 w| LCPER c| 1 i| 000074419081 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.118 no.1 2000 w| LCPER c| 1 i| 000074419098 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.118 no.2 2000 & suppl. w| LCPER c| 1 i| 000074419104 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.118 no.3 2000 w| LCPER c| 1 i| 000074419111 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.118 no.4 2000 w| LCPER c| 1 i| 000074419128 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.118 no.4 2000 suppls. w| LCPER c| 1 i| 000074419135 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.118 no.5 2000 w| LCPER c| 1 i| 000074419142 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.118 no.6 2000 w| LCPER c| 1 i| 000074419159 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.119 no.1 2000 w| LCPER c| 1 i| 000074419241 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.119 no.2 2000 w| LCPER c| 1 i| 000074419234 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.119 no.3 2000 w| LCPER c| 1 i| 000074419227 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.119 no.6 2000 w| LCPER c| 1 i| 000047190634 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.88 no.3-4 1985 w| LCPER c| 1 i| 000074417681 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/27/2013
949 a| Periodical 1952 21 w| ASIS c| 1 i| 32239001031059 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949 a| Periodical 1952 22 w| ASIS c| 1 i| 32239001031067 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949 a| Periodical 1953 23 w| ASIS c| 1 i| 32239001031075 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949 a| Periodical 1953 24 w| ASIS c| 1 i| 32239001031083 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949 a| Periodical 1953 25 w| ASIS c| 1 i| 32239001031091 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949 a| Periodical 1954 26 w| ASIS c| 1 i| 32239001031109 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949 a| Periodical 1954 27 w| ASIS c| 1 i| 32239001031117 d| 4/16/2007 l| CATO-2 m| UP-ANNEX q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949 a| Periodical 1955 28 w| ASIS c| 1 i| 32239001031125 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949 a| Periodical 1955 29, Index w| ASIS c| 1 i| 32239001031133 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949 a| Periodical 1956 30 w| ASIS c| 1 i| 32239001031141 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949 a| Periodical 1956 31 w| ASIS c| 1 i| 32239001031158 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1963 44 w| ASIS c| 1 i| 32239001031273 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1963 45 w| ASIS c| 1 i| 32239001031281 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1964 46 w| ASIS c| 1 i| 32239001031299 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1964 47 w| ASIS c| 1 i| 32239001031307 d| 4/28/2005 l| CATO-2 m| UP-ANNEX q| 2 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1965 48 w| ASIS c| 1 i| 32239001031315 d| 8/28/2006 l| CATO-2 m| UP-ANNEX q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1965 49 w| ASIS c| 1 i| 32239001031323 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1966 50 w| ASIS c| 1 i| 32239001031331 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1966 51 w| ASIS c| 1 i| 32239001031349 d| 8/7/2015 l| CATO-2 m| UP-ANNEX q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1967 52 w| ASIS c| 1 i| 32239001031356 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1967 53 w| ASIS c| 1 i| 32239001031364 d| 7/22/2002 l| CATO-2 m| UP-ANNEX q| 2 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1968 54 w| ASIS c| 1 i| 32239001031372 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1968 55 w| ASIS c| 1 i| 32239001031380 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1969 56 w| ASIS c| 1 i| 32239001031398 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1969 57 w| ASIS c| 1 i| 32239001031406 d| 2/15/2007 l| CATO-2 m| UP-ANNEX q| 2 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1970 58 w| ASIS c| 1 i| 32239001031414 d| 4/28/2005 l| CATO-2 m| UP-ANNEX q| 2 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1970 59 w| ASIS c| 1 i| 32239001031422 d| 5/4/2008 e| 1/27/2003 l| CATO-2 m| UP-ANNEX n| 1 q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1971 60 w| ASIS c| 1 i| 32239001031430 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1971 61 w| ASIS c| 1 i| 32239001031448 d| 2/6/2024 l| CATO-2 m| UP-ANNEX q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1972 62 w| ASIS c| 1 i| 32239001031455 d| 2/22/2008 l| CATO-2 m| UP-ANNEX q| 2 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1972 63 w| ASIS c| 1 i| 32239001031463 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1973 64 w| ASIS c| 1 i| 32239001031471 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1973 65 w| ASIS c| 1 i| 32239001031489 d| 8/17/2005 l| CATO-2 m| UP-ANNEX q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1974 66 w| ASIS c| 1 i| 32239001031497 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1974 67 w| ASIS c| 1 i| 32239001031505 d| 4/11/2007 l| CATO-2 m| UP-ANNEX q| 2 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1975 68 w| ASIS c| 1 i| 32239001031513 d| 10/6/2008 l| CATO-2 m| UP-ANNEX q| 2 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1975 69 w| ASIS c| 1 i| 32239001031521 d| 2/15/2007 l| CATO-2 m| UP-ANNEX q| 3 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1976 70 w| ASIS c| 1 i| 32239000933875 d| 10/10/2008 l| CATO-2 m| UP-ANNEX q| 6 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1976 71 w| ASIS c| 1 i| 32239001031539 d| 8/18/2006 l| CATO-2 m| UP-ANNEX q| 6 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1977 72 w| ASIS c| 1 i| 32239001031547 d| 12/8/2004 l| CATO-2 m| UP-ANNEX q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1977 73 w| ASIS c| 1 i| 32239001031554 d| 8/17/2005 l| CATO-2 m| UP-ANNEX q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1978 74 w| ASIS c| 1 i| 32239001031562 d| 4/15/2024 l| CATO-2 m| UP-ANNEX q| 4 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1978 75 w| ASIS c| 1 i| 32239001031570 d| 9/14/2008 l| CATO-2 m| UP-ANNEX q| 6 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1979 76 w| ASIS c| 1 i| 32239000477949 d| 12/1/2008 e| 11/25/2008 l| CATO-2 m| UP-ANNEX n| 1 q| 3 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1979 77 w| ASIS c| 1 i| 32239000372959 d| 10/10/2008 e| 8/21/2005 l| CATO-2 m| UP-ANNEX n| 1 q| 5 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1980 78 AP-JN, Index w| ASIS c| 1 i| 32239001031596 d| 9/20/2004 l| CATO-2 m| UP-ANNEX q| 2 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1980 78 JA-MR w| ASIS c| 1 i| 32239001031588 d| 10/19/2008 l| CATO-2 m| UP-ANNEX q| 6 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1980 79 w| ASIS c| 1 i| 32239001031604 d| 8/25/2007 l| CATO-2 m| UP-ANNEX q| 4 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1981 80 w| ASIS c| 1 i| 32239000948691 d| 9/15/2008 e| 8/29/2006 l| CATO-2 m| UP-ANNEX n| 1 q| 4 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1981 81 w| ASIS c| 1 i| 32239001031612 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1982 82 w| ASIS c| 1 i| 32239001031620 d| 8/16/2004 l| CATO-2 m| UP-ANNEX q| 4 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1982 83 w| ASIS c| 1 i| 32239001031638 d| 5/14/2009 e| 4/2/2009 l| CATO-2 m| UP-ANNEX n| 3 q| 8 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1983 84 JA-MR w| ASIS c| 1 i| 32239001031646 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1983 84 AP-JN, Index w| ASIS c| 1 i| 32239001031653 d| 7/16/2009 l| CATO-2 m| UP-ANNEX q| 5 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1983 85 w| ASIS c| 1 i| 32239000412268 d| 9/28/2006 l| CATO-2 m| UP-ANNEX q| 4 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1984 86 w| ASIS c| 1 i| 32239001031661 d| 4/18/2007 l| CATO-2 m| UP-ANNEX q| 5 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1984 87 JL-SE w| ASIS c| 1 i| 32239001031679 d| 9/9/2010 l| CATO-2 m| UP-ANNEX q| 4 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1984 87 OC-DE w| ASIS c| 1 i| 32239000897724 d| 5/8/2011 l| CATO-2 m| UP-ANNEX q| 4 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1985 88 JA-MR w| ASIS c| 1 i| 32239001031695 d| 8/9/2006 e| 6/7/2004 l| CATO-2 m| UP-ANNEX n| 1 q| 5 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1985 88 AP-JN, Index w| ASIS c| 1 i| 32239001031703 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1985 89 JL-DE w| ASIS c| 1 i| 32239001031711 d| 8/2/2004 e| 7/30/2004 l| CATO-2 m| UP-ANNEX n| 1 q| 2 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical AGA Presidential Addresses w| ASIS c| 1 i| 000067508518 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 7/16/2015 z| 7083

949 a| Periodical 1957 32 w| ASIS c| 1 i| 32239001031166 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086

949 a| Periodical 1957 33 w| ASIS c| 1 i| 32239001031174 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086

949 a| Periodical 1958 34 w| ASIS c| 1 i| 32239001031182 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086

949 a| Periodical 1958 35 w| ASIS c| 1 i| 32239001031190 d| 4/22/2016 l| CATO-2 m| UP-ANNEX q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086

949 a| Periodical 1959 36 w| ASIS c| 1 i| 32239001031208 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086

949 a| Periodical 1959 37 w| ASIS c| 1 i| 32239000555710 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086

949 a| Periodical 1960 38 w| ASIS c| 1 i| 32239001031216 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086

949 a| Periodical 1960 39 w| ASIS c| 1 i| 32239001031224 d| 3/1/2009 l| CATO-2 m| UP-ANNEX q| 4 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086

949 a| Periodical 1961 40 w| ASIS c| 1 i| 32239001031232 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086

949 a| Periodical 1961 41 w| ASIS c| 1 i| 32239001031240 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086

949 a| Periodical 1962 42 w| ASIS c| 1 i| 32239001031257 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086

949 a| Periodical 1962 43 w| ASIS c| 1 i| 32239001031265 d| 1/12/2004 e| 1/10/2004 l| CATO-2 m| UP-ANNEX n| 1 q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086

949 a| Periodical 1943 1 w| ASIS c| 1 i| 32239001030861 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099

949 a| Periodical 1944 2 w| ASIS c| 1 i| 32239001030879 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099

949 a| Periodical 1944 3 w| ASIS c| 1 i| 32239001030887 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099

949 a| Periodical 1945 4 w| ASIS c| 1 i| 32239001030895 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099

949 a| Periodical 1945 5 w| ASIS c| 1 i| 32239001030903 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099

949 a| Periodical 1946 7 w| ASIS c| 1 i| 32239001030929 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099

949 a| Periodical 1947 8 w| ASIS c| 1 i| 32239001030937 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099

949 a| Periodical 1947 9 w| ASIS c| 1 i| 32239001030945 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099

949 a| Periodical 1948 10 w| ASIS c| 1 i| 32239001030952 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099

949 a| Periodical 1948 11 w| ASIS c| 1 i| 32239001030960 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099

949 a| Periodical 1948 12 w| ASIS c| 1 i| 32239001030978 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099

949 a| Periodical 1949 13 w| ASIS c| 1 i| 32239001030986 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099

949 a| Periodical 1950 14 w| ASIS c| 1 i| 32239001030994 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099

949 a| Periodical 1950 15 w| ASIS c| 1 i| 32239001031000 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099

949 a| Periodical 1950 16 w| ASIS c| 1 i| 32239001031018 d| 3/2/2011 l| CATO-2 m| UP-ANNEX q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099

949 a| Periodical 1951 17 w| ASIS c| 1 i| 32239000948816 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099

949 a| Periodical 1951 18 w| ASIS c| 1 i| 32239001031026 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099

949 a| Periodical 1951 19 w| ASIS c| 1 i| 32239001031034 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099

949 a| Periodical 1952 20 w| ASIS c| 1 i| 32239001031042 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099

949 a| Periodical 1946 6 w| ASIS c| 1 i| 32239001030911 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/4/2015 z| 7099

852 8 1 a| PSt b| UP-ANNEX c| CATO-2 h| Periodical

866 0 8| 0 a| v.1(1943)-v.89(1985)

852 8 1 a| PSt b| UP-PAT c| PATERNO-4 h| RC799 i| .A634

866 0 8| 0.1 a| v.56(1969), v.58(1970)-v.61(1971), v.64(1973)-v.73(1977), v.74:no.4(1978)-v.133(2007)

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RC799.A634 v.133 no.3-4 2007	Bound Journal	Paterno - 4th Floor
RC799.A634 v.133 no.1-2 2007	Bound Journal	Paterno - 4th Floor
RC799.A634 v.132 no.5-7 2007	Bound Journal	Paterno - 4th Floor
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RC799.A634 v.130 no.3-5 2006	Bound Journal	Paterno - 4th Floor
RC799.A634 v.130 no.1-2 2006 & suppl.1	Bound Journal	Paterno - 4th Floor
RC799.A634 v.129 no.5-6 2005	Bound Journal	Paterno - 4th Floor
RC799.A634 v.129 no.3-4 2005	Bound Journal	Paterno - 4th Floor
RC799.A634 v.129 no.2 2005	Bound Journal	Paterno - 4th Floor
RC799.A634 v.129 no.1 2005	Bound Journal	Paterno - 4th Floor
RC799.A634 v.128 no.7 2005	Bound Journal	Paterno - 4th Floor
RC799.A634 v.128 no.5-6 2005	Bound Journal	Paterno - 4th Floor
RC799.A634 v.128 no.4 2005 suppl.2	Bound Journal	Paterno - 4th Floor
RC799.A634 v.128 no.4 2005 & suppl.1	Bound Journal	Paterno - 4th Floor
RC799.A634 v.128 no.3 2005	Bound Journal	Paterno - 4th Floor
RC799.A634 v.128 no.1-2 2005	Bound Journal	Paterno - 4th Floor
RC799.A634 v.127 no.6 2004	Bound Journal	Paterno - 4th Floor
RC799.A634 v.127 no.5 2004 & suppl.1	Bound Journal	Paterno - 4th Floor
RC799.A634 v.127 no.4 2004	Bound Journal	Paterno - 4th Floor
RC799.A634 v.127 no.3 2004	Bound Journal	Paterno - 4th Floor
RC799.A634 v.127 no.2 2004	Bound Journal	Paterno - 4th Floor
RC799.A634 v.127 no.1 2004	Bound Journal	Paterno - 4th Floor

RC799.A634 v.126 no.7 2004	Bound Journal	Paterno - 4th Floor
RC799.A634 v.126 no.5-6 2004	Bound Journal	Paterno - 4th Floor
RC799.A634 v.126 no.4 2004 suppl.2	Bound Journal	Paterno - 4th Floor
RC799.A634 v.126 no.4 2004	Bound Journal	Paterno - 4th Floor
RC799.A634 v.126 no.2-3 2004	Bound Journal	Paterno - 4th Floor
RC799.A634 v.126 no.1 2004 & suppl.1	Bound Journal	Paterno - 4th Floor
RC799.A634 v.125 no.6 2003	Bound Journal	Paterno - 4th Floor
RC799.A634 v.125 no.5 2003	Bound Journal	Paterno - 4th Floor
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RC799.A634 v.125 no.2 2003	Bound Journal	Paterno - 4th Floor
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RC799.A634 v.124 no.7 2003	Bound Journal	Paterno - 4th Floor
RC799.A634 v.124 no.5-6 2003	Bound Journal	Paterno - 4th Floor
RC799.A634 v.124 no.4 2003 suppl.1	Bound Journal	Paterno - 4th Floor
RC799.A634 v.124 no.4 2003	Bound Journal	Paterno - 4th Floor
RC799.A634 v.124 no.3 2003	Bound Journal	Paterno - 4th Floor
RC799.A634 v.124 no.2 2003	Bound Journal	Paterno - 4th Floor
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RC799.A634 v.123 no.1 2002 & suppl.	Bound Journal	Paterno - 4th Floor
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RC799.A634 v.122 no.5-6 2002	Bound Journal	Paterno - 4th Floor
RC799.A634 v.122 no.4 2002 suppl.	Bound Journal	Paterno - 4th Floor
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RC799.A634 v.118 no.4 2000 suppls.	Bound Journal	Paterno - 4th Floor
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RC799.A634 v.118 no.2 2000 & suppl.	Bound Journal	Paterno - 4th Floor
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RC799.A634 v.116 no.4 pt.2 1999	Bound Journal	Paterno - 4th Floor
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RC799.A634 v.100 no.6 1991	Bound Journal	Paterno - 4th Floor
RC799.A634 v.100 no.5 pt.2 1991	Bound Journal	Paterno - 4th Floor
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RC799.A634 v.97 no.5-6 1989	Bound Journal	Paterno - 4th Floor
RC799.A634 v.97 no.3-4 1989	Bound Journal	Paterno - 4th Floor
RC799.A634 v.97 no.1-2 1989	Bound Journal	Paterno - 4th Floor
RC799.A634 v.96 no.6 1989	Bound Journal	Paterno - 4th Floor
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RC799.A634 v.95 no.5-6 1988	Bound Journal	Paterno - 4th Floor
RC799.A634 v.95 no.3-4 1988	Bound Journal	Paterno - 4th Floor
RC799.A634 v.95 no.1-2 1988	Bound Journal	Paterno - 4th Floor
RC799.A634 v.94 no.6 1988	Bound Journal	Paterno - 4th Floor
RC799.A634 v.94 no.5 1988	Bound Journal	Paterno - 4th Floor
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RC799.A634 v.94 no.1-2 1988	Bound Journal	Paterno - 4th Floor
RC799.A634 v.93 no.4-6 1987	Bound Journal	Paterno - 4th Floor
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RC799.A634 v.89 no.4-6 1985	Bound Journal	Paterno - 4th Floor
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RC799.A634 v.56 no.4-6 1969	Bound Journal	Paterno - 4th Floor
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Library Storage (94 items)

Call number	Material	Location
Annexed Material: Holdings Summary v.1(1943)-v.89(1985)		
Periodical AGA Presidential Addresses	Bound Journal	Annexed Material
Periodical 1985 89 JL-DE	Bound Journal	Annexed Material
Periodical 1985 88 JA-MR	Bound Journal	Annexed Material
Periodical 1985 88 AP-JN, Index	Bound Journal	Annexed Material
Periodical 1984 87 OC-DE	Bound Journal	Annexed Material
Periodical 1984 87 JL-SE	Bound Journal	Annexed Material
Periodical 1984 86	Bound Journal	Annexed Material
Periodical 1983 85	Bound Journal	Annexed Material
Periodical 1983 84 JA-MR	Bound Journal	Annexed Material
Periodical 1983 84 AP-JN, Index	Bound Journal	Annexed Material
Periodical 1982 83	Bound Journal	Annexed Material
Periodical 1982 82	Bound Journal	Annexed Material
Periodical 1981 81	Bound Journal	Annexed Material
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Periodical 1979 77	Bound Journal	Annexed Material

