Successful Research Collaborations and Student Education Programs Involving Spelman College and NASA

Presenter: Albert N. Thompson, Jr.

Improving Minority Institution Collaborations at NASA Workshop

October 24-25, 2009
NASA Ames Conference Center
NASA Research Park, Moffett Field, CA

Spelman College

Atlanta, Georgia

MODEL INSTITUTIONS FOR EXCELLENCE PROGRAM

SPELMAN COLLEGE

Spelman College: Enrollment

- 2100 full-time students
- 30% Science Majors
- 25% Science Graduates
  - 50% of science graduates pursue graduate and professional degrees

Overview of the Sciences

1977-1978

- **Student Enrollment: 375 (*1276*)**
- **Departments: Biology, Chemistry, Mathematics**
- **Faculty: 21(*96* FT *17* PT)**

1996-2008

- **Student Enrollment: 707(*2050*)**
- **Departments: Biology, Biochemistry, Chemistry, Computer Science, Dual Degree Engineering; Environmental Science, Mathematics and Physics**
- **Faculty: 50 (*156* FT *48* PT)**

WISE PROGRAM

WISE Scholars Program Goal

To Increase the Number of Underrepresented Minority Women in Scientific and Technical Careers

Commenced in 1987

More than 290 BS/BS-BSE graduates

90% Graduation Rate

www.spelman.edu/wise

ExxonMobil, 2006

WISE Scholars Program Application Eligibility

High School Seniors
Desire to major in the Physical Sciences, Mathematics or Engineering
3.0 GPA on a 4.0 scale
Combined SAT Score of 1100 or above or a composite score of 25 or above on the ACT

Components of the WISE Program

- Academic (6-week pre-freshman program, major in physical science, Math, or Engineering, maintain 3.0 GPA)
- Research
  - NASA Centers
  - Spelman College
- Academic Support and Counseling

www. spelman.edu/wise

Spelman feature - A Wise Choice - on the NASA Portal

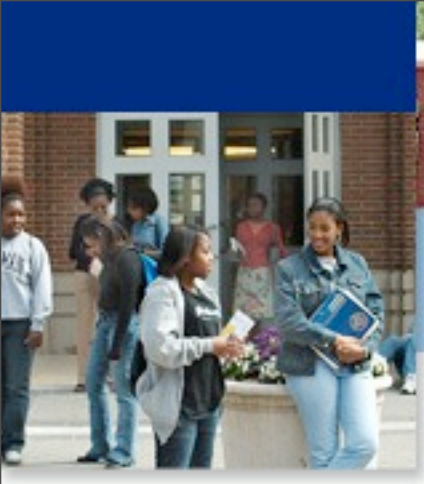
Direct URL:
http://www.nasa.gov/audience/foreducators/postsecondary/features/a-wise-choice.html

Adrienne Stiff-Roberts, Assistant Professor, Department of Electrical and Computer Engineering, Duke University; 2009 Recipient of the Presidential Early Career Award for Scientists and Engineers

Monica Cox, Assistant Professor, Purdue University, School of Engineering Education; 2009 Recipient of the Presidential Early Career Award for Scientists and Engineers

Chekesha Liddell, Assistant Professor in Materials Science and Engineering at Cornell University; 2007 Recipient of the Presidential Early Career Award for Scientists and Engineers

Dr. Kelly Bolden, Plastic and Reconstructive Surgery Fellow, University of Texas at Southwestern Medical Center; daughter of NASA Administrator Charles Bolden



Spelman College
A Choice to Change the World

Success of the Spelman College NASA WISE Scholars Program

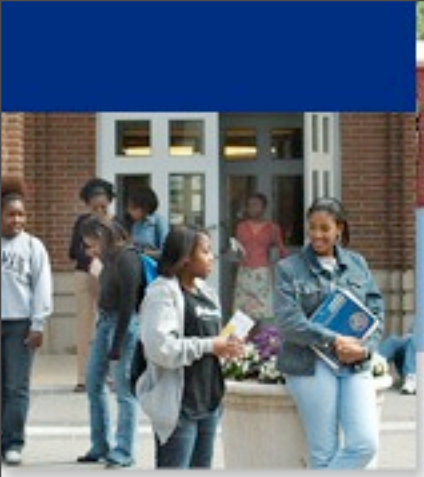
Women in Science and Engineering (WISE)

Monica Cox, Ph.D.