Periodical 1979 76	Bound Journal	Annexed Material
Periodical 1978 75	Bound Journal	Annexed Material
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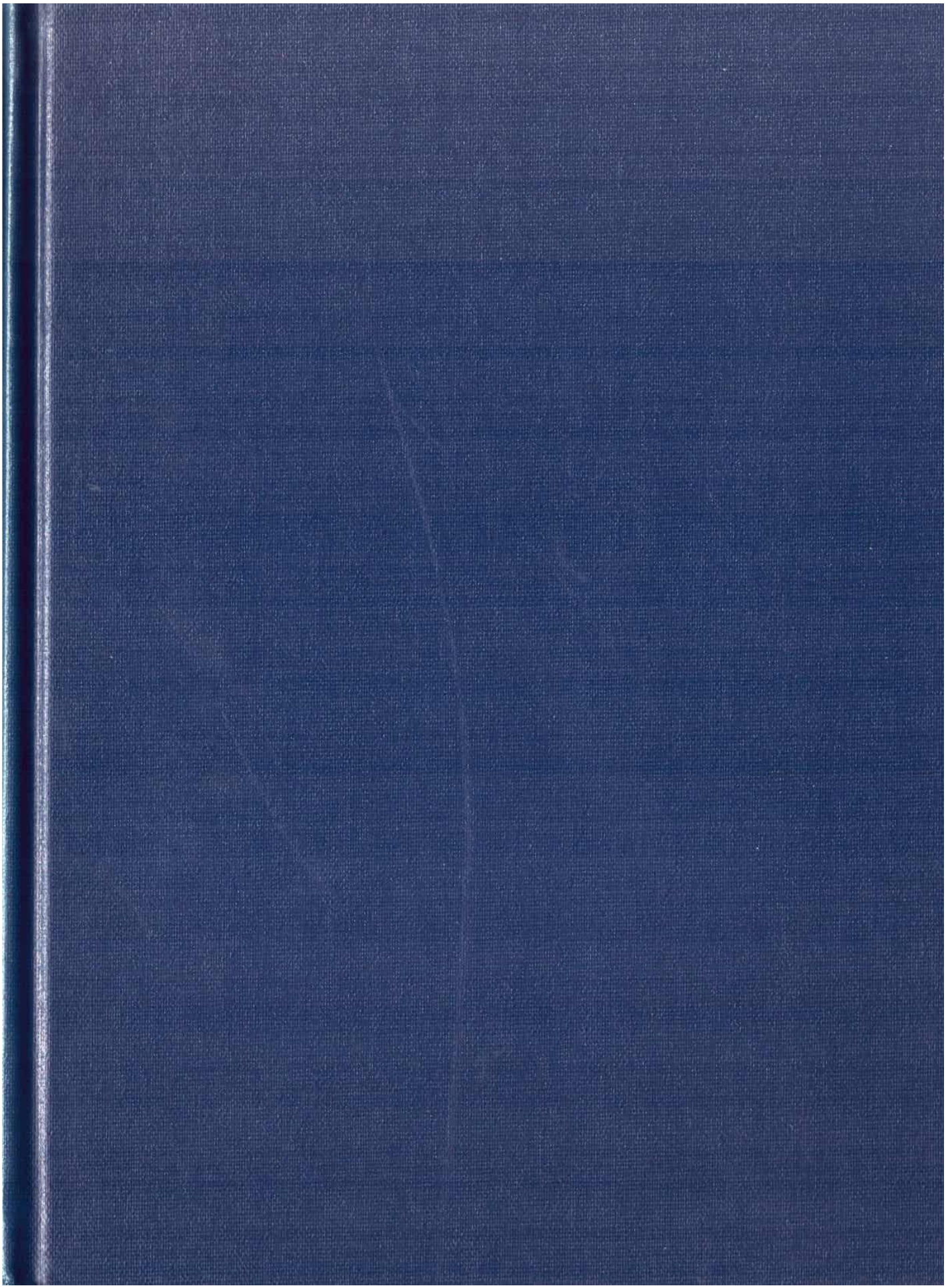
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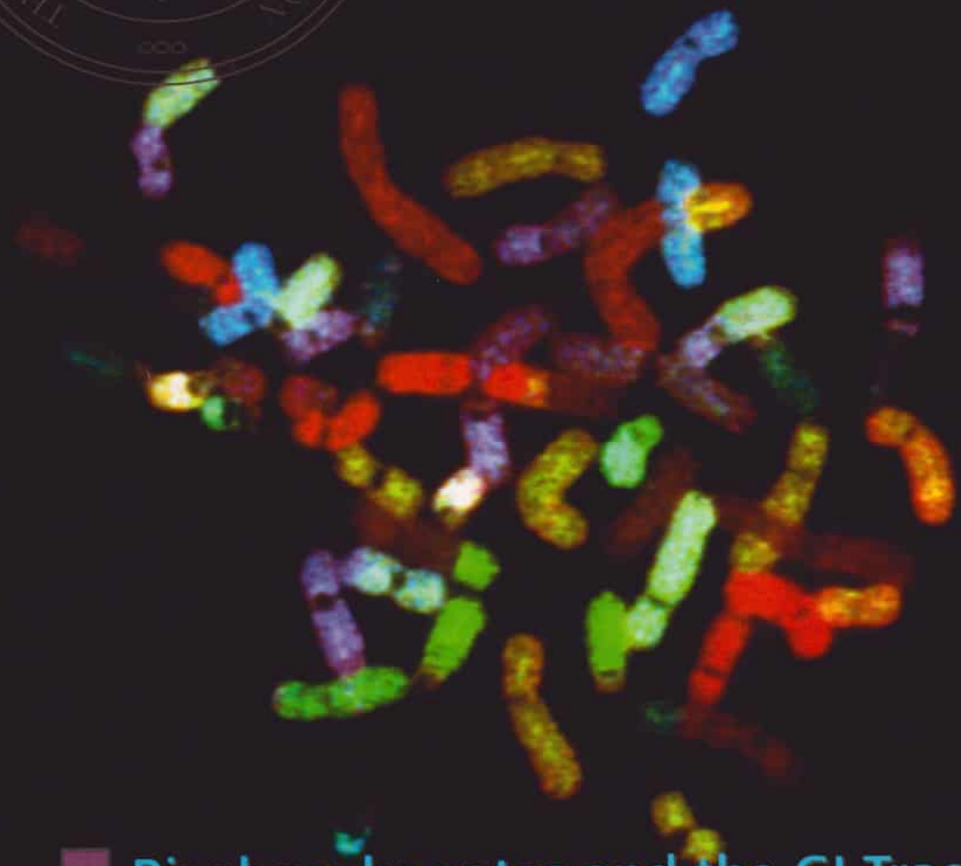
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Spectral karyotype by FISH (flourescent in situ hybridization) analysis demonstrating multiple chromosome abnormalities in a human colon cancer cell. See Burt on page 837 and Chung on page 854. (Picture Courtesy of Dr. Thomas Ried, National Human Genome Research Institute.)

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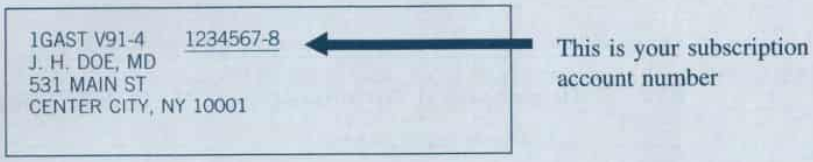
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The Genetic Basis of Colorectal Cancer: Insights Into Critical Pathways of Tumorigenesis

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The impact that modern molecular biology has had on elucidating the genetic basis of neoplasia is best illustrated by the paradigm of colon cancer. Several unique features of colon cancer biology have served to accelerate the discovery process. The development of a readily evident precursor lesion, the adenomatous polyp, has made it possible to construct a model of the sequential genetic events in cancer initiation and progression. Insights into the molecular basis of the relatively rare inherited syndromes familial adenomatous polyposis (FAP) and hereditary nonpolyposis colorectal cancer (HNPCC) have had profound implications for tumorigenesis in the more widespread sporadic forms of colon cancer.

Information on the genetics of neoplasia has increased at an exponential rate; the goal of this review is to focus on the pathways that seem to be uniquely relevant to colorectal cancer pathogenesis. It is clear that multiple events involving tumor-suppressor genes, oncogenes, and DNA mismatch repair genes contribute to the development of colorectal cancer, and the order in which these mutations occur is critical. Table 1 outlines some of the key genetic alterations that have been identified.

In 1990, a stepwise model of colorectal tumorigenesis was developed in which (1) mutations in the adenomatous polyposis coli tumor-suppressor gene (*APC*) were proposed to occur early during the development of polyps, (2) oncogenic *KRAS* mutations arose during the adenomatous stage, and (3) mutations of *TP53* and deletions on chromosome 18q coincided with the transition to malignancy.[1] This model has been generally validated. Subsequent work has identified additional genetic events as well as the specific molecular pathways perturbed by each of these mutations. These pathways regulate important cellular processes in neoplastic cells including proliferation and apoptosis. Ras and p53 pathways underlie tumorigenesis in a broad array of tumor types, and have been extensively reviewed.[2–5] This article will focus on three critical mechanistic pathways that characteristically affect colonic epithelia: the APC/β-catenin, DNA mismatch repair, and transforming growth factor (TGF)-β/SMAD pathways.

The final section will address the role of epigenetics in tumor development. While clonal gene mutations that provide a selective growth advantage are considered the sine qua non of molecular tumor pathogenesis, the importance of epigenetic mechanisms that regulate gene expression is becoming increasingly clear. Defects in DNA methylation may play an especially critical role in colon cancer pathogenesis.

The APC/β-Catenin Pathway

The clinical and hereditary features of the FAP syndrome implied the existence of a single gene that regulates the formation of adenomatous polyps, the precursor for most colorectal cancers. The identification of an interstitial deletion on chromosome 5q in a patient with the Gardner's variant of FAP combined with classical linkage analysis facilitated the positional cloning of the *APC* gene in 1991.[6,7] The 15-exon gene encodes a multifunctional 2843–amino acid protein of 310 kilodaltons that, when mutated in the germline, results in either FAP or Gardner's syndrome.

Subsequent studies have suggested that the *APC* tumor-suppressor gene also plays a critical early role in sporadic colon cancer, and *APC* is mutated in more than 70% of all colorectal cancers. This high mutational rate is unique to colorectal cancer. Although germline inactivating mutations of *APC* are distributed throughout the entire gene, somatic mutations are somewhat clustered at the 5′ end of exon 15 between amino acid residues 1280–1500.[8] This overlaps with the 15–amino acid repeat domains between residues 1020 and 1169 and 20–amino acid repeat domains between residues 1324 and 2075 that have been implicated in β-catenin

Abbreviations used in this paper: APC, adenomatous polyposis coli; COX, cyclooxygenase; DNMT, DNA methyltransferase; FAP, familial adenomatous polyposis; GSK, glycogen synthase kinase; HNPCC, hereditary nonpolyposis colorectal cancer; LOH, loss of heterozygosity; MSI, microsatellite instability; PPAR, peroxisome proliferator–activated receptor; TCF, T-cell factor; TGF, transforming growth factor.

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Table 1. Overall Prevalence of Genetic Mutations in Colorectal Cancer

Gene	Chromosomal location	Prevalence of mutations	Comment
Oncogenes			
KRAS2	12p	~50%	Consensus activating point mutations at codons 12 and 13
CTNNB1	3p22	~4%–15%	Identified in 50% of tumors without APC mutations; most mutations in exon 3 at GSK-3β phosphorylation sites
SRC	20q11	2%	Identified only in metastatic tumors
Tumor-suppressor genes			
APC	5q21	~70%	Most mutations are truncating and occur early at adenoma stage
TP53	17p13	~50%–70%	Rarely identified in benign adenomas; mutant p53 protein detectable immunohistochemically
SMAD4	18q21	16%	>70% of colorectal tumors show allelic loss on 18q; many potential tumor-suppressor gene targets including *SMAD4*, *SMAD2*, and *DCC*
SMAD2	18q21	6%	
DCC	18q21	3%	
DNA mismatch repair genes			
hMSH2	2p21		>90% of identified germline mutations are in *hMSH2* or *hMLH1*; limited mutational data in sporadic tumors, but maximum of 26% with MSI have somatic *hMSH2* mutations
hMLH1	3p21		
hPMS1	2q31–33	~15%[a]	
hPMS2	7p22		
hMSH6	2p21		

[a]Overall, 15% of tumors display MSI.

interactions,[9,10] as well as the SAMP (Ser-Ala-Met-Pro) domains located between the 20–amino acid repeats that interact with axin.[11] Consistent with the model of tumor-suppressor gene inactivation first proposed by Knudsen, mutations in 1 copy of *APC* are typically coupled with chromosomal deletions of the second wild-type allele. However, biallelic inactivation may occur through alternative routes. In some tumors from FAP patients with a germline *APC* mutation, deletions of the wild-type *APC* allele are not observed. Rather, there are deletions of the inherited mutant allele, and these are accompanied by new somatic mutations in the remaining allele.[8,12]

Regardless of the mechanism through which they are acquired, more than 90% of *APC* mutations result in a premature stop codon and thus a truncated gene product.[8,13] This observation serves as the basis for the most commonly used clinical assay for *APC* gene testing, the in vitro synthesized protein truncation test (Figure 1).[14] As predicted by the stepwise model of colonic tumorigenesis cited above, alterations in *APC* are characteristically present in benign polyps and the prevalence does not increase with advancing tumor stage.[13,15]

Several fascinating correlations between genotype and phenotype have been found in families with germline *APC* mutations. Mutations between codons 463 and 1387 are associated with congenital hypertrophy of the retinal pigmented epithelium.[16] An increased risk of desmoid tumor formation is observed in families with germline mutations between codons 1445 and 1578.[17] In addition, mutations at the 5′ end of the gene proximal to codon 157[18] or at the 3′ end distal to codon 1900[19] are associated with a more attenuated form of the disease (attenuated APC), in which fewer polyps develop than found in classic FAP and the onset of cancer is delayed until the sixth decade of life. However, these correlations are not uniform, and families with identical mutations may display variable phenotypes.[7]

Specific polymorphisms of *APC* are also associated with an increased risk of colorectal cancer. Individuals with the I1307K polymorphism (a transition from T to A at nucleotide 3920 of APC) have a 2-fold increase in the risk of colon cancer compared with the general population.[20] Tumors develop when new inactivating mutations in *APC* arise on the same allele carrying the I1307K polymorphism; curiously, most such mutations are situated within 36 nucleotides of the 8–base pair polyA tract that results from this polymorphism. The mechanisms underlying this unusual susceptibility to somatic mutations associated with certain *APC* alleles remain to be defined.

The APC gene product is a large protein with multiple functional domains that mediate both oligomerization and binding to many intracellular proteins including β-catenin, γ-catenin, glycogen synthase kinase (GSK)-3β, axin, tubulin, EB1, and hDLG.[21] The greatest progress in understanding the function of APC has been made in studying its interaction with GSK-3β and β-catenin, each an essential component of the Wingless/Wnt signaling pathway, which was first characterized in *Drosophila* and mice. As outlined in Figure 2, GSK-3β complexes with and phosphorylates APC, β-catenin, and

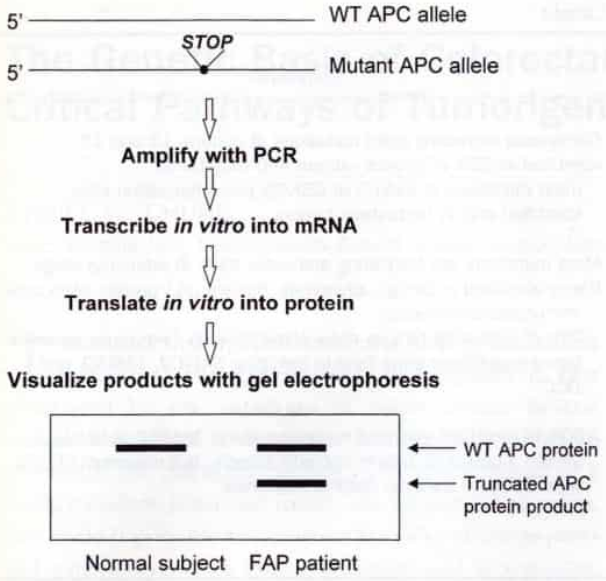


Figure 1. The APC protein truncation assay. Genomic DNA or complementary DNA is harvested from peripheral blood leukocytes, and fragments of the *APC* gene are amplified with polymerase chain reaction. Each fragment is then transcribed and translated in vitro, and the synthesized protein products are visualized with gel electrophoresis. A truncated protein product is detected in addition to the normal full-length product in patients who carry an *APC* mutation in 1 allele. This assay will detect germline mutations in 80% of patients with classic FAP. WT, wild-type.

axin. Phosphorylation targets β-catenin for degradation via a ubiquitin-mediated proteasomal pathway.[22] Truncation of APC results in the disruption of complex formation and ultimately increased cytoplasmic levels of β-catenin. Free β-catenin is translocated to the nucleus, where it interacts with T-cell factor (TCF)/lymphoid enhancer factor high-mobility group transcription factors. TCF-4 is the predominant member of this family of transcription factors in colonic epithelial cells, and activation of this pathway up-regulates the oncogenes c-Myc and cyclin D1, as well as matrilysin, c-jun, fra-1, and urokinase-type plasminogen activator receptor through binding to TCF-response elements.[23–26] Another recently identified target is the peroxisome proliferator–activated receptor (PPAR) δ gene, which is also regulated by nonsteroidal anti-inflammatory drugs (NSAIDs).[27] It is likely that additional important gene targets of TCF still remain to be identified.

Collectively, these findings suggest that β-catenin is a "driver" that up-regulates TCF-responsive genes critical for proliferation and transformation of colonic epithelial cells. In this context, it is noteworthy that gain-of-function mutations in the β-catenin gene (*CTNNB1*) have been identified in as many as 50% of colon tumors with intact *APC*.[28] Overall, 4%–15% of all sporadic colorectal adenomas and carcinomas harbor *CTNNB1* mutations,[28,29] and these localize predominantly to the amino-terminal regulatory region (amino acids 29–45) of exon 3 where critical serine and threonine phosphorylation sites are altered. Because mutant forms of β-catenin constitutively activate TCF-promoter elements and transform cells in culture,[30,31] it is now clear that β-catenin can function as an oncogene.

Consistent with the essential role of this pathway in early tumorigenesis, β-catenin mutations are also identified in benign adenomatous polyps. Because it is "downstream" of APC, mutations in β-catenin can promote polyp formation even when *APC* is intact. In contrast to *APC*, the frequency of mutations in benign adenomas (12.5%) decreases significantly in invasive cancers (1.4%), suggesting that adenomas with alterations in β-catenin are less likely to progress to malignancy.[29] Interestingly, no germline mutations in *CTNNB1* have yet been described in FAP kindreds with wild-type *APC*.[32] Similarly, no mutations of GSK-3β or axin have

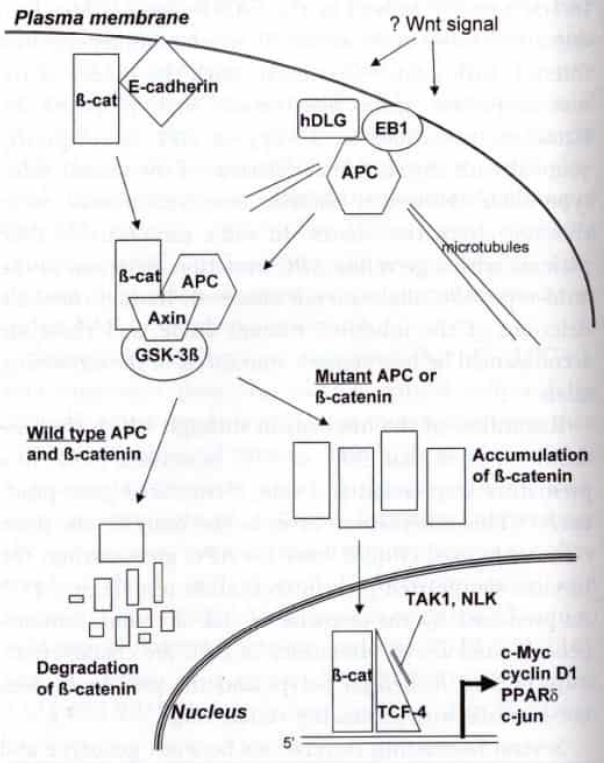


Figure 2. The APC/β-catenin pathway. APC together with GSK-3 provides a signal that targets the degradation of cytoplasmic β-catenin (β-cat). Axin functions as a scaffold for this multimeric complex. In the presence of either mutant APC or β-catenin, this process is disrupted. Excess β-catenin is translocated to the nucleus where it binds with TCF-4 to up-regulate target genes including c-myc, cyclin D1, PPARδ, and c-jun. β-Catenin binds to APC in a mutually exclusive manner with E-cadherin at the plasma membrane. The nature of the extracellular Wnt signal that may regulate colonic epithelial cells is unknown.

yet been found in colorectal tumors with intact *APC* and *CTNNB1*. *TCF4* mutations have been identified, but only in a unique subset of colon tumors; 39% (19/49) of tumors with microsatellite instability (MSI) harbored a 1–base pair deletion within a polyA tract,[33] although the functional significance of this frameshift has not yet been defined.

The mechanisms that counterbalance signaling through this pathway are only beginning to be characterized. The mitogen-activated protein kinase–related enzymes TAK1 and NLK are mammalian homologues of the MOM-4 and LIT-1 kinases that regulate Wnt signaling in *Caenorhabditis elegans*. Both TAK1 and NLK inhibit β-catenin–mediated up-regulation of a TCF-response element, and this inhibition results from direct phosphorylation of TCF-4 by NLK.[34] The B56 subunit of protein phosphatase 2A also regulates β-catenin signaling, and its effects may be mediated through dephosphorylation of GSK-3β.[35] Mutations of a phosphatase 2A subunit were identified in 2 of 13 primary colon tumors, suggesting that alterations in these counterregulatory pathways may play a role in the pathogenesis of colorectal cancer.[36]

Specific localization of the APC protein to discrete puncta at the ends of microtubules implies an important role in regulation of the cytoskeleton and cellular migration.[37] In colonic epithelial cells, APC also interacts with hDLG through its COOH terminus, and hDLG and APC colocalize along the lateral plasma membrane.[38] However, animal studies suggest that this interaction may not be essential for adenoma formation. Mice with a truncating *Apc* mutation at codon 1638 (Apc1638T) that eliminates the COOH-terminus DLG-binding domain do not develop intestinal adenomas.[39] In contrast, animals carrying a nonsense *Apc* mutation at either codon 850 or 716 eliminating β-catenin interaction sites develop widespread intestinal polyposis.[40,41] A similar polyposis phenotype is observed in mice with a mutant β-catenin gene (Table 2).[42]

The DNA Mismatch Repair Pathway

Identification of the genes responsible for the HNPCC syndrome has led to insights into a novel mechanism of tumorigenesis in colon cancer. Mutations in five different genes (*hMSH2*, *hMSH6*, *hMLH1*, *hPMS1*, and *hPMS2*) have now been associated with the syndrome.[43] As many as 45%–70% of HNPCC families who meet the Amsterdam criteria have mutations in one of these genes, most frequently either *hMSH2* or *hMLH1*.[44,45] Each of the five genes encodes a protein involved in DNA mismatch repair, a complex enzymatic proofreading system that corrects base pair mismatches that arise during DNA replication.

In yeast, MSH2 complexes with either MSH6 to recognize single base pair mismatches, insertions, or deletions or MSH3 to recognize larger 2– to 4–base pair insertions or deletions.[46] The MLH1 and PMS2 gene products then excise the mismatched nucleotides from the newly synthesized strand. Cells with a defective mismatch repair system display a mutator phenotype in which many genes exhibit mutations because of uncorrected errors in DNA replication. Genes with simple repetitive sequences such as polyA tracts or CA-repeat microsatellites are particularly susceptible targets. Tumors with such alterations are said to display MSI or the replication error phenotype. A recent National Cancer Institute workshop proposed a consensus panel of five

Table 2. Summary of Selected Genetic Mouse Models of Colorectal Cancer

Model	Genetic alteration	Intestinal tumors				Comment
		+++	++	+	o	
Apc-Min +/−	Truncation at *Apc* codon 850	√				
× Dnmt1 +/−	Heterozygous inactivation of DNMT in Min mice			√		
× p53 −/−	Homozygous inactivation of p53 in Min mice	√				No change in intestinal tumors
Apc716 +/−	Truncation at *Apc* codon 716	√				
× Ptgs2 −/−	Homozygous inactivation of cox2 in Apc716 mice			√		
× Smad4 +/−	Heterozygous inactivation of Smad4 in Apc716 mice	√				Tumors are more malignant
Apc1638T +/− or −/−	Truncation at *Apc* codon 1638				√	
Apc1638N +/−	Insertion of neomycin gene at *Apc* codon 1638		√			Results in an unstable Apc protein
× Mlh1 −/−	Homozygous deletion of Mlh1 in Apc1638N mice	√				Tumors are also more malignant
Ctnnb ex3 +/−	Heterozygous deletion of exon 3 of β-catenin gene	√				
Msh2 −/−	Homozygous deletion of *Msh2*			√		Frequent lymphomas
Mlh1 −/−	Homozygous deletion of *Mlh1*		√			Frequent lymphomas
Msh3 −/−	Homozygous deletion of *Msh3*				√	
Msh6 −/−	Homozygous deletion of *Msh6*			√		Frequent lymphomas
× Msh3 −/−	Homozygous deletion of *Msh3* in Msh6 null mice		√			

mononucleotide and dinucleotide microsatellite markers for MSI testing. On this basis, tumors could be classified as demonstrating high frequency MSI (MSI-H, ≥2 markers unstable), low frequency MSI (MSI-L, 1 marker unstable), or microsatellite stability (MSS, 0 markers unstable).[47]

HNPCC accounts for as much as 3%–6% of colorectal cancer; virtually all of these tumors display MSI. Up to 15% of sporadic colorectal tumors exhibit MSI. However, only a small fraction (4%–26%) of these have identifiable somatic mutations in *hMSH2*,[48,49] and only 6%–10% of unselected sporadic cases with MSI harbor germline mutations in *hMSH2* or *hMLH1*.[50,51] Tumors with MSI show distinctive clinical features including a proximal colonic location, mucinous or undifferentiated histology, prominent infiltration of lymphocytes, and improved prognosis compared with stage-matched microsatellite stable controls.[47,52] The molecular basis for these unique clinical phenotypes remains to be defined.

Germline mutations in *hMSH2* and *hMLH1* are widely distributed throughout the 16 exons spanning 73 kilobases of *hMSH2* or the 19 exons spanning 58 kilobases of *hMLH1*.[53] The majority are point mutations arising from single base pair substitutions, deletions, or insertions. In *hMSH2*, this results primarily in frameshifts (60%) or premature truncations (23%), whereas frameshifts (40%) or missense mutations of unknown significance (31%) are typically observed in families with a mutant *hMLH1* gene. Simple assays to determine the functional consequences of these frequent missense mutations are not yet available. The absence of either consensus mutational hotspots or a high frequency of truncating mutations has hampered efforts to develop an inexpensive and simple mutational assay. Correlations between genotype and phenotype have not yet been defined, with the exception of an increased risk of extraintestinal tumors of the urinary tract, stomach, and ovary in carriers of germline *hMSH2* mutations.[54]

Inactivation of both alleles of *hMSH2* or *hMLH1* is necessary to generate the MSI-H phenotype, and this occurs through several routes. Loss of heterozygosity (LOH) is often coupled with point mutations of *hMSH2* or *hMLH1*, consistent with the two-hit model of tumor-suppressor gene inactivation.[50] Epigenetic mechanisms may also play a role because *hMLH1* can be silenced through hypermethylation of CpG islands in its promoter. More than 80% of MSI-positive sporadic colorectal tumors show hypermethylation of the *hMLH1* promoter, suggesting that this may be a primary mechanism underlying the MSI phenotype in sporadic tumors.[55] Furthermore, both alleles of *hMLH1* were hypermethylated in five of six MSI-positive colon cancer cell lines without identifiable mismatch repair gene mutations, and the demethylating agent 5-azacytidine restored the expression of both *hMLH1* alleles as well as functional mismatch repair activity.[55,56] A third mechanism of gene inactivation is a dominant negative effect caused by a germline truncating *hPMS2* mutation at codon 134.[57] In this instance, MSI occurs in cells that still contain a wild-type *hPMS2* allele. In mice, homozygous inactivation of DNA mismatch repair genes can lead to intestinal tumorigenesis[58–60]; some of these models are outlined in Table 2.

DNA mismatch repair gene defects in HNPCC syndrome are presumed to lead to tumor development as a result of the accumulation of widespread mutations within short repetitive sequences. Because most stretches of microsatellite DNA lie in noncoding sequences, many such alterations are unlikely to be functionally significant. However, mutations also occur in genes with repetitive sequences in coding exons. The type II TGF-β receptor gene was the first such target to be identified, and frameshift mutations occurred in a short GT-repeat sequence or a stretch of 10 adenines as a consequence of either an insertion or deletion of the repeated nucleotides.[61] This finding provided independent validation of the importance of the TGF-β signaling pathway in colorectal tumorigenesis because TGF-β is a potent inhibitor of colonic epithelial cell growth.[62,63] Additional mutational targets include the apoptosis regulator BAX,[64] the insulin-like growth factor II receptor,[65] the cell cycle–regulated transcription factor E2F-4,[66] TCF-4,[33] caspase 5,[67] the intestinal homeobox factor CDX2,[68] and even the mismatch repair genes hMSH3 and hMSH6 themselves.[69] The latter provides a unique positive feedback loop in which tumors with MSI can enhance their own phenotype. Table 3 summarizes the unique association between this specific class of frameshift mutations and MSI-positive tumors. Although the relative importance of these alterations in tumorigenesis is unknown, they are likely to play a pathogenic role because no mutations of short repeat sequences are identified in genes (e.g., histone) that are not intimately linked to the tumorigenic process.[70]

The relationship between the MSI phenotype and mutations of *APC*, *KRAS*, or *TP53* remains unsettled. Initial reports suggested that *APC* mutations were present in only 21% of tumors with MSI,[71] but more recent studies have noted that 43% of tumors with wild-type *APC* harbor *CTNNB1* gene mutations.[72] Thus, alterations in the APC/β-catenin pathway are common in tumors irrespective of MSI. Although some

Table 3. Prevalence of Somatic Frameshift Mutations in Colorectal Tumors With and Without MSI

Gene	Mutated target sequence	MSI$^+$ tumors (HNPCC)	MSI$^+$ tumors (sporadic)	MSS tumors
TGFβRII	$(A)_{10}$	78%–83%	82%–90%	0%[a]
IGF2R	$(G)_8$	13%	9%	0%
BAX	$(G)_8$	52%–55%	13%–50%	0%
hMSH3	$(A)_8$	50%–58%	39%–46%	0%
hMSH6	$(C)_8$	33%	28%–36%	0%
E2F4	$(CAG)_{13}$	71%	42%–57%	0%
Caspase-5	$(A)_{10}$	—	62%	0%
TCF4	$(A)_9$	—	39%	2%
CDX2	$(G)_7$	5%	—	0%

MSS, microsatellite stable; —, data not available.
[a]Fifteen percent of MSS colorectal cancer cell lines exhibit TGFβRII mutations that are not frameshifts in the polyA tract.

investigators have identified *KRAS* mutations in only 7% of MSI-positive tumors,[71] others have noted frequencies as high as 22%–31%, similar to the rates seen in control tumors with MSS.[16,73] Finally, fewer p53 mutations seem to be present in tumors with MSI; mutation rates range from 0%–5%, 13%–40%, and 31%, compared with rates of 33%–50%, 55%–67%, and 55%, respectively, for tumors without MSI.[71,73,74]

Collectively, these observations establish the overriding importance of the APC/β-catenin pathway in the initiation of tumors regardless of MSI status. The mechanisms that then govern the accumulation of additional mutations after initial polyp formation diverge depending on the underlying basis for genetic instability. In contrast to MSI-positive tumors that are typically diploid and possess a narrowly defined mutator phenotype affecting simple sequence repeats, the larger population of MSS tumors shows more global chromosomal instability manifested by aneuploidy and frequent LOH.[75] The molecular basis for this type of chromosomal instability is beginning to be understood, and it seems that alterations in mitotic checkpoint genes such as *hBUB1* may be important.[76] Both types of genetic instability can be observed in benign polyps, and the specific rates at which subsequent mutations develop during the transition to malignancy are unknown. However, the clinical observation that HNPCC-associated polyps become malignant more rapidly than sporadic MSS polyps suggests that the MSI mutator phenotype may accelerate tumor progression. This contrasts with FAP-associated polyps, in which the process of tumor initiation is accelerated. Figure 3 summarizes the timing of the key genetic events in colon cancer pathogenesis, based on whether there is underlying chromosomal instability or MSI.

The TGF-β/SMAD Pathway

TGF-β and related family members mediate a wide variety of biological effects, the most characteristic being its potent inhibition of proliferation.[77] TGF-β initiates its broad spectrum of cellular responses through binding to the type II TGF-β receptor (TGFβRII). Binding to TGFβRII recruits and activates the type I receptor through phosphorylation of specific serine and threonine residues; signaling to the nucleus is then mediated through the so-called SMAD proteins, which are phosphorylated by the type I receptor. To date, nine SMAD proteins have already been identified. In mammalian cells, the type I receptor kinase first phosphorylates SMAD2 and SMAD3; SMAD4 then joins the complex. After translocation to the nucleus, this heteroligomeric complex modulates transcription of specific genes through cis-regulatory SMAD-binding sequences. The SMAD pathway has been shown to regulate genes encoding plasminogen activator inhibitor1,[78] the CDK inhibitors p15 and p21,[79,80] cyclin D1,[81] and TGF-β itself,[82] among others.

The identification of TGFβRII mutations in most colorectal tumors with MSI first suggested that genetic alterations in this pathway may contribute to colorectal tumorigenesis. Functional studies confirmed that these mutations render cells resistant to the effects of TGF-β.[61] Type II receptor mutations are also present in 15% of MSS colorectal cancer lines. Not surprisingly, these are not frameshifts of the $(A)_{10}$ tract typically mutated in tumors with MSI.[83] However, the number of mutations identified in the multiple SMAD genes has been relatively small; 16% (5/31) of primary colorectal tumors harbor alterations of *SMAD4*,[84] and missense mutations of *SMAD2* are identified in 6% (4/66) of cases.[85] *SMAD4* and *SMAD2* (as well as *DCC*, the "deleted in colon cancer" locus) lie on chromosome 18q21 within 10 cM of each other, and all three are thus potential tumor-suppressor gene targets of the LOH on 18q present in as many as 70% of colorectal cancers.[86] So far, no mutations of the remaining SMADs (*SMAD1, SMAD3, SMAD5,* or *SMAD6*) have been documented.[87] Of note, deletion of *Smad4* in *Apc* null mice results in more malignant intestinal tumors than those in *Apc* null mice alone (Table 2), suggesting that SMAD4 plays a functional role in tumor progression.[88]

The importance of the TGF-β pathway in colorectal tumorigenesis is further underscored by the description of a colon cancer family exhibiting a germline mutation in the TGFβRII gene.[89] Colorectal tumors developed in members of this kindred with the loss of the remaining wild-type allele. In contrast to classic HNPCC syn-

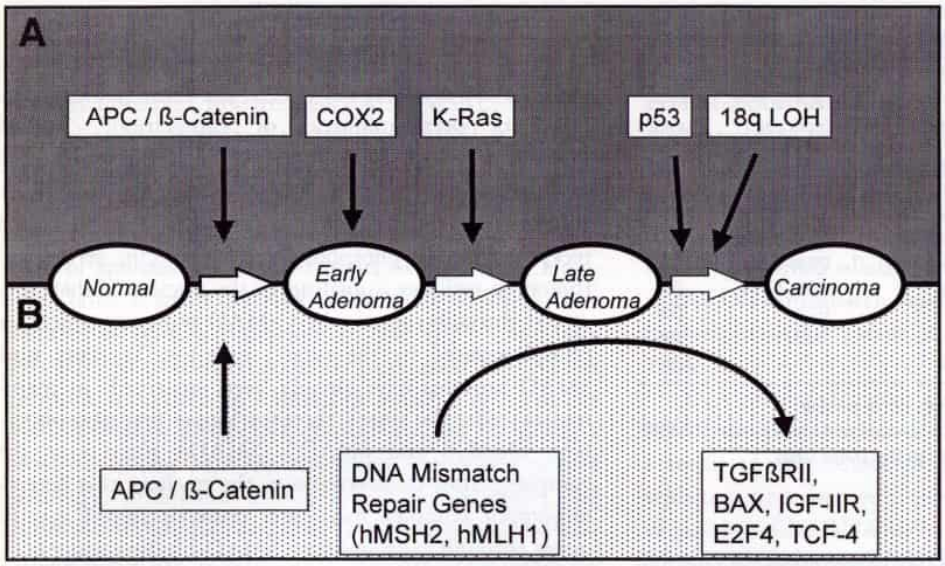


Figure 3. Overall scheme of key genetic events in colorectal tumorigenesis. The critical genes involved in the development of colorectal polyps and cancer are illustrated. The specific timing of each genetic event is crucial in tumor pathogenesis. These genetic events can be grouped into two broad categories. Eighty-five percent of tumors exhibit chromosomal instability but stability of microsatellite DNA; the typical genetic events associated with these tumors are illustrated in *A*. The remaining 15% of tumors are characterized by MSI; the key genetic events in these tumors are illustrated in *B*.

drome, tumors in this family were diagnosed after age 60 and no metachronous lesions were found. Furthermore, no extracolonic malignancies were reported, illustrating the unique dependence of intestinal epithelia on the actions of TGF-β.

Additional Genetic Events in Colorectal Tumorigenesis

KRAS is mutated in approximately 50% of colorectal tumors, and alterations in this small GTP-binding protein almost uniformly occur as activating point mutations in codons 12, 13, and to a lesser extent, 61. Among their many functions, K-ras pathways transduce signals from extracellular growth factors to regulate progression through the cell cycle and proliferation.[2,3] *KRAS* mutations are associated with up-regulation of DNA methyltransferase, cyclin D1, and gastrin, all of which may be important in colon cancer pathogenesis.[90–92] Mutations are frequently present in aberrant crypt foci, which may represent the earliest precursor of an adenoma. However, these mutations are present in 80%–92% of nondysplastic or hyperplastic aberrant crypt foci but only 57% of dysplastic or adenomatous aberrant crypt foci,[93] casting doubt on their importance in tumorigenesis given that hyperplastic changes are generally not thought to be precursors of adenomas.

TP53 mutations are also identified in 50% or more of colorectal tumors; mutations localize primarily to exons 5–8. The *TP53* tumor-suppressor gene product (p53) is a sequence-specific transcriptional activator that plays diverse and complex roles in the regulation of cell cycle progression and apoptosis.[4,5] Most p53 mutations result in a protein with an abnormally long half-life, and the accumulation of mutant p53 can be detected immunohistochemically. Inactivating mutations in p53 occur as a late event during the transition from adenoma to carcinoma and are typically accompanied by deletions of the remaining wild-type allele on chromosome 17p.

The *DCC* tumor-suppressor gene was cloned in 1990 and encodes a cell surface receptor for the ligand netrin. Point mutations have been detected in 2 of 30 human colorectal cancer samples.[94] The large size of the gene (>1300 kilobases) has hampered efforts to analyze a greater number of tumors for mutations in this gene. Loss of DCC protein is associated with a poor prognosis, suggesting an important functional role for the protein.[95] Data on the specific biological activities of DCC are limited, but regulation of apoptosis has been implicated.[96]

SRC encodes a nonreceptor tyrosine kinase that is frequently up-regulated in advanced colonic malignancies. A truncating mutation at codon 531 was found in 12% of metastatic colorectal tumors in one study.[97] Truncation results in increased src kinase activity and tumorigenicity in both colony-formation assays and nude mice.

PPARγ, a member of the nuclear hormone receptor superfamily, is a key regulator of adipocyte differentiation. Interestingly, PPARγ is also expressed in colorectal cancers, and in vitro studies indicate that ligand activation can induce differentiation of colon cancer cells, partially reversing the malignant phenotype.[98,99] However, there are conflicting data because ligand activation in Apc^{min} mice results in enhanced tumorigenesis.[100,101]

Monoallelic inactivating mutations of PPARγ have been found in 4 of 55 sporadic colon cancers, suggesting that ligand signaling through PPARγ may prevent colon tumor development in humans.[102]

Several genes are also consistently up-regulated but not mutated in colon cancer. Cyclooxygenase (COX)-2 is overexpressed in as many as 43% of adenomas and 86% of carcinomas, and the increased levels of COX-2 play a role in regulating angiogenesis and apoptosis.[103–105] Furthermore, inhibition of COX-2 activity blocks the growth of cultured colon cancer cells[106] and dramatically reduces the number of intestinal polyps in *Apc*-mutant mice (Table 2).[107] Interestingly, several mouse models of colonic tumorigenesis suggest that it is the stromal cells within these tumors that overexpress COX-2.[108] Overexpression of insulin-like growth factor II and incompletely processed forms of gastrin also seem to play a role in colorectal tumorigenesis.[109–111] Up-regulation of these tumor-promoting genes cannot be easily classified as a clonal genetic event underlying tumor formation. Although these events seem to be secondary, they likely play an important role in tumor pathogenesis.

The number of genes already implicated in colorectal cancer development is impressive, but the list is undoubtedly incomplete. Initial allelotyping studies performed over a decade ago suggested critical tumor-suppressor gene loci on 5q, 8p, 17p, 18q, and 22q.[112] Although the *APC, TP53*, and *DCC/SMAD4/SMAD2* genes have been mapped to 5q, 17p, and 18q, respectively, no candidates have yet been identified on 8p or 22q. LOH on 22q has been confirmed in independent analyses, inferring the presence of a novel tumor-suppressor gene.[113]

Epigenetic Mechanisms in Colorectal Tumorigenesis

The transformation of a normal colonic epithelial cell to a malignant clone is the consequence of a complicated program in which the inappropriate activation of some genes is accompanied by the specific inactivation of others. Tumorigenesis requires that this altered program is passed on to subsequent generations of cells. Thus far, this review has focused primarily on the specific alterations in gene sequence (i.e., mutations) that fulfill these criteria. However, epigenetic mechanisms, especially DNA methylation, also seem to play an important role.