- Four summers as a NASA intern
- B.S. Mathematics
- M.S. Industrial Engineering
- Ph.D. Leadership & Policy Studies
- Asst. Prof. School of Engineering Educ. Purdue Univ.
- 2009 Recipient of the Presidential Early
- Career Award for Scientists and Engineers

SharolynWynter

- Two summers as NASA intern
- B.S. Mathematics
- M.S. Operations Research
- M.S. Industrial Engineering
- Research Experience for Undergraduates Univ. of MD (Spiral Program)
- Consultant for Deloitte



Spelman College
A Choice to Change the World

DELTA DECISIONS (Washington, DC)
An Operations Research Consulting Company

- Received the American Small Business Coalition's Rookie of the Year Award, 2008

- Founded in 2006 by three African-American women; two Spelman alumnae (B.S. in mathematics):

Kim Barnette and Afi Harrington
Both earned the Ph.D.
in Operations Research from
North Carolina State University

FACULTY RESEARCH

"Synchronously Scanned OPO CARS as a New Probe for Hostile Environments," NASA Faculty Awards for Research, $149,000, October 1996-99. (Principal investigator-Peter Chen)

Publications:

- Chen, P. C., "Rejection of background light using single wavelength detection in nonlinear Raman spectroscopy," *Applied Spectroscopy* 51, 376-379, 1997.
- Chen, P. C. and Pinnix*, M., "Low-Frequency Raman Spectra using Synchronously Scanned Optical Parametric Oscillator CARS," *Applied Spectroscopy* 51, 1678-1681, 1997.
- Chen, P. C., Joyner, C. C., and Burns-Kaurin, M., "Multiplex coherent anti-Stokes Raman spectroscopy by use of a nearly degenerate broadband optical parametric oscillator," *Applied Optics* 38, 5894-5898, 1999.

Student Researchers:
-Michon Pinnix, Spring '96-Spring'97
-LaTasha Amisial, Summer '96
-Miguela Gonzalez, Spring '97 - Summer '97
-Husniyah Dent, Spring '97-Summer '97
-Tennille Thames, Summer '97
- Alice Turner, Summer '98
- Brandi Johnson, Summer '98
- Kanika Benton, Summer '98 - Fall 2001

Analysis of Carbohydrates by GCxGC/ MS

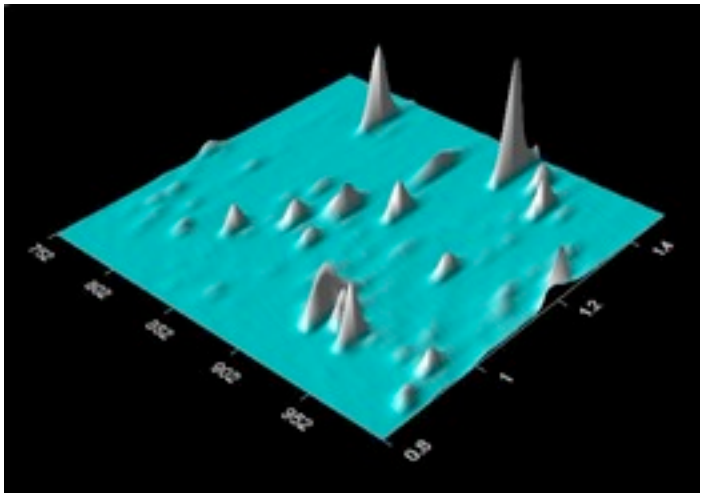
NASA Collaborator: Dr. George Cooper (NASA/Ames)

Project: Separation of C1 – C6 sugars of interest in exobiology samples (meteorites, etc.)

Two students have contributed to this project:
Brittany Cole (Spelman College)
Latisha Wright (Bennett College)

These results have led to collaborative efforts with:
Dr. Arthur Weber (SETI Institute)
Dr. Sandra Pizzarello (University of Arizona)
Dr. David Deamer (UC Santa Cruz)
Dr. Jim Cleaves (Carnegie Institute)
for the screening of various exobiology samples.