Widespread genomic hypomethylation in both benign adenomas and malignant colon cancers was first reported in 1985.[114] Interestingly, this global hypomethylation occurs in the setting of localized hypermethylation.[115] As noted above, hypermethylation of CpG islands within promoter sequences of specific tumor-suppressor genes can have a potent silencing effect. In addition to *hMLH1*, hypermethylation of the $INK4A^{p16}$ gene is observed in 28%–55% of colon tumors.[90,116]

DNA methyltransferase (DNMT) enzymes catalyze the transfer of methyl groups from *S*-adenosyl methionine to cytosine residues. DNMT-1 is the best studied form in eukaryotic cells. The specific mechanisms that regulate DNMT activity and the methylation status of the genome are poorly understood. Mutant K-ras signaling is associated with up-regulation of DNA methyltransferase activity.[90] Furthermore, elevated DNA methyltransferase activity is detected in colon cancer cells,[117] and overexpression of *DNMT1* can lead to cellular transformation.[118] The most compelling in vivo data directly implicating altered methylation in colorectal tumorigenesis come from Apc^{min} mice crossed with *Dnmt1* null mice. A dramatic reduction in the number of intestinal polyps is observed, suggesting that DNA methylation plays a critical role in tumor pathogenesis.[119]

Implications for Clinical Management

Dramatic insights into the genetic basis of colon cancer have been achieved. These advances will undoubtedly have many direct applications to clinical management of patients with colorectal cancer. The feasibility of K-ras and p53 molecular analysis of stool for the diagnosis of colon cancer has already been shown and awaits further refinement.[120,121] Germline testing for the FAP and HNPCC syndromes is now commercially available and plays a valuable role in the counseling of high-risk families. The search for molecular prognostic markers that may predict outcomes is ongoing and will hopefully build on initial observations that the status of chromosome 18q LOH and loss of DCC protein staining can be used to stratify patients.[95,122] It is clear that optimal responses to chemotherapy are influenced by the underlying tumor genotype, e.g., the efficacy of DNA alkylating agents is dependent on an intact DNA mismatch repair system.[123] Similarly, p53-deficient colorectal cancer cells display an enhanced sensitivity to doxorubicin but are resistant to the commonly used antimetabolite, 5-fluorouracil.[124] Finally, advances in our understanding of COX-2 up-regulation in colon cancer are already enabling strategies for the prevention of colon cancer with NSAIDs.[125]

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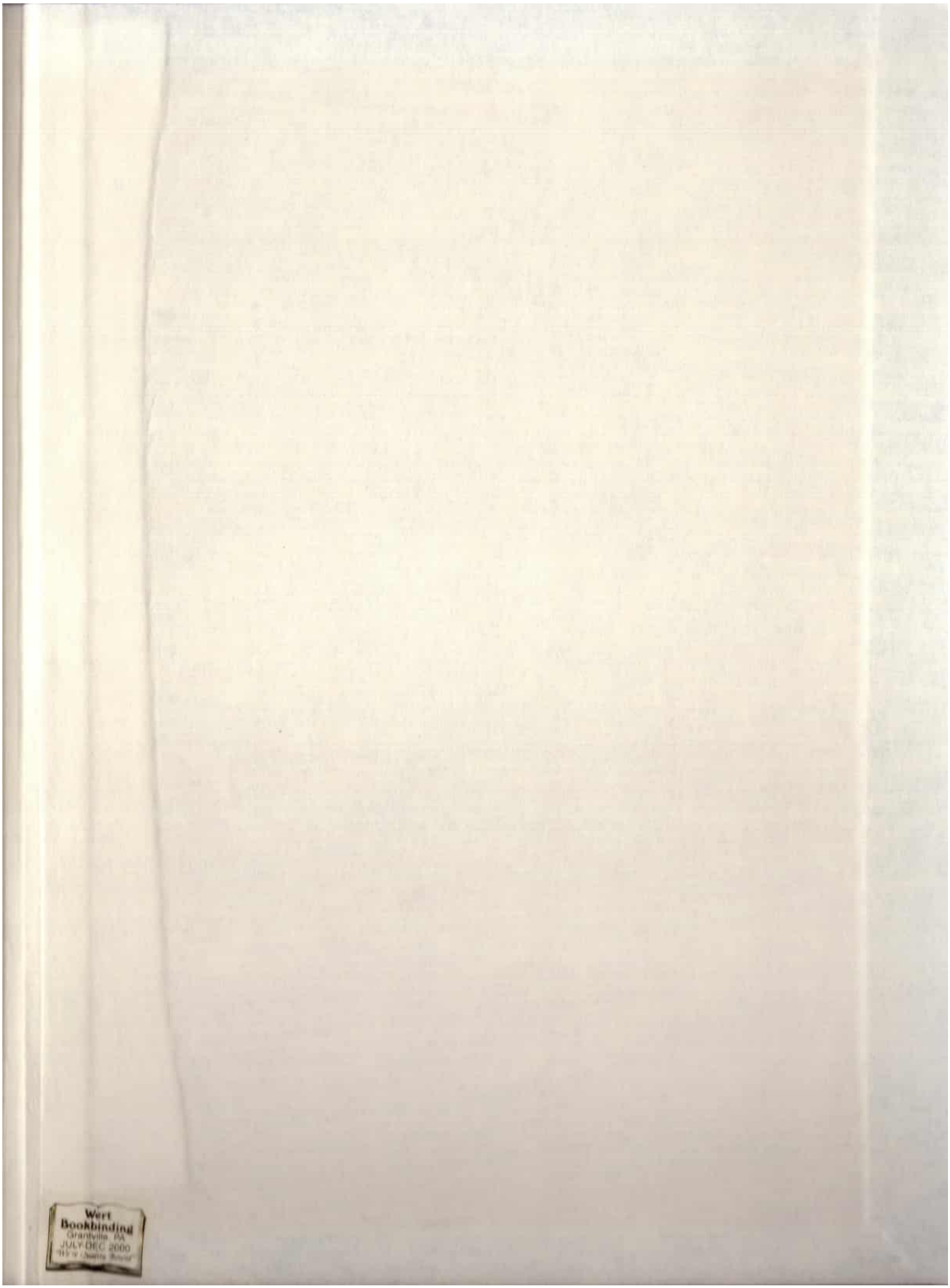
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Colorectal cancer

Risk of progression of advanced adenomas to colorectal cancer by age and sex: estimates based on 840 149 screening colonoscopies

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Appendix BRENNER02

COLORECTAL CANCER

Risk of progression of advanced adenomas to colorectal cancer by age and sex: estimates based on 840 149 screening colonoscopies

Hermann Brenner, Michael Hoffmeister, Christa Stegmaier, Gerhard Brenner, Lutz Altenhofen, Ulrike Haug

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Objectives: To derive age and sex specific estimates of transition rates from advanced adenomas to colorectal cancer by combining data of a nationwide screening colonoscopy registry and national data on colorectal cancer (CRC) incidence.
Design: Registry based study.
Setting: National screening colonoscopy programme in Germany.
Patients: Participants of screening colonoscopy in 2003 and 2004 (n = 840 149).
Main outcome measures: Advanced adenoma prevalence, colorectal cancer incidence, annual and 10 year cumulative risk of developing CRC among carriers of advanced adenomas according to sex and age (range 55–80+ years)
Results: The age gradient is much stronger for CRC incidence than for advanced adenoma prevalence. As a result, projected annual transition rates from advanced adenomas to CRC strongly increase with age (from 2.6% in age group 55–59 years to 5.6% in age group ⩾80 years among women, and from 2.6% in age group 55–59 years to 5.1% in age group ⩾80 years among men). Projections of 10 year cumulative risk increase from 25.4% at age 55 years to 42.9% at age 80 years in women, and from 25.2% at age 55 years to 39.7% at age 80 years in men.
Conclusions: Advanced adenoma transition rates are similar in both sexes, but there is a strong age gradient for both sexes. Our estimates of transition rates in older age groups are in line with previous estimates derived from small case series in the pre-colonoscopy era independent of age. However, our projections for younger age groups are considerably lower. These findings may have important implications for the design of CRC screening programmes.

Most colorectal cancers (CRCs) develop from adenomas, among which "advanced" adenomas are considered to be the clinically relevant precursors of CRC. The natural history of colorectal adenomas is a decisive factor for the design of CRC screening measures and their cost effectiveness. Since advanced adenomas need to be removed once they are detected, any direct observation of their natural history would be unethical. Thus, available estimates for the progression of adenomas mostly stem from radiological surveillance data or from autopsy series collected prior to the colonoscopy era.[1–9] However, these data are rather vague as they were derived from small and potentially selective samples. For example, a major source for the estimation of adenoma transition rates has been a retrospective review of Mayo Clinic records from 226 patients with colonic polyps ⩾10 mm in diameter in whom periodic radiographical examination of the colon was performed, and in whom 21 invasive carcinomas were identified during a mean follow up of 9 years.[9] Despite the undoubted usefulness of available data sources from the pre-colonoscopy era, sample size limitations did not allow reliable estimates of adenoma transition rates according to key factors, such as age and sex. Accordingly, a common estimate of these transition rates for all ages and both sexes has generally been assumed in previous studies on effectiveness and cost effectiveness of CRC screening.[10–17] Given that sensitivity analyses in these studies showed that the advanced adenoma–carcinoma transition rate represents a very influential parameter,[10 11 13 18] its variation by age and sex might have a large impact on relative effectiveness and cost effectiveness of various screening schemes.

The aim of this paper was to estimate risk for developing CRC according to age and sex among carriers of advanced adenomas by combining data from a large national colonoscopy screening database and national data on CRC incidence in Germany.

METHODS

Data sources

German national registry of screening colonoscopies

Prevalences of advanced adenomas (defined as presence of at least one adenoma with at least one of the following features: ⩾1 cm in size, tubulovillous or villous adenoma, high grade dysplasia; no further distinction according to number of adenomas) by 5 year age groups and sex were obtained from a nationwide registry of screening colonoscopies, which was established after implementation of colonoscopic screening for women and men aged ⩾55 years in Germany in late 2002.[19] Only experienced endoscopists (internists/gastroenterologists or surgeons with pertinent certified specialisations, having conducted at least 200 colonoscopies and at least 50 polypectomies under supervision in the preceding two calendar years) are admitted to conduct screening colonoscopies. Requirements for maintenance of admission include conduction of at least 200 colonoscopies and at least 10 polypectomies per year. Histopathological examination is performed decentrally by certified pathological labs.

Abbreviation: CRC, colorectal cancer

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Table 1 Advanced adenoma prevalence, colorectal cancer incidence and estimated annual progression of advanced adenomas according to sex and age

Sex	Age(y)	National colonoscopy registry		National estimates of colorectal cancer occurrence		Annual transition in %‡
		Number screened	Advanced adenomas n (%)	Observed "incidence" *	Estimated onset†	
Women	55–59	112 399	3866 (3.4)	82.1	104.3	2.6
	60–64	160 880	6773 (4.2)	113.0	161.3	3.3
	65–69	125 133	6005 (4.8)	180.1	238.4	4.2
	70–74	55 582	3219 (5.8)	261.0	326.2	4.8
	75–79	27 414	1785 (6.5)	351.5	440.4	5.8
	80+	9492	691 (7.3)	479.0	481.2	5.6
Men	55–59	66 330	4130 (6.2)	132.4	188.7	2.6
	60–64	110 597	8312 (7.5)	210.5	284.8	3.2
	65–69	97 411	8217 (8.4)	313.6	405.7	4.1
	70–74	47 018	4336 (9.2)	441.5	452.6	4.2
	75–79	21 220	2051 (9.7)	456.9	512.9	4.5
	80+	6673	632 (9.5)	551.4	564.7	5.1

*Patients diagnosed with colorectal cancer within age group per 100 000 per year; †patients estimated to have onset of CRC within age group per 100 000 per year; ‡onset of colorectal cancers per 100 advanced adenomas.

In the nationwide screening colonoscopy registry, basic sociodemographic variables and results of screening colonoscopy are collected anonymously for all screening colonoscopies conducted in Germany using a standardised reporting form to be completed by the gastroenterologists. In case of multiple adenomas, only the largest is recorded (categories used for classification of size of adenomas: >1 cm, ⩽1 cm; categories used for histopathological classification of adenomas: tubular, tubulovillous, villous, high grade dysplasia).

The forms are scanned, processed and checked for completeness and plausibility using standardised algorithms at regional data centres before transmission to the national data centre for analysis. For this analysis, 840 149 records from screening colonoscopies conducted by more than 2000 endoscopists in 2003 and 2004 were available.

Population-based cancer registry data

National estimates of colorectal cancer incidence by age and sex are provided by the Robert Koch Institute, a Federal Institute for Disease Surveillance in Germany.[20] These estimates are derived from the best available incidence data from multiple state cancer registries and nationwide available CRC mortality data. Coding of cancers in the cancer registries follows international standards for epidemiological cancer registries.[21] For this analysis, we used CRC incidence data for the year 2002, the year immediately preceding introduction of screening colonoscopy, as the latter may affect observed CRC incidence by prevention of CRC or by detection of asymptomatic CRC.

Statistical analysis

For each 5 year age group i (i = 55–59, 60–64, 65–69, 70–74, 75–79, 80+ years) and each sex j (j = females, males), annual transition rates from advanced adenomas to CRC, denoted A_{ij}, were estimated from CRC incidence I_{ij} and advanced adenoma prevalence P_{ij} as follows:

$A_{ij} = (I_{ij} \times Q)/P_{ij}$.

The factor Q reflects the proportion of CRCs assumed to develop through adenomas. This proportion has been assumed to equal values between 0.7 and 1.0 by various authors (regardless of age and sex).[10–13 15–18] Similar to the recent study by Ladabaum and Song,[17] we set Q to 0.85 in our main analysis and we varied it between 0.7 and 1.0 in additional sensitivity analyses.

Rates of CRC reported by population-based cancer registries are in reality clinical detection rates rather than true incidence rates. It has been estimated that onset of preclinical CRC on average precedes clinical detection by 3.6 years.[13] We therefore recalculated age specific rates of CRC onset by "shifting" age specific observed incidence rates to younger ages. In the main analysis, a shift by 3.6 years was made. In sensitivity analyses, this shift was varied between 2 and 5 years, according to the range of duration from preclinical CRC onset to CRC diagnosis estimated by other authors.[12 15 22]

Finally, cumulative risk of developing CRC within 10 years (conditional on not dying from other causes) among carriers of advanced adenomas at the beginning of each age group i—that is, at ages 55, 60, 65, 70, 75 and 80 years—was calculated as $1\text{-}\exp(-5(A_{ij} + A_{(i+1)j}))$.[23]

RESULTS

In total, records from the national screening colonoscopy database of 840 149 women and men who underwent a screening colonoscopy in Germany in 2003 or 2004 were included in the estimates of advanced adenoma prevalences (table 1). Prevalences of advanced adenomas were higher in men than in women, and they increased with age in both sexes (from age 55–59 years to ⩾80 years they increased from 3.4% to 7.3% among women, and from 6.2% to 9.5% among men, table 1). All age and sex specific prevalence estimates were based on at least 600 cases and most prevalence estimates were based on more than 2000 cases.

The age gradient was considerably stronger for observed CRC "incidence". For women, a more than fivefold increase between ages 55–59 and 80+ years was observed. For men, higher incidence rates at all ages and a more than fourfold increase from the youngest to the oldest age group was observed. Within each age group, estimated CRC onset was somewhat higher than observed incidence, given that a substantial proportion of cases diagnosed in each age group were assumed to have had their onset in the preceding younger age group and given the strong increase of incidence with age. The age gradient of estimated rates of CRC onset was somewhat lower than the age gradient of observed incidence rates, but it was still considerably stronger than the age gradient of advanced adenoma prevalence (table 1).

Combining the advanced adenoma prevalences and the estimated CRC onset rates as outlined in the Methods section, and assuming that 85% of CRCs arise from advanced adenomas, yielded estimates of annual transition rates from 2.6% in the youngest age group to 5.6% in age group 80+ among women, and from 2.6% in the youngest age group to 5.1% in the oldest age group among men (table 1 and fig 1, left graph).

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Estimates of 10 year cumulative risk increased from 25.4% at age 55 years to 42.9% at age 80 years in women, and from 25.2% at age 55 to 39.7% at age 80 years among men (table 2 and fig 1, right graph). These estimates varied by ±3.8–3.9 percentage points at age 55 years and by ±5.1–5.9 percentage points at age 80 years when the proportion of CRCs arising from adenomas was varied between 70% and 100% in sensitivity analyses. Variation of the time from CRC onset to CRC diagnosis between 2 and 5 years led to relatively minor variation in the estimated 10 year cumulative risk (table 2).

DISCUSSION

In this paper, we combined data from a unique nationwide colonoscopy registry and from population-based cancer registries from Germany to project age and sex specific risk of CRC development among carriers of advanced colorectal adenomas. Any direct estimation of this parameter from cohorts of adenoma carriers would be unethical, as advanced adenomas have to be removed once they are detected, and pertinent data from the pre-colonoscopy era are very sparse. Our analysis shows that the risk of advanced adenoma–CRC transition is comparable among women and men, but strongly increases with age.

Our projections of advanced adenoma progression to CRC in the older age groups are in line with previous estimates based on much smaller samples, which have been used for all age groups in previous analyses of cost effectiveness of CRC screening. For example, the cost effectiveness analyses of colorectal cancer screening by Frazier *et al*[11] and O'Leary *et al*[16] assumed a base-case value of 5% for the annual transition rate from high-risk polyps to localised cancer regardless of age, citing the 1987 report of Stryker *et al* from the Mayo clinic case series as pertinent reference.[9] The same estimate was used, again for all age groups and both sexes, in the recent cost-effectiveness analysis by Ladabaum and Song.[17] Furthermore, polyp dwell time, which is closely related to the adenoma–CRC transition rate, has been found to be an important influential parameter in pertinent sensitivity analyses in a number of cost effectiveness studies.[10 13 16 18] Therefore, the finding of a strongly age-dependent transition rate may be of high relevance for the optimal design of CRC screening programmes.

In our analysis, we implicitly made the assumption that all CRCs arising from adenomas were arising from advanced adenomas—that is, advanced adenomas represent a necessary interim stage in the adenoma–CRC sequence. A similar assumption (eg large adenomas or high risk polyps being necessary intermediate stages in the development of CRC from small adenomas or from low risk polyps, respectively) has been implicitly or explicitly made by other authors, and it appears plausible on biological grounds.[11 16 17]

In the interpretation of our results, specific strengths and limitations of this study require careful consideration. Strengths include the large population-based data sources, especially a unique nationwide registry with more than 840 000 records from screening colonoscopies. The latter allowed estimating age and sex-specific prevalences of advanced adenomas in an unselected screening population with very small random error. Unfortunately, no data for age group 50–54 years could be provided, as colonoscopy screening in Germany is offered from 55 years on only. Given the lack of information on adenoma location in the national colonoscopy database, it was not possible to further assess potential differences in transition rates of proximal and distal advanced adenomas. The latter might be of interest when (cost-) effectiveness of screening colonoscopy and screening sigmoidoscopy are compared. Furthermore, although high levels of qualification and experience are a prerequisite for conducting screening colonoscopies and for certification of pathology labs in Germany, and all screening colonoscopies have to be documented on a standardised form, the degree of standardisation of information given on colonoscopy reports is likely to be less perfect in such a nationwide database than it could be achieved in a trial conducted by a few specialised centres with centralised review of all adenomas. However, our results might be more relevant for judging the risk that advanced adenomas detected in routine practice will progress to cancer. Furthermore, potentially less than perfect classification of adenomas provided on colonoscopy reports would be expected to apply to all ages. The resulting potential misclassification would therefore be

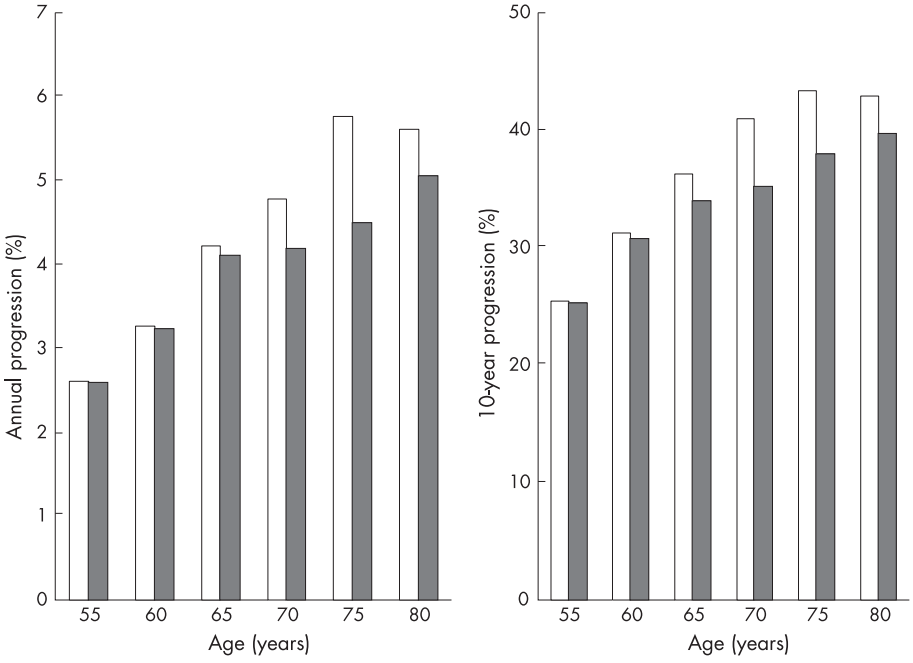


Figure 1 Projected annual progression (left graph) and 10 year progression (right graph) of advanced adenomas to colorectal cancer according to sex and age in Germany. Women = left columns, men = right columns.

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Table 2 Estimated 10 year cumulative risk of colorectal cancer among women and men with advanced adenomas at various ages

		10 year cumulative risk (%)				
		Main analysis Q = 0.85	One-way sensitivity analyses			
Sex	Age (y)	D = 3.6y	Q = 0.70	Q = 1.00	D = 2y	D = 5y
Women	55	25.4	21.5	29.2	22.9	27.3
	60	31.2	26.5	35.6	28.1	33.5
	65	36.2	31.0	41.1	33.4	38.3
	70	41.0	35.2	46.2	38.1	43.0
	75	43.3	37.4	48.7	41.8	44.5
	80	42.9	37.0	48.3	42.7	43.0
Men	55	25.2	21.3	29.0	22.5	27.2
	60	30.7	26.1	35.0	27.9	32.7
	65	33.9	28.9	38.6	32.4	35.1
	70	35.2	30.0	40.0	34.3	35.8
	75	38.0	32.5	43.0	36.9	38.7
	80	39.7	34.0	44.8	38.9	40.2

The proportion of colorectal cancers (CRC) arising from polypoid adenomas Q and the duration from CRC onset to CRC detection D are set to 0.85 and 3.6 years, respectively, in the main analyses, and they are varied between 0.7 and 1.0 and between 2 and 5 years, respectively, in the sensitivity analyses.

expected to be ''non-differential'' with respect to age, which, according to epidemiological theory, implies that differences in age-specific transition rates would tend to be underestimated rather than overestimated.[24] Potentially less than perfect classification of histopathological findings would thus not explain the major differences in estimates of CRC transition rates between age groups.

A possible concern could be that adenoma prevalences among screening participants might not be representative for adenoma prevalences among the general population. On the one hand, prevalences could be somewhat lower among screening participants, assuming that they are more health conscious than non-participants. However, in contrast to other cancers, no major variation of CRC risk by factors related to health consciousness, such as indicators of education or socioeconomic status, has been found. However, adenoma prevalences among screening participants might even be somewhat higher than in the general population, assuming that people at higher risk of CRC, such as people with a family history of CRC, might be more likely to undergo screening. Overall, the estimates of advanced adenoma prevalences from the German national screening registry were in line with[25–27] or somewhat lower than[28] previous, less detailed, estimates from much smaller colonoscopy studies conducted in the USA. Although selection patterns could have led to some underestimation or overestimation of advanced adenoma prevalences overall, it is unlikely that they could account for the strong age gradient in advanced adenoma progression estimates found in our study.

National estimates of CRC incidence in Germany referred to the year 2002—the year immediately preceding introduction of screening colonoscopy to avoid ''contamination'' by detection of asymptomatic CRC by screening colonoscopy. As described in the Methods section, CRC onset rates were derived from CRC incidence rates in our calculations. Therefore, major changes in CRC incidence in the years preceding 2003 and 2004 could, in theory, have influenced our results. However, incidence rates of colorectal cancer have been very stable in Germany since the middle of the 1990s,[20] and it appears particularly unlikely that the strong age gradient, which is a universal finding in CRC incidence,[29] should have markedly changed in recent years.

Like other studies, we had to rely on external sources for estimates of the proportion of CRC arising from adenomas, but uncertainty with respect to this parameter was taken care of in sensitivity analyses. The same applies to estimates of the duration from CRC onset to CRC detection. The main finding of our study, the strong age dependency of adenoma–CRC transition rates, was not affected by variation of overall levels of these parameters. However, we cannot rule out that potential variation of these parameters between age groups might affect the projections of age-specific CRC transition rates to some extent.

Despite its limitations, our analysis provides information on age and sex-specific advanced adenoma transition rates, which could be helpful in the design of endoscopy based screening programmes and their optimisation regarding effectiveness and cost effectiveness. Our finding that advanced adenoma transition rates are strongly age-dependent could have important clinical implications, possibly including a higher age at first screening or differential endoscopy intervals according to age. However, additional risk factors, such as family history of CRC, also have to be taken into account. To further differentiate estimates of the natural history of colorectal adenomas—for example, by various types and by location—large studies with more detailed information about colonoscopic findings are needed.

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EDITOR'S QUIZ: GI SNAPSHOT

Robin Spiller, editor

History of bilious vomiting: a tale with a twist

Clinical presentation

A 16-year old girl was admitted with a 9-month history of bilious vomiting, colicky central abdominal pain and 3 stone weight loss. There was no previous medical history or psychiatric problems. Blood investigations were normal.

On examination she looked well. Her abdomen was soft and non-tender. There was a sucussion splash. Abdominal radiograph and gastroscopy were normal. A barium meal follow-through examination was arranged (fig 1).

Question

What is the cause of this young girl's vomiting?

See page 1598 for answer

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Figure 1 Barium meal.

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506			a| Access via some providers may be limited to authorized users at subscribing institutions.
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Gastroenterology
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Other Subject(s)
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Volume 96, Issue 10, October 2001, Pages 3004-3008

Original contribution

Colorectal cancer screening compliance by medicine residents: perceived and actual

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Abstract

OBJECTIVE:

Implementation of colorectal cancer (CRC) screening with widely available techniques can result in a significant reduction in CRC-related mortality. Clinical practice paradigms are often ingrained in physicians during residency. We, therefore, investigated both compliance and perceived obstacles to CRC screening in the practices of physicians-in-training.

METHODS:

We conducted a retrospective analysis of medical records of patients who were receiving their primary care in the internal medicine resident clinics at the University of Nebraska Medical Center and were at average risk for CRC. In addition to demographics, data on the use of screening mammography, Pap smear, cholesterol, fecal occult blood testing (FOBT), and flexible sigmoidoscopy (FS) were collected. A questionnaire was also distributed to all internal medicine residents to assess their CRC screening knowledge and perceived screening compliance.

RESULTS:

One hundred eight patient charts were reviewed. The percentage of patients appropriately screened for each test was as follows: mammography 66%, Pap smear 65%, cholesterol 53%, FOBT 13%, and FS 16%. Residents dramatically overestimated their perceived FS and FOBT screening rates, 78% and 88%, respectively. Most residents identified barriers to FS screening. Although rudimentary CRC screening knowledge appeared adequate, a number of knowledge-based deficiencies were identified.

CONCLUSIONS:

Internal medicine residents at our institution demonstrate poor CRC screening compliance especially when compared with other health care maintenance interventions. This cannot be entirely accounted for by inadequate knowledge; discrepancy between the perceived and actual implementation of CRC screening may be important. Efforts to improve screening compliance should include a focus on physicians-in-training.

Previous Next

Introduction

Colorectal cancer (CRC) is the second leading cause of cancer mortality in the United States. Approximately 135,400 new cases of CRC and 56,700 CRC-related deaths are forecast in 2001 (1). When diagnosed at an early stage, colon cancer is almost invariably curable. Unfortunately, CRC is often asymptomatic until it has reached an advanced stage. Screening strategies have been designed to enable early diagnosis of colon cancer and prevention of this malignancy through removal of its precursor lesion, the adenomatous polyp (2). Flexible sigmoidoscopy (FS), fecal occult blood tests (FOBT), air-contrast barium enema, and colonoscopy have been recommended as acceptable screening techniques in a recent consensus statement; of these, only FS and FOBT are widely available, relatively inexpensive, and have been unequivocally demonstrated to reduce mortality (3).

Despite these screening strategies and the increased attention that preventive care has received in the public and medical communities, most colon cancers still present at relatively advanced stages. As clinical practice paradigms are often ingrained in physicians' during their training, we wished to assess whether screening strategies were being properly employed in the ambulatory care practice of our internal medicine residents. Assessment was made of the rate of compliance with CRC screening in comparison with other well-established preventive healthcare techniques. Finally, because little data exist on factors related to CRC screening (4), we wanted to identify potential obstacles to the implementation of CRC screening programs in this setting.

Materials and methods

Ambulatory care resident education

The University of Nebraska Medical Center Internal Medicine residency program is a traditional, accredited 3-yr program consisting of both hospital and ambulatory-based training. The ambulatory care portion consists of two half-day clinics weekly throughout all 3 yr of training. Thirty-six medicine residents provide longitudinal care each year in these clinics. Formal lectures addressing preventive care cancer screening are interspersed throughout the academic year. Specifically, two lectures focus on colon cancer with an emphasis on screening in the average-risk patient. Furthermore, all residents rotate, at least once, on the gastroenterology inpatient consult service where didactic and practical instruction is given on FOBT and FS. Residents perform screening video FS in a dedicated procedure room located in the outpatient clinic facility. All procedures are performed under the supervision of general internal medicine attending physicians.

Study population

A retrospective chart review of patients who received their care in the internal medicine resident clinics at the University of Nebraska Medical Center over a consecutive 4-wk period was performed. Patients considered appropriate candidates for CRC screening included those aged >50 yr at average risk for developing CRC and who had been followed by an internal medicine resident over a period of at least 6 months duration during which they had a minimum of two clinic visits. Exclusion criteria included patients who were at increased risk to develop CRC (family or personal history of adenomatous polyps, CRC, or polyposis syndromes), ongoing GI complaints necessitating colonic evaluation, severe comorbid illness for which screening was believed to be inappropriate, a previous lower GI evaluation by colonoscopy or barium enema in the preceding 3 yr, medical care provided directly by an attending physician, and patients who were only evaluated on a single occasion for a specific problem. The study was approved by the Institutional Review Board of the University of Nebraska Medical Center.

Data collection

Two hundred consecutive medical records of patients seen in internal medicine residents clinics were screened by two investigators (D.L.Z. and J.K.D.), using a standardized form. Those charts that met the eligibility criteria were reviewed in further detail. Data recorded included patient demographics and details regarding performance of FOBT, FS, and other well-accepted preventive health care techniques (mammography, breast exam, pelvic exam, Pap smear, cholesterol testing, and rectal exam). An acceptable screening interval for each test was defined as follows: mammography, breast exam, cholesterol, and FOBT performed on a yearly basis; pelvic exam and pap smear performed every 3 yr; and sigmoidoscopy performed every 5 yr. Screening methods were considered offered and/or completed if there was documentation in the medical record.

Questionnaire

After pilot testing, a questionnaire, comprised of 25 questions, was distributed to all internal medicine residents. The survey was designed to assess: 1) habits regarding preventive care screening; 2) CRC screening knowledge; 3) perceived CRC screening compliance; 4) specific barriers to performing FS including difficulty scheduling/staffing procedures, technical problems with the equipment, residents uncomfortable performing the procedure and residents' perception of patients' reluctance to undergo the procedure, and/or the bowel preparation required before the procedure; and 5) personal attitudes toward performing FS.

Statistical analysis

Data were analyzed using the SAS statistical program (SAS Institute, Cary, NC). The Fisher's exact test and χ^2 test were used to compare the proportion of patients receiving colon cancer screening with screening for other diseases. Student's *t* test was used to compare age between screening groups. Analysis of variance was used to compare age for the FOBT. Statistical significance was defined as $p < 0.05$. Analysis of the questionnaire was determined by calculations of the percentage of correct answer.

Results

One hundred eight patients were considered appropriate for detailed chart review. The study population consisted of 36 men with a mean age of 60.3 yr (range = 51–77 yr) and 72 women with a mean age of 62.2 yr (range = 50–80 yr). Sixty-seven (62%) of the patients were white, and 41 (38%) were black. The residents performed FOBT in 13% of the patients and FS in only 16%. Table 1depicts patient characteristics in terms of gender and race. No differences in CRC screening were present between men and women. Although whites were offered FS more often than blacks, no differences were identified in the actual performance rate. In contrast to CRC screening, the same residents appropriately performed mammography in 66%, cholesterol testing in 53%, and Pap smear in 65% of patients. Table 2demonstrates the residents perceived rate of offering various preventive care services compared with the actual rates of those services being performed.

Table 1. CRC Screening According to Gender and Race

	Total Offered		Performed		Refused	
	FS (%)	FOBT (%)	FS (%)	FOBT (%)	FS (%)	FOBT (%)
Total (n = 108)	21 (19)	28 (26)	17 (16)	14 (13)	4 (4)	14 (13)
Gender						
Male (n = 36)	10 (28)	10 (28)	8 (22)	5 (14)	2 (6)	5 (14)
Female (n = 72)	11 (15)	18 (25)	9 (13)	9 (13)	2 (3)	9 (13)
Race						
White (n = 67)	18 (27)	20 (30)	13 (19)	10 (15)	5 (7)	10 (15)
Black (n = 41)	3 (7)*	8 (20)	3 (7)	4 (10)	0 (0)	4 (10)

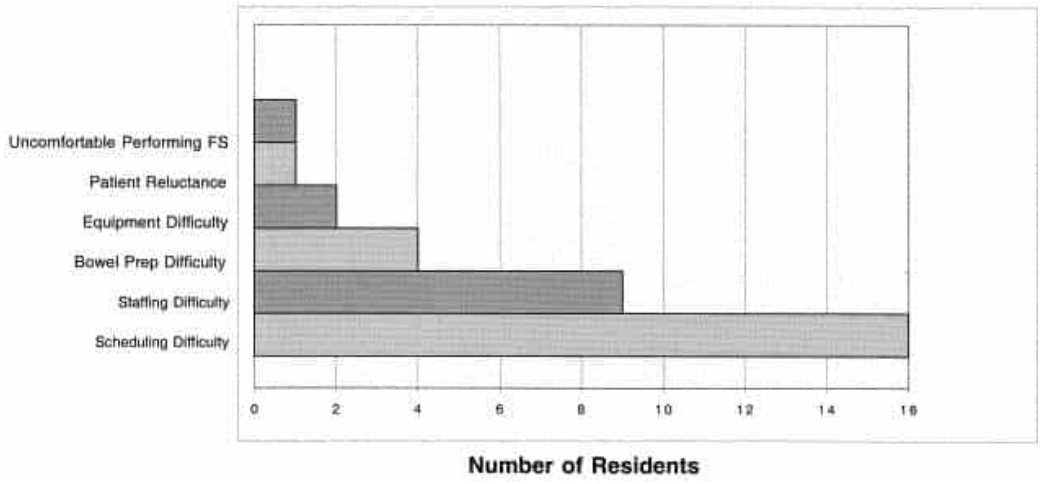
* $p = 0.01$.

Table 2. Perceived and Actual Screening Rates by Medicine Residents

	Perceived Offered (%)	Actually Performed (%)	*p*
Mammography	100	66	ns
Cholesterol	100	53	ns
Pap smear	100	65	ns
FOBT	88	13	<0.05
Sigmoidoscopy	78	16	<0.05

Nineteen of 36 (53%) questionnaires were returned after a single mailing with the following breakdown by postgraduate year (PGY): four PGY-1, nine PGY-2, and six PGY-3. According to the report, residents believed they offered screening FS and FOBT to their patients most of the time; however, only 26% of the residents believed their patients were actually completing FS greater than half of the time. When asked to identify

barriers to CRC screening using FS, 16 (84%) of the residents responding to the survey listed difficulty scheduling the procedure as the dominant barrier despite having a dedicated FS room and equipment available (Fig. 1).



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Figure 1. Resident perception of barriers to performing screening FS.

All of the responding residents correctly identified both the age at which CRC screening should begin in an average-risk patient and the recommended interval between successive FOBT and FS screening after a negative initial exam. In contrast, only 50% correctly identified the appropriate means of follow-up for a positive FOBT, and 60% were unaware that the number of positive guaiac cards is irrelevant when deciding on the appropriate next step in management.

Discussion

We demonstrate that the rate of CRC screening with FOBT and FS by our internal medicine residents was remarkably poor. Indeed, our data indicate that most of the patients in our analysis received inadequate CRC screening. This is particularly alarming as these simple and inexpensive tests have been unequivocally demonstrated to reduce mortality. For instance, Mandel *et al.* demonstrated a 33% decrease in mortality with yearly FOBT, whereas Selby *et al.* showed a 60% reduction in deaths from cancers in the surveyed bowel with sigmoidoscopy 2, 5. Moreover, a more recent report by Mandel *et al.* suggests that FOBT can actually decrease the incidence of cancers, presumably through detection and removal of premalignant lesions (6). Unfortunately, the dismal screening rate found in this study is consistent with the national average. During 1973–1997, Ries *et al.* reported that only 30.6% of adults aged >50 yr had undergone a sigmoidoscopy/proctoscopy in the preceding 5 yr (7). Furthermore, the FOBT rate found by Ries *et al.*(7) was 15% in 1987 and, despite vigorous patient education campaigns, only improved to 18% by 1998.

Data similar to ours have been reported in other internal medicine residency programs. Borum recently showed that only 29% and 13% of traditional 3-yr internal medicine residents at her program appropriately used screening FOBT and FS, respectively (8). In contrast, residents in a primary care track program performed CRC screening at a considerably higher rate with FS and FOBT performance rates of 71% and 81%, respectively. This indicates that we may be able to achieve substantially higher screening by modifying

physician training. Although issues of patient reluctance to undergo procedures performed by physicians-in-training have been offered to explain poorer screening rates, recent data suggest that patient satisfaction is comparable when FS is perfomed by residents or staff physicians (9).

Our data suggest a difference in the rate of CRC screening offered to blacks compared with whites. Racial bias in screening may, possibly, be at least one of the reasons that blacks have more advanced CRC at diagnosis than whites and, hence, a poorer prognosis (10). Although it is difficult to assess the significance of this finding, given our relatively small patient population, similar results have been described with regards to cardiovascular screening in blacks (11). Indeed, given the higher incidence of colon cancer among blacks, it has been demonstrated that CRC screening is most cost-effective in the black population (12). Further studies are needed to clarify this issue.

The low level of FS and FOBT implementation in this study is in dramatic contrast to the adequate use of other health care maintenance strategies, such as mammography, cholesterol testing, and Pap smears. The clinical/public health consequences of the discrepancy between colon cancer screening and other screening practices is underscored by recent data, which suggest that CRC screening is slightly more cost-effective than a variety of other health care interventions including pneumococcal vaccinations and treatment of hypertension, whereas it is markedly more cost-effective than breast cancer screening (13). Indeed, a recent analysis indicates that the costs incurred by FS will be offset by the savings from early diagnosis and prevention of CRC (14).

The reason for the discordance between CRC screening and other health care maintenance practices reported in this study remains unclear. Previous reports on cancer screening practices among resident physicians have suggested that both physician and patient factors may be important. Myers *et al.* recently reported that there was substantial variability in physician intention to recommend colon cancer screening based on the physicians' perception of CRC screening effectiveness, board certification, and length of time in practice (15). Although our residents appeared to have a solid grasp of screening indications and strategies, fewer than half were able to appropriately manage a positive FOBT. This is consistent with results from a recent survey of primary care physicians in which only one-half of practitioners answered questions correctly regarding the evaluation of a heme-positive stool (16). Moreover, a survey of CRC screening knowledge in 168 internal medicine residents at four institutions demonstrated remarkably similar results, with only 29% recommending colonoscopy to evaluate a positive FOBT (17). Findings from our study suggest that at least part of the problem with poor screening rates appears to be a misperception by the residents of their colon cancer screening implementation. This may reflect both patient and physician reluctance to aggressively deal with colon cancer because of social norms reflecting distaste for CRC.

There are several caveats to the interpretation of these data. First, chart reviews have intrinsic weaknesses including their retrospective nature and their reliance upon information being appropriately documented. Nevertheless, Montano and Phillips recently demonstrated that, in cancer screening, the correlation between chart audits and patient surveys was very high (18). This methodology is also supported by a report from Luck *et al.* in which an assessment of quality of care was determined through chart review of encounters with standardized patients (19). They demonstrated that scores from chart review underestimated actual quality of care by only 14%, thus suggesting that the magnitude of the differences found in our study would not be adequately explained solely by these methodological differences alone (19). Secondly, the size of our patient population was modest and, despite a concerted effort, the internal medicine resident survey

response rate was only 53%. This poor rate is, however, comparable with that seen in most physician surveys. Finally, our exclusion of patients having undergone full colonic evaluation within the last 3 yr only is more conservative than the screening guidelines currently recommended (*i.e.*, barium enema every 5 yr or colonoscopy every 10 yr); however, none of our 108 patients had previously undergone either study.

Despite these limitations, our data suggest that physicians have an important role in the underuse of colon cancer screening. With regard to physicians, it is particularly disturbing that residents, despite lectures on CRC and preventive medicine, had a screening rate comparable with the national average. It can be speculated that if these clinical habits are not ingrained during a residency program, they are even less likely to be nurtured in a busy primary care practice. Potential ways to improve physician implementation might include enhancing education on colon cancer and its prevention as well as offering structured FS instruction. Improved teaching aides, such as a virtual reality FS simulator, may also be helpful (20). The importance of having confidence in the performance of the procedure is underscored by the finding of Lewis *et al.*, who determined that the main reason that half of primary care physicians, who were trained in FS, did not perform this examination was self-perceived technical inadequacy (21). Finally, targeting differences in the perceived *versus* actual frequency of CRC implementation is also possible. Data from our institution suggest that an automated computer-based reminder system improves CRC cancer screening and other facets of health care maintenance (22).

In summary, in this audit of internal medicine resident practices, we have demonstrated that implementation of CRC screening guidelines was poor, especially when compared with other health care maintenance techniques. Factors that may account for this poor compliance include deficiencies in certain elements of CRC screening knowledge and differences between actual and perceived rates of CRC screening. Our study suggests that, in addition to increasing public awareness, an aggressive focus on physicians-in-training is important. This should include both didactic practical instruction and also feedback on CRC screening implementation. Further studies are necessary to determine how to optimize CRC screening compliance.

Recommended articles

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>
> ...Although notification alone may not ensure adherence to screening recommendations (16–19), risk communication is an essential prerequisite to risk perception and effective colorectal cancer control. Our study adds to a growing body of literature suggesting that IM residents are deficient in their understanding and compliance with colorectal cancer screening recommendations (15, 20, 21). These observations highlight the need for evidence-based educational programs that not only increase knowledge about the epidemiology of colorectal cancer and various aspects of colorectal cancer screening (e.g., rationale, risk factors, pros and cons of the recommended tests, and guidelines) but also foster skill building in the areas of risk stratification, risk communication, and documentation....

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Colorectal Cancer Screening Compliance by Medicine Residents: Perceived and Actual

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OBJECTIVE: Implementation of colorectal cancer (CRC) screening with widely available techniques can result in a significant reduction in CRC-related mortality. Clinical practice paradigms are often ingrained in physicians during residency. We, therefore, investigated both compliance and perceived obstacles to CRC screening in the practices of physicians-in-training.

METHODS: We conducted a retrospective analysis of medical records of patients who were receiving their primary care in the internal medicine resident clinics at the University of Nebraska Medical Center and were at average risk for CRC. In addition to demographics, data on the use of screening mammography, Pap smear, cholesterol, fecal occult blood testing (FOBT), and flexible sigmoidoscopy (FS) were collected. A questionnaire was also distributed to all internal medicine residents to assess their CRC screening knowledge and perceived screening compliance.

RESULTS: One hundred eight patient charts were reviewed. The percentage of patients appropriately screened for each test was as follows: mammography 66%, Pap smear 65%, cholesterol 53%, FOBT 13%, and FS 16%. Residents dramatically overestimated their perceived FS and FOBT screening rates, 78% and 88%, respectively. Most residents identified barriers to FS screening. Although rudimentary CRC screening knowledge appeared adequate, a number of knowledge-based deficiencies were identified.

CONCLUSIONS: Internal medicine residents at our institution demonstrate poor CRC screening compliance especially when compared with other health care maintenance interventions. This cannot be entirely accounted for by inadequate knowledge; discrepancy between the perceived and actual implementation of CRC screening may be important. Efforts to improve screening compliance should include a focus on physicians-in-training. (Am J Gastroenterol 2001; 96:3004–3008. © 2001 by Am. Coll. of Gastroenterology)

INTRODUCTION

Colorectal cancer (CRC) is the second leading cause of cancer mortality in the United States. Approximately 135,400 new cases of CRC and 56,700 CRC-related deaths are forecast in 2001 (1). When diagnosed at an early stage, colon cancer is almost invariably curable. Unfortunately, CRC is often asymptomatic until it has reached an advanced stage. Screening strategies have been designed to enable early diagnosis of colon cancer and prevention of this malignancy through removal of its precursor lesion, the adenomatous polyp (2). Flexible sigmoidoscopy (FS), fecal occult blood tests (FOBT), air-contrast barium enema, and colonoscopy have been recommended as acceptable screening techniques in a recent consensus statement; of these, only FS and FOBT are widely available, relatively inexpensive, and have been unequivocally demonstrated to reduce mortality (3).

Despite these screening strategies and the increased attention that preventive care has received in the public and medical communities, most colon cancers still present at relatively advanced stages. As clinical practice paradigms are often ingrained in physicians' during their training, we wished to assess whether screening strategies were being properly employed in the ambulatory care practice of our internal medicine residents. Assessment was made of the rate of compliance with CRC screening in comparison with other well-established preventive healthcare techniques. Finally, because little data exist on factors related to CRC screening (4), we wanted to identify potential obstacles to the implementation of CRC screening programs in this setting.

MATERIALS AND METHODS

Ambulatory Care Resident Education

The University of Nebraska Medical Center Internal Medicine residency program is a traditional, accredited 3-yr program consisting of both hospital and ambulatory-based training. The ambulatory care portion consists of two half-day clinics weekly throughout all 3 yr of training. Thirty-six medicine residents provide longitudinal care each year in these clinics. Formal lectures addressing preventive care cancer screening are interspersed throughout the academic year. Specifically, two lectures focus on colon cancer with an emphasis on screening in the average-risk patient. Furthermore, all residents rotate, at least once, on the gastroenterology inpatient consult service where didactic and practical instruction is given on FOBT and FS. Residents

Table 1. CRC Screening According to Gender and Race

	Total Offered		Performed		Refused	
	FS (%)	FOBT (%)	FS (%)	FOBT (%)	FS (%)	FOBT (%)
Total (n = 108)	21 (19)	28 (26)	17 (16)	14 (13)	4 (4)	14 (13)
Gender						
Male (n = 36)	10 (28)	10 (28)	8 (22)	5 (14)	2 (6)	5 (14)
Female (n = 72)	11 (15)	18 (25)	9 (13)	9 (13)	2 (3)	9 (13)
Race						
White (n = 67)	18 (27)	20 (30)	13 (19)	10 (15)	5 (7)	10 (15)
Black (n = 41)	3 (7)*	8 (20)	3 (7)	4 (10)	0 (0)	4 (10)

* $p = 0.01$.

perform screening video FS in a dedicated procedure room located in the outpatient clinic facility. All procedures are performed under the supervision of general internal medicine attending physicians.

Study Population

A retrospective chart review of patients who received their care in the internal medicine resident clinics at the University of Nebraska Medical Center over a consecutive 4-wk period was performed. Patients considered appropriate candidates for CRC screening included those aged >50 yr at average risk for developing CRC and who had been followed by an internal medicine resident over a period of at least 6 months duration during which they had a minimum of two clinic visits. Exclusion criteria included patients who were at increased risk to develop CRC (family or personal history of adenomatous polyps, CRC, or polyposis syndromes), ongoing GI complaints necessitating colonic evaluation, severe comorbid illness for which screening was believed to be inappropriate, a previous lower GI evaluation by colonoscopy or barium enema in the preceding 3 yr, medical care provided directly by an attending physician, and patients who were only evaluated on a single occasion for a specific problem. The study was approved by the Institutional Review Board of the University of Nebraska Medical Center.

Data Collection

Two hundred consecutive medical records of patients seen in internal medicine residents clinics were screened by two investigators (D.L.Z. and J.K.D.), using a standardized form. Those charts that met the eligibility criteria were reviewed in further detail. Data recorded included patient demographics and details regarding performance of FOBT, FS, and other well-accepted preventive health care techniques (mammography, breast exam, pelvic exam, Pap smear, cholesterol testing, and rectal exam). An acceptable screening interval for each test was defined as follows: mammography, breast exam, cholesterol, and FOBT performed on a yearly basis; pelvic exam and pap smear performed every 3 yr; and sigmoidoscopy performed every 5 yr. Screening methods were considered offered and/or completed if there was documentation in the medical record.

Questionnaire

After pilot testing, a questionnaire, comprised of 25 questions, was distributed to all internal medicine residents. The survey was designed to assess: 1) habits regarding preventive care screening; 2) CRC screening knowledge; 3) perceived CRC screening compliance; 4) specific barriers to performing FS including difficulty scheduling/staffing procedures, technical problems with the equipment, residents uncomfortable performing the procedure and residents' perception of patients' reluctance to undergo the procedure, and/or the bowel preparation required before the procedure; and 5) personal attitudes toward performing FS.

Statistical Analysis

Data were analyzed using the SAS statistical program (SAS Institute, Cary, NC). The Fisher's exact test and χ^2 test were used to compare the proportion of patients receiving colon cancer screening with screening for other diseases. Student's t test was used to compare age between screening groups. Analysis of variance was used to compare age for the FOBT. Statistical significance was defined as $p < 0.05$. Analysis of the questionnaire was determined by calculations of the percentage of correct answer.

RESULTS

One hundred eight patients were considered appropriate for detailed chart review. The study population consisted of 36 men with a mean age of 60.3 yr (range = 51–77 yr) and 72 women with a mean age of 62.2 yr (range = 50–80 yr). Sixty-seven (62%) of the patients were white, and 41 (38%) were black. The residents performed FOBT in 13% of the patients and FS in only 16%. Table 1 depicts patient characteristics in terms of gender and race. No differences in CRC screening were present between men and women. Although whites were offered FS more often than blacks, no differences were identified in the actual performance rate. In contrast to CRC screening, the same residents appropriately performed mammography in 66%, cholesterol testing in

Table 2. Perceived and Actual Screening Rates by Medicine Residents

	Perceived Offered (%)	Actually Performed (%)	*p*
Mammography	100	66	ns
Cholesterol	100	53	ns
Pap smear	100	65	ns
FOBT	88	13	<0.05
Sigmoidoscopy	78	16	<0.05

53%, and Pap smear in 65% of patients. Table 2 demonstrates the residents perceived rate of offering various preventive care services compared with the actual rates of those services being performed.

Nineteen of 36 (53%) questionnaires were returned after a single mailing with the following breakdown by postgraduate year (PGY): four PGY-1, nine PGY-2, and six PGY-3. According to the report, residents believed they offered screening FS and FOBT to their patients most of the time; however, only 26% of the residents believed their patients were actually completing FS greater than half of the time. When asked to identify barriers to CRC screening using FS, 16 (84%) of the residents responding to the survey listed difficulty scheduling the procedure as the dominant barrier despite having a dedicated FS room and equipment available (Fig. 1).

All of the responding residents correctly identified both the age at which CRC screening should begin in an average-risk patient and the recommended interval between successive FOBT and FS screening after a negative initial exam. In contrast, only 50% correctly identified the appropriate means of follow-up for a positive FOBT, and 60% were unaware that the number of positive guaiac cards is irrelevant when deciding on the appropriate next step in management.

DISCUSSION

We demonstrate that the rate of CRC screening with FOBT and FS by our internal medicine residents was remarkably poor. Indeed, our data indicate that most of the patients in our analysis received inadequate CRC screening. This is particularly alarming as these simple and inexpensive tests have been unequivocally demonstrated to reduce mortality. For instance, Mandel *et al.* demonstrated a 33% decrease in mortality with yearly FOBT, whereas Selby *et al.* showed a 60% reduction in deaths from cancers in the surveyed bowel with sigmoidoscopy (2, 5). Moreover, a more recent report by Mandel *et al.* suggests that FOBT can actually decrease the incidence of cancers, presumably through detection and removal of premalignant lesions (6). Unfortunately, the dismal screening rate found in this study is consistent with the national average. During 1973–1997, Ries *et al.* reported that only 30.6% of adults aged >50 yr had undergone a sigmoidoscopy/proctoscopy in the preceding 5 yr (7). Furthermore, the FOBT rate found by Ries *et al.* (7) was 15% in 1987 and, despite vigorous patient education campaigns, only improved to 18% by 1998.

Data similar to ours have been reported in other internal medicine residency programs. Borum recently showed that only 29% and 13% of traditional 3-yr internal medicine residents at her program appropriately used screening FOBT and FS, respectively (8). In contrast, residents in a primary care track program performed CRC screening at a considerably higher rate with FS and FOBT performance rates of 71% and 81%, respectively. This indicates that we may be able to achieve substantially higher screening by modifying physician training. Although issues of patient reluctance to undergo procedures performed by physicians-in-training have been offered to explain poorer screening rates, recent data suggest that patient satisfaction is comparable when FS is perfomed by residents or staff physicians (9).

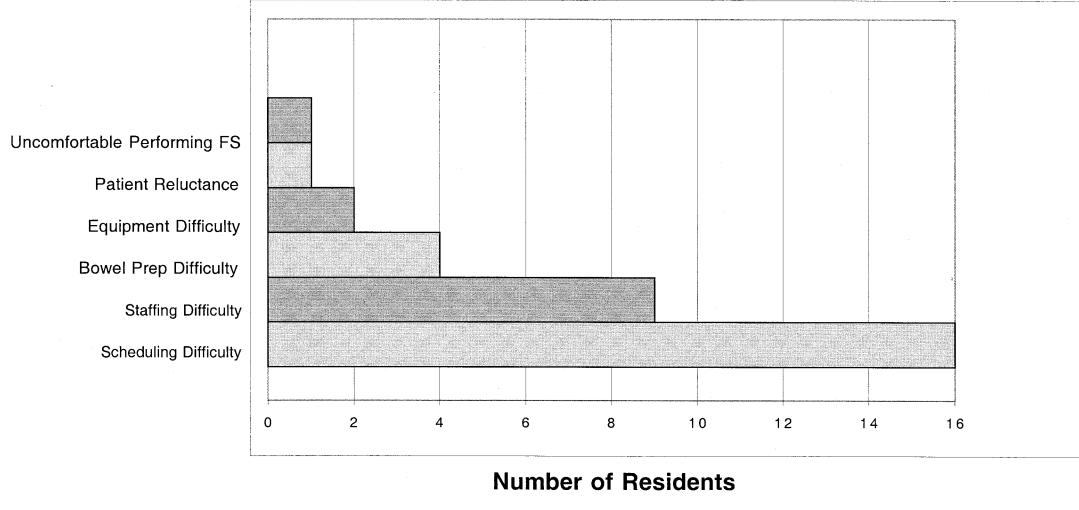


Figure 1. Resident perception of barriers to performing screening FS.

Our data suggest a difference in the rate of CRC screening offered to blacks compared with whites. Racial bias in screening may, possibly, be at least one of the reasons that blacks have more advanced CRC at diagnosis than whites and, hence, a poorer prognosis (10). Although it is difficult to assess the significance of this finding, given our relatively small patient population, similar results have been described with regards to cardiovascular screening in blacks (11). Indeed, given the higher incidence of colon cancer among blacks, it has been demonstrated that CRC screening is most cost-effective in the black population (12). Further studies are needed to clarify this issue.

The low level of FS and FOBT implementation in this study is in dramatic contrast to the adequate use of other health care maintenance strategies, such as mammography, cholesterol testing, and Pap smears. The clinical/public health consequences of the discrepancy between colon cancer screening and other screening practices is underscored by recent data, which suggest that CRC screening is slightly more cost-effective than a variety of other health care interventions including pneumococcal vaccinations and treatment of hypertension, whereas it is markedly more cost-effective than breast cancer screening (13). Indeed, a recent analysis indicates that the costs incurred by FS will be offset by the savings from early diagnosis and prevention of CRC (14).

The reason for the discordance between CRC screening and other health care maintenance practices reported in this study remains unclear. Previous reports on cancer screening practices among resident physicians have suggested that both physician and patient factors may be important. Myers *et al.* recently reported that there was substantial variability in physician intention to recommend colon cancer screening based on the physicians' perception of CRC screening effectiveness, board certification, and length of time in practice (15). Although our residents appeared to have a solid grasp of screening indications and strategies, fewer than half were able to appropriately manage a positive FOBT. This is consistent with results from a recent survey of primary care physicians in which only one-half of practitioners answered questions correctly regarding the evaluation of a heme-positive stool (16). Moreover, a survey of CRC screening knowledge in 168 internal medicine residents at four institutions demonstrated remarkably similar results, with only 29% recommending colonoscopy to evaluate a positive FOBT (17). Findings from our study suggest that at least part of the problem with poor screening rates appears to be a misperception by the residents of their colon cancer screening implementation. This may reflect both patient and physician reluctance to aggressively deal with colon cancer because of social norms reflecting distaste for CRC.

There are several caveats to the interpretation of these data. First, chart reviews have intrinsic weaknesses including their retrospective nature and their reliance upon information being appropriately documented. Nevertheless, Montano and Phillips recently demonstrated that, in cancer screening, the correlation between chart audits and patient surveys was very high (18). This methodology is also supported by a report from Luck *et al.* in which an assessment of quality of care was determined through chart review of encounters with standardized patients (19). They demonstrated that scores from chart review underestimated actual quality of care by only 14%, thus suggesting that the magnitude of the differences found in our study would not be adequately explained solely by these methodological differences alone (19). Secondly, the size of our patient population was modest and, despite a concerted effort, the internal medicine resident survey response rate was only 53%. This poor rate is, however, comparable with that seen in most physician surveys. Finally, our exclusion of patients having undergone full colonic evaluation within the last 3 yr only is more conservative than the screening guidelines currently recommended (*i.e.*, barium enema every 5 yr or colonoscopy every 10 yr); however, none of our 108 patients had previously undergone either study.

Despite these limitations, our data suggest that physicians have an important role in the underuse of colon cancer screening. With regard to physicians, it is particularly disturbing that residents, despite lectures on CRC and preventive medicine, had a screening rate comparable with the national average. It can be speculated that if these clinical habits are not ingrained during a residency program, they are even less likely to be nurtured in a busy primary care practice. Potential ways to improve physician implementation might include enhancing education on colon cancer and its prevention as well as offering structured FS instruction. Improved teaching aides, such as a virtual reality FS simulator, may also be helpful (20). The importance of having confidence in the performance of the procedure is underscored by the finding of Lewis *et al.*, who determined that the main reason that half of primary care physicians, who were trained in FS, did not perform this examination was self-perceived technical inadequacy (21). Finally, targeting differences in the perceived *versus* actual frequency of CRC implementation is also possible. Data from our institution suggest that an automated computer-based reminder system improves CRC cancer screening and other facets of health care maintenance (22).

In summary, in this audit of internal medicine resident practices, we have demonstrated that implementation of CRC screening guidelines was poor, especially when compared with other health care maintenance techniques. Factors that may account for this poor compliance include deficiencies in certain elements of CRC screening knowledge and differences between actual and perceived rates of CRC screening. Our study suggests that, in addition to increasing public awareness, an aggressive focus on physicians-in-training is important. This should include both didactic practical instruction and also feedback on CRC screening implementation. Further studies are necessary to determine how to optimize CRC screening compliance.

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Appendix SONNENBERG01

MARC View

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260	a| Chicago : b| American Medical Association.
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650 0	a| Medicine v| Periodicals.
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949	a| R11.A87 v.162 no.13-15 2002 w| LCPER c| 1 i| 000051753085 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 1/16/2003
949	a| R11.A87 v.162 no.16-19 2002 w| LCPER c| 1 i| 000051773342 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 2/14/2003
949	a| R11.A87 v.162 no.20-22 2002 w| LCPER c| 1 i| 000051699130 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 3/13/2003
949	a| R11.A87 v.163 no.1-4 2003 w| LCPER c| 1 i| 000051878597 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 5/16/2003
949	a| R11.A87 v.163 no.5-8 2003 w| LCPER c| 1 i| 000051822354 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 7/25/2003
949	a| R11.A87 v.163 no.9-12 2003 w| LCPER c| 1 i| 000052542565 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/28/2003
949	a| R11.A87 v.17 1916 w| LCPER c| 1 i| 000052238147 d| 11/21/2003 l| ACAD-BLDG m| UP-ANNEX n| 1 r| Y s| Y t| PERIODICAL u| 11/20/2003
949	a| R11.A87 v.163 no.13-15 2003 w| LCPER c| 1 i| 000052781858 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 1/22/2004
949	a| R11.A87 v.163 no.16-19 2003 w| LCPER c| 1 i| 000052781124 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 1/22/2004
949	a| R11.A87 v.163 no.20-22 2003 w| LCPER c| 1 i| 000052807763 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 3/5/2004
949	a| R11.A87 v.164 no.1-4 2004 w| LCPER c| 1 i| 000052833359 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 6/3/2004
949	a| R11.A87 v.164 no.5-8 2004 w| LCPER c| 1 i| 000052833366 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 6/3/2004
949	a| R11.A87 v.164 no.9-12 2004 w| LCPER c| 1 i| 000054881211 d| 2/8/2005 e| 2/8/2005 l| PATERNO-4 m| UP-PAT n| 1 r| Y s| Y t| PERIODICAL u| 11/24/2004
949	a| R11.A87 v.164 no.13-15 2004 w| LCPER c| 1 i| 000054829886 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 2/24/2005
949	a| R11.A87 v.164 no.16-19 2004 w| LCPER c| 1 i| 000054846531 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 4/1/2005
949	a| R11.A87 v.164 no.20-22 2004 w| LCPER c| 1 i| 000055008426 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 6/23/2005
949	a| R11.A87 v.165 no.1-4 2005 w| LCPER c| 1 i| 000055014342 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 7/21/2005
949	a| R11.A87 v.165 no.5-8 2005 w| LCPER c| 1 i| 000055040402 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 9/28/2005
949	a| R11.A87 v.165 no.9-12 2005 w| LCPER c| 1 i| 000054944770 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 1/12/2006
949	a| R11.A87 v.165 no.13-15 2005 w| LCPER c| 1 i| 000054948488 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 1/20/2006
949	a| R11.A87 v.165 no.16-19 2005 w| LCPER c| 1 i| 000054962323 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 3/3/2006
949	a| R11.A87 v.165 no.20-22 2005 w| LCPER c| 1 i| 000054970793 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 3/23/2006
949	a| R11.A87 v.166 no.1-4 2006 w| LCPER c| 1 i| 000055137195 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2006
949	a| R11.A87 v.166 no.5-8 2006 w| LCPER c| 1 i| 000055084581 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 11/9/2006

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949 a| R11.A87 v.166 no.9-12 2006 w| LCPER c| 1 i| 000055096249 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 1/11/2007

949 a| R11.A87 v.166 no.16-19 2006 w| LCPER c| 1 i| 000061727007 d| 2/23/2015 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/21/2007

949 a| R11.A87 v.166 no.13-15 2006 w| LCPER c| 1 i| 000061727199 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/21/2007

949 a| R11.A87 v.166 no.20-22 2006 w| LCPER c| 1 i| 000059710592 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 2/4/2008

949 a| R11.A87 v.167 no.1-6 2007 w| LCPER c| 1 i| 000059710684 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 2/4/2008

949 a| R11.A87 v.167 no.7-12 2007 w| LCPER c| 1 i| 000059643647 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 5/20/2008

949 a| R11.A87 v.167 no.13-17 2007 w| LCPER c| 1 i| 000059658597 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 7/14/2008

949 a| R11.A87 v.167 no.18-22 2007 w| LCPER c| 1 i| 000059658580 d| 2/22/2012 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 7/14/2008

949 a| R11.A87 v.168 no.1-6 2008 w| LCPER c| 1 i| 000059812326 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 6/30/2009

949 a| R11.A87 v.168 no.13-17 2008 w| LCPER c| 1 i| 000059774778 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 9/4/2009

949 a| R11.A87 v.168 no.7-12 2008 w| LCPER c| 1 i| 000059774785 d| 9/18/2015 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 9/4/2009

949 a| R11.A87 v.168 no.18-22 2008 w| LCPER c| 1 i| 000059774761 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 9/4/2009

949 a| R11.A87 v.169 no.1-6 2009 w| LCPER c| 1 i| 000059779469 d| 3/9/2015 l| PATERNO-4 m| UP-PAT q| 2 r| Y s| Y t| PERIODICAL u| 9/29/2009

949 a| R11.A87 v.169 no.7-12 2009 w| LCPER c| 1 i| 000061840638 d| 7/9/2015 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 12/23/2009

949 a| R11.A87 v.169 no.13-17 2009 w| LCPER c| 1 i| 000061886667 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 7/6/2010

949 a| R11.A87 v.169 no.18-22 2009 w| LCPER c| 1 i| 000061886674 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 7/6/2010

949 a| R11.A87 v.79 1947 w| LCPER c| 1 i| 000060017369 d| 8/16/2010 l| ACAD-BLDG m| UP-ANNEX q| 2 r| Y s| Y t| PERIODICAL u| 8/6/2010

949 a| R11.A87 v.118 1966 w| LCPER c| 1 i| 000060016928 d| 8/23/2010 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 8/23/2010

949 a| R11.A87 v.126 1970 w| LCPER c| 1 i| 000070482669 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 3/3/2011

949 a| R11.A87 v.2 1908 w| LCPER c| 1 i| 000070478495 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.3 1909 w| LCPER c| 1 i| 000070478501 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.4 1909 w| LCPER c| 1 i| 000070478518 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.5 1910 w| LCPER c| 1 i| 000070478525 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.6 1910 w| LCPER c| 1 i| 000070478532 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.7 1911 w| LCPER c| 1 i| 000070478549 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.8 1911 w| LCPER c| 1 i| 000070478556 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.9 1912 w| LCPER c| 1 i| 000070478563 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.10 1912 w| LCPER c| 1 i| 000070478570 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.11 1913 w| LCPER c| 1 i| 000070478587 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.12 1913 w| LCPER c| 1 i| 000070478594 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.13 1914 w| LCPER c| 1 i| 000070478600 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.14 1914 w| LCPER c| 1 i| 000070478617 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.15 1915 w| LCPER c| 1 i| 000070478624 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.16 1915 w| LCPER c| 1 i| 000070478631 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.18 1916 w| LCPER c| 1 i| 000070478648 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.19 1917 w| LCPER c| 1 i| 000070478655 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.20 1917 w| LCPER c| 1 i| 000070478662 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.21 1918 w| LCPER c| 1 i| 000070478679 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.22 1918 w| LCPER c| 1 i| 000070478686 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.23 1919 w| LCPER c| 1 i| 000070478693 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.24 1919 w| LCPER c| 1 i| 000070478709 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.25 1920 w| LCPER c| 1 i| 000070478716 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.26 1920 w| LCPER c| 1 i| 000070478723 d| 2/26/2024 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.27 1921 w| LCPER c| 1 i| 000070478730 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.28 1921 w| LCPER c| 1 i| 000070478747 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.29 1922 w| LCPER c| 1 i| 000070478754 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.30 1922 w| LCPER c| 1 i| 000070478761 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.31 1923 w| LCPER c| 1 i| 000070478778 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.32 1923 w| LCPER c| 1 i| 000070478785 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.33 1924 w| LCPER c| 1 i| 000070478792 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.34 1924 w| LCPER c| 1 i| 000070478808 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.35 1925 w| LCPER c| 1 i| 000070478815 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.36 1925 w| LCPER c| 1 i| 000070478822 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.37 1926 w| LCPER c| 1 i| 000070478839 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.38 1926 w| LCPER c| 1 i| 000070478846 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.39 1927 w| LCPER c| 1 i| 000070478853 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.40 1927 w| LCPER c| 1 i| 000070478860 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.41 1928 w| LCPER c| 1 i| 000070478877 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.42 1928 w| LCPER c| 1 i| 000070478884 l| CATO-2 m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011 z| 6613

949 a| R11.A87 v.43 1929 w| LCPER c| 1 i| 000070478891 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.44 1929 w| LCPER c| 1 i| 000070478907 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.45 1930 w| LCPER c| 1 i| 000070478914 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.46 1930 w| LCPER c| 1 i| 000070478921 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.47 1931 w| LCPER c| 1 i| 000070478938 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.48 1931 w| LCPER c| 1 i| 000070478945 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.49 1932 w| LCPER c| 1 i| 000070478952 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.50 1932 w| LCPER c| 1 i| 000070478969 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.51 1933 w| LCPER c| 1 i| 000070478976 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.52 1933 w| LCPER c| 1 i| 000070478983 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.53 1934 w| LCPER c| 1 i| 000070478990 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.54 1934 w| LCPER c| 1 i| 000070479003 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.55 1935 w| LCPER c| 1 i| 000070479010 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.56 1935 w| LCPER c| 1 i| 000070479027 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.57 1936 w| LCPER c| 1 i| 000070479034 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.58 1936 w| LCPER c| 1 i| 000070479041 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.59 1937 w| LCPER c| 1 i| 000070479058 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.60 1937 w| LCPER c| 1 i| 000070479065 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.61 1938 w| LCPER c| 1 i| 000070479072 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.62 1938 w| LCPER c| 1 i| 000070479089 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.63 1939 w| LCPER c| 1 i| 000070479096 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.64 1939 w| LCPER c| 1 i| 000070479102 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.65 1940 w| LCPER c| 1 i| 000070479119 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.66 1940 w| LCPER c| 1 i| 000070479126 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.67 1941 w| LCPER c| 1 i| 000070479133 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.68 1941 w| LCPER c| 1 i| 000070479140 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.69 1942 w| LCPER c| 1 i| 000070479157 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.70 1942 w| LCPER c| 1 i| 000070479164 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.71 1943 w| LCPER c| 1 i| 000070479171 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.72 1943 w| LCPER c| 1 i| 000070479188 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.73 1944 w| LCPER c| 1 i| 000070479195 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.74 1944 w| LCPER c| 1 i| 000070479201 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.75-76 1945 w| LCPER c| 1 i| 000070479218 d| 7/2/2013 e| 7/1/2013 l| ACAD-BLDG m| UP-ANNEX n| 1 r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.77 1946 w| LCPER c| 1 i| 000070479225 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.78 1946 w| LCPER c| 1 i| 000070479232 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.80 1947 w| LCPER c| 1 i| 000070479249 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.81 1948 w| LCPER c| 1 i| 000070479256 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.82 1948 w| LCPER c| 1 i| 000070479263 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.83 1949 w| LCPER c| 1 i| 000070479270 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.84 1949 w| LCPER c| 1 i| 000070479287 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.85 1950 w| LCPER c| 1 i| 000070479294 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.86 1950 w| LCPER c| 1 i| 000070479300 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.87 1951 w| LCPER c| 1 i| 000070479317 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.88 1951 w| LCPER c| 1 i| 000070479324 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.89 1952 w| LCPER c| 1 i| 000070479331 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.90 1952 w| LCPER c| 1 i| 000070479348 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.91 1953 w| LCPER c| 1 i| 000070479355 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.92 1953 w| LCPER c| 1 i| 000070482331 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.93 1954 w| LCPER c| 1 i| 000070482348 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.94 1954 w| LCPER c| 1 i| 000070482355 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.95 1955 w| LCPER c| 1 i| 000070482362 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.96 1955 w| LCPER c| 1 i| 000070482379 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.97 1956 w| LCPER c| 1 i| 000070482386 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.98 1956 w| LCPER c| 1 i| 000070482393 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.99 1957 w| LCPER c| 1 i| 000070482409 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.100 1957 w| LCPER c| 1 i| 000070482416 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.101 1958 w| LCPER c| 1 i| 000070482423 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.102 1958 w| LCPER c| 1 i| 000070482430 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.103 1959 w| LCPER c| 1 i| 000070482447 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.104 1959 w| LCPER c| 1 i| 000070482454 d| 12/14/2015 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.105 1960 w| LCPER c| 1 i| 000070482461 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.106 1960 w| LCPER c| 1 i| 000070482478 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.107 1961 w| LCPER c| 1 i| 000070482485 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.108 1961 w| LCPER c| 1 i| 000070482492 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.109 1962 w| LCPER c| 1 i| 000070482508 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.110 1962 w| LCPER c| 1 i| 000070482515 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.111 1963 w| LCPER c| 1 i| 000070482522 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.112 1963 w| LCPER c| 1 i| 000070482539 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.113 1964 w| LCPER c| 1 i| 000070482546 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.114 1964 w| LCPER c| 1 i| 000070482553 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.115 1965 w| LCPER c| 1 i| 000070482560 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.116 1965 w| LCPER c| 1 i| 000070482577 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.117 1966 w| LCPER c| 1 i| 000070482584 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.119 1967 w| LCPER c| 1 i| 000070482591 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.120 1967 w| LCPER c| 1 i| 000070482607 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.121 1968 w| LCPER c| 1 i| 000070482614 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.122 1968 w| LCPER c| 1 i| 000070482621 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.123 1969 w| LCPER c| 1 i| 000070482638 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.124 1969 w| LCPER c| 1 i| 000070482645 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.125 1970 w| LCPER c| 1 i| 000070482652 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.127 1971 w| LCPER c| 1 i| 000073908517 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 9/27/2012
949 a| R11.A87 v.128 1971 w| LCPER c| 1 i| 000073908500 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 9/27/2012
949 a| R11.A87 v.129 1972 w| LCPER c| 1 i| 000073908593 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 9/27/2012
949 a| R11.A87 v.130 1972 w| LCPER c| 1 i| 000073908609 d| 8/6/2015 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 9/27/2012
949 a| R11.A87 v.131 1973 w| LCPER c| 1 i| 000073908616 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 9/27/2012
949 a| R11.A87 v.132 1973 w| LCPER c| 1 i| 000073908623 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 9/27/2012
949 a| R11.A87 v.133 1974 w| LCPER c| 1 i| 000073908630 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 9/27/2012
949 a| R11.A87 v.134 1974 w| LCPER c| 1 i| 000073908647 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 9/27/2012
949 a| R11.A87 v.135 no.1-6 1975 w| LCPER c| 1 i| 000073908654 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.135 no.7-12 1975 w| LCPER c| 1 i| 000073908661 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.136 no.1-6 1976 w| LCPER c| 1 i| 000073908678 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.136 no.7-12 1976 w| LCPER c| 1 i| 000073908760 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.137 no.1-6 1977 w| LCPER c| 1 i| 000073908753 d| 4/7/2015 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.137 no.7-12 1977 w| LCPER c| 1 i| 000073908746 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.138 no.1-6 1978 w| LCPER c| 1 i| 000073908739 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.138 no.7-12 1978 w| LCPER c| 1 i| 000073908722 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.139 no.1-6 1979 w| LCPER c| 1 i| 000073908715 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.139 no.7-12 1979 w| LCPER c| 1 i| 000073908708 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.125-139 1970-79 Index w| LCPER c| 1 i| 000073908692 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.140 no.1-6 1980 w| LCPER c| 1 i| 000073908685 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.140 no.7-12 1980 w| LCPER c| 1 i| 000073908777 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.141 no.1-7 1981 w| LCPER c| 1 i| 000073908784 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.141 no.8-13 1981 w| LCPER c| 1 i| 000073908791 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.142 no.1-4 1982 w| LCPER c| 1 i| 000073908807 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.142 no.5-8 1982 w| LCPER c| 1 i| 000073908814 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.142 no.9-13 1982 w| LCPER c| 1 i| 000073908821 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.143 no.1-4 1983 w| LCPER c| 1 i| 000073908838 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.143 no.5-8 1983 w| LCPER c| 1 i| 000073908845 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.143 no.9-12 1983 w| LCPER c| 1 i| 000073908852 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.144 no.1-4 1984 w| LCPER c| 1 i| 000073908944 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.144 no.5-6 1984 w| LCPER c| 1 i| 000073908937 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.144 no.7-8 1984 w| LCPER c| 1 i| 000073908920 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.144 no.9-12 1984 w| LCPER c| 1 i| 000073908913 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.145 no.1-3 1985 w| LCPER c| 1 i| 000073908906 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.145 no.4-6 1985 w| LCPER c| 1 i| 000073908890 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.145 no.7-9 1985 w| LCPER c| 1 i| 000073908883 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.145 no.10-12 1985 w| LCPER c| 1 i| 000073908876 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.146 no.1-3 1986 w| LCPER c| 1 i| 000073908869 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.146 no.4-6 1986 w| LCPER c| 1 i| 000073909033 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.146 no.7-9 1986 w| LCPER c| 1 i| 000073909026 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.146 no.10-12 1986 w| LCPER c| 1 i| 000073909019 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.147 no.1-3 1987 w| LCPER c| 1 i| 000073909002 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.147 no.4-6 1987 w| LCPER c| 1 i| 000073908999 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.147 no.7-9 1987 w| LCPER c| 1 i| 000073908982 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.147 no.10-12 1987 w| LCPER c| 1 i| 000073908975 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.148 no.1-3 1988 w| LCPER c| 1 i| 000073908968 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.148 no.4-6 1988 w| LCPER c| 1 i| 000073908951 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.148 no.7-9 1988 w| LCPER c| 1 i| 000073909040 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.148 no.10-12 1988 w| LCPER c| 1 i| 000073909057 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.149 no.1-3 1989 w| LCPER c| 1 i| 000073909064 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012

949 a| R11.A87 v.149 no.4-6 1989 w| LCPER c| 1 i| 000073909071 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.149 no.7-9 1989 w| LCPER c| 1 i| 000073909088 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.149 no.10-12 1989 w| LCPER c| 1 i| 000073909095 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.150 no.1-3 1990 w| LCPER c| 1 i| 000073909101 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.150 no.4-6 1990 w| LCPER c| 1 i| 000073909118 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.150 no.7-9 1990 w| LCPER c| 1 i| 000073909125 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.150 no.10-12 1990 w| LCPER c| 1 i| 000073909217 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.151 no.1-3 1991 w| LCPER c| 1 i| 000073909200 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.151 no.4-6 1991 w| LCPER c| 1 i| 000073909194 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.151 no.7-9 1991 w| LCPER c| 1 i| 000073909187 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.151 no.10-12 1991 w| LCPER c| 1 i| 000073909170 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.152 no.1-2 1992 w| LCPER c| 1 i| 000073909163 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.152 no.3-4 1992 w| LCPER c| 1 i| 000073909156 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.152 no.5-6 1992 w| LCPER c| 1 i| 000073909149 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.152 no.7-8 1992 w| LCPER c| 1 i| 000073909132 d| 8/1/2022 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.152 no.9-10 1992 w| LCPER c| 1 i| 000073909224 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.152 no.11-12 1992 w| LCPER c| 1 i| 000073909231 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.153 no.1-4 1993 w| LCPER c| 1 i| 000073909248 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.153 no.5-8 1993 w| LCPER c| 1 i| 000073909255 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.153 no.9-12 1993 w| LCPER c| 1 i| 000073909262 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.153 no.13-16 1993 w| LCPER c| 1 i| 000073909279 d| 3/30/2015 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.153 no.17-20 1993 w| LCPER c| 1 i| 000073909286 d| 4/3/2023 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.153 no.21-24 1993 w| LCPER c| 1 i| 000073909293 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.154 no.1-4 1994 w| LCPER c| 1 i| 000073909309 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.154 no.5-8 1994 w| LCPER c| 1 i| 000073909392 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.154 no.9-12 1994 w| LCPER c| 1 i| 000073909385 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.154 no.13-16 1994 w| LCPER c| 1 i| 000073909378 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.154 no.17-20 1994 w| LCPER c| 1 i| 000073909361 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.154 no.21-23 1994 w| LCPER c| 1 i| 000073909354 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.155 no.1-4 1995 w| LCPER c| 1 i| 000073909347 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.155 no.5-8 1995 w| LCPER c| 1 i| 000073909330 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.155 no.9-12 1995 w| LCPER c| 1 i| 000073909323 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.155 no.13-15 1995 w| LCPER c| 1 i| 000073909316 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.155 no.16-19 1995 w| LCPER c| 1 i| 000073909484 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.155 no.20-22 1995 w| LCPER c| 1 i| 000073909477 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.156 no.1-4 1996 w| LCPER c| 1 i| 000073909460 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.156 no.5-8 1996 w| LCPER c| 1 i| 000073909453 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.156 no.9-12 1996 w| LCPER c| 1 i| 000073909446 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.156 no.13-15 1996 w| LCPER c| 1 i| 000073909439 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.156 no.16-19 1996 w| LCPER c| 1 i| 000073909422 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.156 no.20-22 1996 w| LCPER c| 1 i| 000073909415 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.157 no.1-4 1997 w| LCPER c| 1 i| 000073909408 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.157 no.5-8 1997 w| LCPER c| 1 i| 000073909491 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.157 no.9-12 1997 w| LCPER c| 1 i| 000073909507 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.157 no.13-16 1997 w| LCPER c| 1 i| 000073909514 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.157 no.17-19 1997 w| LCPER c| 1 i| 000073909521 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.157 no.20-22 1997 w| LCPER c| 1 i| 000073909538 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.158 no.1-4 1998 w| LCPER c| 1 i| 000073909545 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.158 no.5-8 1998 w| LCPER c| 1 i| 000073909552 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.158 no.9-12 1998 w| LCPER c| 1 i| 000073909569 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.158 no.13-17 1998 w| LCPER c| 1 i| 000073909576 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.158 no.18-22 1998 w| LCPER c| 1 i| 000073909668 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.159 no.1-4 1999 w| LCPER c| 1 i| 000073909651 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.159 no.5-8 1999 w| LCPER c| 1 i| 000073909644 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.159 no.9-12 1999 w| LCPER c| 1 i| 000073909637 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.159 no.13-16 1999 w| LCPER c| 1 i| 000073909620 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.159 no.17-19 1999 w| LCPER c| 1 i| 000073909613 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.159 no.20-22 1999 w| LCPER c| 1 i| 000073909606 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.160 no.1-4 2000 w| LCPER c| 1 i| 000073909590 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.160 no.5-8 2000 w| LCPER c| 1 i| 000073909583 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.160 no.9-12 2000 w| LCPER c| 1 i| 000073909675 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.160 no.13-16 2000 w| LCPER c| 1 i| 000073909682 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.160 no.17-19 2000 w| LCPER c| 1 i| 000073909699 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
852 0 1 a| PSt b| UP-ANNEX c| ANNEX h| R11 i| .A87

866		0	8| 0 a| v.1(1908)-v.126(1970)
852	0		a| PSt b| UP-PAT c| PATERNO-4 h| R11 i| .A87
866		0	8| 0 a| v.127(1971)-v.169(2009)

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Archives of internal medicine

Additional Titles	Oct. 1950-June 1960, A. M. A. archives of internal medicine
Published	Chicago : American Medical Association.
Additional Creators	American Medical Association

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Pattee Library and Paterno Library Stacks (162 items)

Call number	Material	Location
Paterno - 4th Floor: Holdings Summary v.127(1971)-v.169(2009)		
R11.A87 v.169 no.18-22 2009	Bound Journal	Paterno - 4th Floor
R11.A87 v.169 no.13-17 2009	Bound Journal	Paterno - 4th Floor
R11.A87 v.169 no.7-12 2009	Bound Journal	Paterno - 4th Floor
R11.A87 v.169 no.1-6 2009	Bound Journal	Paterno - 4th Floor
R11.A87 v.168 no.18-22 2008	Bound Journal	Paterno - 4th Floor
R11.A87 v.168 no.13-17 2008	Bound Journal	Paterno - 4th Floor
R11.A87 v.168 no.7-12 2008	Bound Journal	Paterno - 4th Floor
R11.A87 v.168 no.1-6 2008	Bound Journal	Paterno - 4th Floor
R11.A87 v.167 no.18-22 2007	Bound Journal	Paterno - 4th Floor
R11.A87 v.167 no.13-17 2007	Bound Journal	Paterno - 4th Floor
R11.A87 v.167 no.7-12 2007	Bound Journal	Paterno - 4th Floor
R11.A87 v.167 no.1-6 2007	Bound Journal	Paterno - 4th Floor
R11.A87 v.166 no.20-22 2006	Bound Journal	Paterno - 4th Floor
R11.A87 v.166 no.16-19 2006	Bound Journal	Paterno - 4th Floor
R11.A87 v.166 no.13-15 2006	Bound Journal	Paterno - 4th Floor
R11.A87 v.166 no.9-12 2006	Bound Journal	Paterno - 4th Floor
R11.A87 v.166 no.5-8 2006	Bound Journal	Paterno - 4th Floor
R11.A87 v.166 no.1-4 2006	Bound Journal	Paterno - 4th Floor
R11.A87 v.165 no.20-22 2005	Bound Journal	Paterno - 4th Floor
R11.A87 v.165 no.16-19 2005	Bound Journal	Paterno - 4th Floor
R11.A87 v.165 no.13-15 2005	Bound Journal	Paterno - 4th Floor
R11.A87 v.165 no.9-12 2005	Bound Journal	Paterno - 4th Floor
R11.A87 v.165 no.5-8 2005	Bound Journal	Paterno - 4th Floor
R11.A87 v.165 no.1-4 2005	Bound Journal	Paterno - 4th Floor
R11.A87 v.164 no.20-22 2004	Bound Journal	Paterno - 4th Floor
R11.A87 v.164 no.16-19 2004	Bound Journal	Paterno - 4th Floor
R11.A87 v.164 no.13-15 2004	Bound Journal	Paterno - 4th Floor
R11.A87 v.164 no.9-12 2004	Bound Journal	Paterno - 4th Floor
R11.A87 v.164 no.5-8 2004	Bound Journal	Paterno - 4th Floor

R11.A87 v.164 no.1-4 2004	Bound Journal	Paterno - 4th Floor
R11.A87 v.163 no.20-22 2003	Bound Journal	Paterno - 4th Floor
R11.A87 v.163 no.16-19 2003	Bound Journal	Paterno - 4th Floor
R11.A87 v.163 no.13-15 2003	Bound Journal	Paterno - 4th Floor
R11.A87 v.163 no.9-12 2003	Bound Journal	Paterno - 4th Floor
R11.A87 v.163 no.5-8 2003	Bound Journal	Paterno - 4th Floor
R11.A87 v.163 no.1-4 2003	Bound Journal	Paterno - 4th Floor
R11.A87 v.162 no.20-22 2002	Bound Journal	Paterno - 4th Floor
R11.A87 v.162 no.16-19 2002	Bound Journal	Paterno - 4th Floor
R11.A87 v.162 no.13-15 2002	Bound Journal	Paterno - 4th Floor
R11.A87 v.162 no.9-12 2002	Bound Journal	Paterno - 4th Floor
R11.A87 v.162 no.5-8 2002	Bound Journal	Paterno - 4th Floor
R11.A87 v.162 no.1-4 2002	Bound Journal	Paterno - 4th Floor
R11.A87 v.161 no.20-22 2001	Bound Journal	Paterno - 4th Floor
R11.A87 v.161 no.16-19 2001	Bound Journal	Paterno - 4th Floor
R11.A87 v.161 no.13-15 2001	Bound Journal	Paterno - 4th Floor
R11.A87 v.161 no.9-12 2001	Bound Journal	Paterno - 4th Floor
R11.A87 v.161 no.5-8 2001	Bound Journal	Paterno - 4th Floor
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R11.A87 v.160 no.9-12 2000	Bound Journal	Paterno - 4th Floor
R11.A87 v.160 no.5-8 2000	Bound Journal	Checked out
R11.A87 v.160 no.1-4 2000	Bound Journal	Checked out
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R11.A87 v.159 no.17-19 1999	Bound Journal	Paterno - 4th Floor
R11.A87 v.159 no.13-16 1999	Bound Journal	Paterno - 4th Floor
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R11.A87 v.159 no.5-8 1999	Bound Journal	Paterno - 4th Floor
R11.A87 v.159 no.1-4 1999	Bound Journal	Paterno - 4th Floor
R11.A87 v.158 no.18-22 1998	Bound Journal	Paterno - 4th Floor
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R11.A87 v.158 no.5-8 1998	Bound Journal	Paterno - 4th Floor
R11.A87 v.158 no.1-4 1998	Bound Journal	Paterno - 4th Floor
R11.A87 v.157 no.20-22 1997	Bound Journal	Paterno - 4th Floor
R11.A87 v.157 no.17-19 1997	Bound Journal	Paterno - 4th Floor
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R11.A87 v.157 no.5-8 1997	Bound Journal	Paterno - 4th Floor
R11.A87 v.157 no.1-4 1997	Bound Journal	Paterno - 4th Floor
R11.A87 v.156 no.20-22 1996	Bound Journal	Paterno - 4th Floor
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R11.A87 v.156 no.13-15 1996	Bound Journal	Paterno - 4th Floor
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R11.A87 v.156 no.5-8 1996	Bound Journal	Paterno - 4th Floor
R11.A87 v.156 no.1-4 1996	Bound Journal	Paterno - 4th Floor
R11.A87 v.155 no.20-22 1995	Bound Journal	Paterno - 4th Floor

R11.A87 v.155 no.16-19 1995	Bound Journal	Paterno - 4th Floor
R11.A87 v.155 no.13-15 1995	Bound Journal	Paterno - 4th Floor
R11.A87 v.155 no.9-12 1995	Bound Journal	Paterno - 4th Floor
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R11.A87 v.155 no.1-4 1995	Bound Journal	Paterno - 4th Floor
R11.A87 v.154 no.21-23 1994	Bound Journal	Paterno - 4th Floor
R11.A87 v.154 no.17-20 1994	Bound Journal	Paterno - 4th Floor
R11.A87 v.154 no.13-16 1994	Bound Journal	Paterno - 4th Floor
R11.A87 v.154 no.9-12 1994	Bound Journal	Paterno - 4th Floor
R11.A87 v.154 no.5-8 1994	Bound Journal	Paterno - 4th Floor
R11.A87 v.154 no.1-4 1994	Bound Journal	Paterno - 4th Floor
R11.A87 v.153 no.21-24 1993	Bound Journal	Paterno - 4th Floor
R11.A87 v.153 no.17-20 1993	Bound Journal	Paterno - 4th Floor
R11.A87 v.153 no.13-16 1993	Bound Journal	Paterno - 4th Floor
R11.A87 v.153 no.9-12 1993	Bound Journal	Paterno - 4th Floor
R11.A87 v.153 no.5-8 1993	Bound Journal	Paterno - 4th Floor
R11.A87 v.153 no.1-4 1993	Bound Journal	Paterno - 4th Floor
R11.A87 v.152 no.11-12 1992	Bound Journal	Paterno - 4th Floor
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R11.A87 v.152 no.7-8 1992	Bound Journal	Paterno - 4th Floor
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R11.A87 v.151 no.10-12 1991	Bound Journal	Paterno - 4th Floor
R11.A87 v.151 no.7-9 1991	Bound Journal	Paterno - 4th Floor
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R11.A87 v.151 no.1-3 1991	Bound Journal	Paterno - 4th Floor
R11.A87 v.150 no.10-12 1990	Bound Journal	Paterno - 4th Floor
R11.A87 v.150 no.7-9 1990	Bound Journal	Paterno - 4th Floor
R11.A87 v.150 no.4-6 1990	Bound Journal	Paterno - 4th Floor
R11.A87 v.150 no.1-3 1990	Bound Journal	Paterno - 4th Floor
R11.A87 v.149 no.10-12 1989	Bound Journal	Paterno - 4th Floor
R11.A87 v.149 no.7-9 1989	Bound Journal	Paterno - 4th Floor
R11.A87 v.149 no.4-6 1989	Bound Journal	Paterno - 4th Floor
R11.A87 v.149 no.1-3 1989	Bound Journal	Paterno - 4th Floor
R11.A87 v.148 no.10-12 1988	Bound Journal	Paterno - 4th Floor
R11.A87 v.148 no.7-9 1988	Bound Journal	Paterno - 4th Floor
R11.A87 v.148 no.4-6 1988	Bound Journal	Paterno - 4th Floor
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R11.A87 v.147 no.1-3 1987	Bound Journal	Paterno - 4th Floor
R11.A87 v.146 no.10-12 1986	Bound Journal	Paterno - 4th Floor
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R11.A87 v.146 no.1-3 1986	Bound Journal	Paterno - 4th Floor
R11.A87 v.145 no.10-12 1985	Bound Journal	Paterno - 4th Floor

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R11.A87 v.144 no.9-12 1984	Bound Journal	Paterno - 4th Floor
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R11.A87 v.143 no.9-12 1983	Bound Journal	Paterno - 4th Floor
R11.A87 v.143 no.5-8 1983	Bound Journal	Paterno - 4th Floor
R11.A87 v.143 no.1-4 1983	Bound Journal	Paterno - 4th Floor
R11.A87 v.142 no.9-13 1982	Bound Journal	Paterno - 4th Floor
R11.A87 v.142 no.5-8 1982	Bound Journal	Paterno - 4th Floor
R11.A87 v.142 no.1-4 1982	Bound Journal	Paterno - 4th Floor
R11.A87 v.141 no.8-13 1981	Bound Journal	Paterno - 4th Floor
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R11.A87 v.140 no.7-12 1980	Bound Journal	Paterno - 4th Floor
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R11.A87 v.139 no.7-12 1979	Bound Journal	Paterno - 4th Floor
R11.A87 v.139 no.1-6 1979	Bound Journal	Paterno - 4th Floor
R11.A87 v.138 no.7-12 1978	Bound Journal	Paterno - 4th Floor
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R11.A87 v.137 no.7-12 1977	Bound Journal	Paterno - 4th Floor
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R11.A87 v.136 no.7-12 1976	Bound Journal	Paterno - 4th Floor
R11.A87 v.136 no.1-6 1976	Bound Journal	Paterno - 4th Floor
R11.A87 v.135 no.7-12 1975	Bound Journal	Paterno - 4th Floor
R11.A87 v.135 no.1-6 1975	Bound Journal	Paterno - 4th Floor
R11.A87 v.134 1974	Bound Journal	Paterno - 4th Floor
R11.A87 v.133 1974	Bound Journal	Paterno - 4th Floor
R11.A87 v.132 1973	Bound Journal	Paterno - 4th Floor
R11.A87 v.131 1973	Bound Journal	Paterno - 4th Floor
R11.A87 v.130 1972	Bound Journal	Paterno - 4th Floor
R11.A87 v.129 1972	Bound Journal	Paterno - 4th Floor
R11.A87 v.128 1971	Bound Journal	Paterno - 4th Floor
R11.A87 v.127 1971	Bound Journal	Paterno - 4th Floor
R11.A87 v.125-139 1970-79 Index	Bound Journal	Paterno - 4th Floor

Library Storage (125 items)

Call number	Material	Location
Annexed Material: Holdings Summary v.1(1908)-v.126(1970)		
R11.A87 v.126 1970	Bound Journal	Annexed Material
R11.A87 v.125 1970	Bound Journal	Annexed Material
R11.A87 v.124 1969	Bound Journal	Annexed Material
R11.A87 v.123 1969	Bound Journal	Annexed Material
R11.A87 v.122 1968	Bound Journal	Annexed Material
R11.A87 v.121 1968	Bound Journal	Annexed Material
R11.A87 v.120 1967	Bound Journal	Annexed Material
R11.A87 v.119 1967	Bound Journal	Annexed Material
R11.A87 v.118 1966	Bound Journal	Annexed Material

R11.A87 v.117 1966	Bound Journal	Annexed Material
R11.A87 v.116 1965	Bound Journal	Annexed Material
R11.A87 v.115 1965	Bound Journal	Annexed Material
R11.A87 v.114 1964	Bound Journal	Annexed Material
R11.A87 v.113 1964	Bound Journal	Annexed Material
R11.A87 v.112 1963	Bound Journal	Annexed Material
R11.A87 v.111 1963	Bound Journal	Annexed Material
R11.A87 v.110 1962	Bound Journal	Annexed Material
R11.A87 v.109 1962	Bound Journal	Annexed Material
R11.A87 v.108 1961	Bound Journal	Annexed Material
R11.A87 v.107 1961	Bound Journal	Annexed Material
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R11.A87 v.103 1959	Bound Journal	Annexed Material
R11.A87 v.102 1958	Bound Journal	Annexed Material
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R11.A87 v.100 1957	Bound Journal	Annexed Material
R11.A87 v.99 1957	Bound Journal	Annexed Material
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R11.A87 v.95 1955	Bound Journal	Annexed Material
R11.A87 v.94 1954	Bound Journal	Annexed Material
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R11.A87 v.92 1953	Bound Journal	Annexed Material
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R11.A87 v.90 1952	Bound Journal	Annexed Material
R11.A87 v.89 1952	Bound Journal	Annexed Material
R11.A87 v.88 1951	Bound Journal	Annexed Material
R11.A87 v.87 1951	Bound Journal	Annexed Material
R11.A87 v.86 1950	Bound Journal	Annexed Material
R11.A87 v.85 1950	Bound Journal	Annexed Material
R11.A87 v.84 1949	Bound Journal	Annexed Material
R11.A87 v.83 1949	Bound Journal	Annexed Material
R11.A87 v.82 1948	Bound Journal	Annexed Material
R11.A87 v.81 1948	Bound Journal	Annexed Material
R11.A87 v.80 1947	Bound Journal	Annexed Material
R11.A87 v.79 1947	Bound Journal	Annexed Material
R11.A87 v.78 1946	Bound Journal	Annexed Material
R11.A87 v.77 1946	Bound Journal	Annexed Material
R11.A87 v.75-76 1945	Bound Journal	Annexed Material
R11.A87 v.74 1944	Bound Journal	Annexed Material
R11.A87 v.73 1944	Bound Journal	Annexed Material
R11.A87 v.72 1943	Bound Journal	Annexed Material
R11.A87 v.71 1943	Bound Journal	Annexed Material
R11.A87 v.70 1942	Bound Journal	Annexed Material
R11.A87 v.69 1942	Bound Journal	Annexed Material

R11.A87 v.68 1941	Bound Journal	Annexed Material
R11.A87 v.67 1941	Bound Journal	Annexed Material
R11.A87 v.66 1940	Bound Journal	Annexed Material
R11.A87 v.65 1940	Bound Journal	Annexed Material
R11.A87 v.64 1939	Bound Journal	Annexed Material
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R11.A87 v.62 1938	Bound Journal	Annexed Material
R11.A87 v.61 1938	Bound Journal	Annexed Material
R11.A87 v.60 1937	Bound Journal	Annexed Material
R11.A87 v.59 1937	Bound Journal	Annexed Material
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R11.A87 v.45 1930	Bound Journal	Annexed Material
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R11.A87 v.40 1927	Bound Journal	Annexed Material
R11.A87 v.39 1927	Bound Journal	Annexed Material
R11.A87 v.38 1926	Bound Journal	Annexed Material
R11.A87 v.37 1926	Bound Journal	Annexed Material
R11.A87 v.36 1925	Bound Journal	Annexed Material
R11.A87 v.35 1925	Bound Journal	Annexed Material
R11.A87 v.34 1924	Bound Journal	Annexed Material
R11.A87 v.33 1924	Bound Journal	Annexed Material
R11.A87 v.32 1923	Bound Journal	Annexed Material
R11.A87 v.31 1923	Bound Journal	Annexed Material
R11.A87 v.30 1922	Bound Journal	Annexed Material
R11.A87 v.29 1922	Bound Journal	Annexed Material
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R11.A87 v.26 1920	Bound Journal	Annexed Material
R11.A87 v.25 1920	Bound Journal	Annexed Material
R11.A87 v.24 1919	Bound Journal	Annexed Material
R11.A87 v.23 1919	Bound Journal	Annexed Material
R11.A87 v.22 1918	Bound Journal	Annexed Material
R11.A87 v.21 1918	Bound Journal	Annexed Material
R11.A87 v.20 1917	Bound Journal	Annexed Material

R11.A87 v.19 1917	Bound Journal	Annexed Material
R11.A87 v.18 1916	Bound Journal	Annexed Material
R11.A87 v.17 1916	Bound Journal	Annexed Material
R11.A87 v.16 1915	Bound Journal	Annexed Material
R11.A87 v.15 1915	Bound Journal	Annexed Material
R11.A87 v.14 1914	Bound Journal	Annexed Material
R11.A87 v.13 1914	Bound Journal	Annexed Material
R11.A87 v.12 1913	Bound Journal	Annexed Material
R11.A87 v.11 1913	Bound Journal	Annexed Material
R11.A87 v.10 1912	Bound Journal	Annexed Material
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R11.A87 v.8 1911	Bound Journal	Annexed Material
R11.A87 v.7 1911	Bound Journal	Annexed Material
R11.A87 v.6 1910	Bound Journal	Annexed Material
R11.A87 v.5 1910	Bound Journal	Annexed Material
R11.A87 v.4 1909	Bound Journal	Annexed Material
R11.A87 v.3 1909	Bound Journal	Annexed Material
R11.A87 v.2 1908	Bound Journal	Annexed Material
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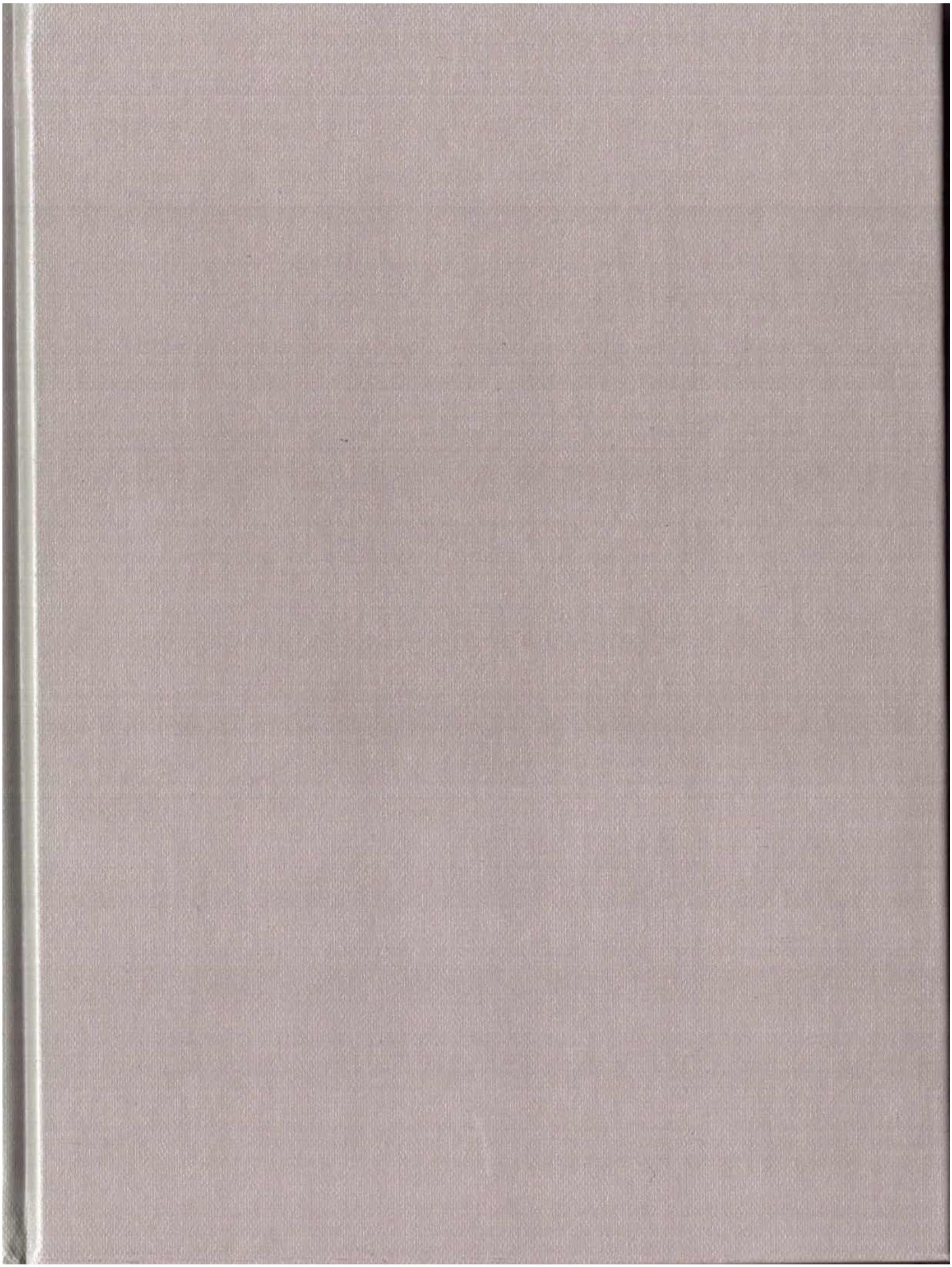
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