Dr. Dimandja was a NASA/GSRP Fellow at NASA/Ames from 1991-1995 (in Glenn Carle's SSX branch).



Portion of a GCxGC chromatogram analysis for a mixture of sugars.

Brittany Cole

The NASA Alliance for Nonlinear Optics

A consortium of seven institutions

1994-2004

- Prediction of properties → Spelman College - *Beatriz H. Cardelino (Chemistry)*
- Synthesis of materials
  - New Mexico Highlands University - *Ronald D. Clark (Chemistry)*
  - University of Puerto Rico -Mayaguez - *Alexander Leyderman (Physics)*
- Optical characterization → University of Alabama-Huntsville - *Mohan Sanghadasa (Physics)*
- Device development → Alabama A&M University - *Putcha Venkateswarlu (Physics)*
  Manmohan Aggarwal (Materials Science)

The Alliance headquarters were at **New Mexico Highlands University**.
In 2000, two more institutions: Grambling State University and University of Texas at El Paso.

Spelman College outcomes:

Trained 2-6 students per year

Students presented at NCUR, NASA-Alliance meetings, etc.

PI co-authored more than 20 papers with other members of the Alliance.

MIE PROGRAM

MIE PROGRAM TIMELINE

- (1994) ~70 HBCUs and MIs were invited to submit planning proposals to NSF
- ~60 planning grants submitted
- 15 institutions were chosen to compete for MIE funding
- (1995) 6 were selected to become MIE institutions {Bowie State (NASA), Oglala Lakota (NSF), Spelman (NASA), UMET (NSF), UTEP (NSF) & Xavier (NSF)}

MIE GOAL

- To strengthen STEM education and research-training programs and increase the number and quality of STEM graduates, particularly those entering STEM graduate programs and careers

MIE PROGRAM

IMPLEMENTATION
Phase I, Year Beginning June, 1996

INSTITUTIONALIZATION
Phase II, Year Beginning June, 2001

DISSEMINATION

COMPONENTS

- Undergraduate Education
- Undergraduate Research
- Faculty Development
- Student Development
- Infrastructure Development
- Citations
- Evaluation

MRIs

Navajo Technical College
New York City College of Technology
Northwest Indian College
Stillman College
Texas A&M University-Corpus Christi
Paine College
Universidad del Turabo
Alabama A&M University
Southwestern Indian Polytechnic Institute

IHEP
INSTITUTE FOR HIGHER EDUCATION POLICY

Minority Replication Institution Programs

NASA STUDENTS PURSURING ACADEMIC AND CAREER EXCELLENCE SCHOLARS PROGRAM

NSPACE

CHICAGO STATE UNIVERSITY

Spelman College
A Choice to Change the World

TSU TEXAS SOUTHERN UNIVERSITY
"EXCELLENCE IN ACHIEVEMENT"

Special Thanks to NASA:
Dr. Beth Brown, In Memorial
Dr. Carl Person

Pre-College Science and Mathematics Program

Baccalaureate-Origin Institutions of Black S&E Doctorate Recipients - 1997-2006

Howard led the country with 310 doctoral recipients in S&E from 1997-2006. The following schools round out the top 10: *Spelman College (224),* Hampton University (150), Florida Agricultural and Mechanical University (135), Morehouse College (100), North Carolina A&T University (99), Southern University A&M College at Baton Rouge (89), Xavier University (79), Harvard University (73), and University of Maryland at College Park(72).

Spelman ranked 15th per 1000 BS/BA degrees awarded to Blacks.

To read the full report visit http://nsf.gov/statistics/infbrief/nsf08319/

GEORGIA EDUCATION

Spelman students sparkle in sciences

Atlanta women's college No. 2 in sending black graduates on to Ph.D.s in fields such as math, chemistry

Hyosub Shin / hshin@ajc.com
Diana Spell (left) tests prostate cancer cells as Kimberly Jackson (center), assistant chemistry professor, supervises Patrice Wagner's work in a Spelman College lab.

By GAYLE WHITE
Atlanta Journal-Constitution
Sunday, November 16, 2008

Which Atlanta institution produces the most African-American graduates who go on to earn doctoral degrees in science and engineering?

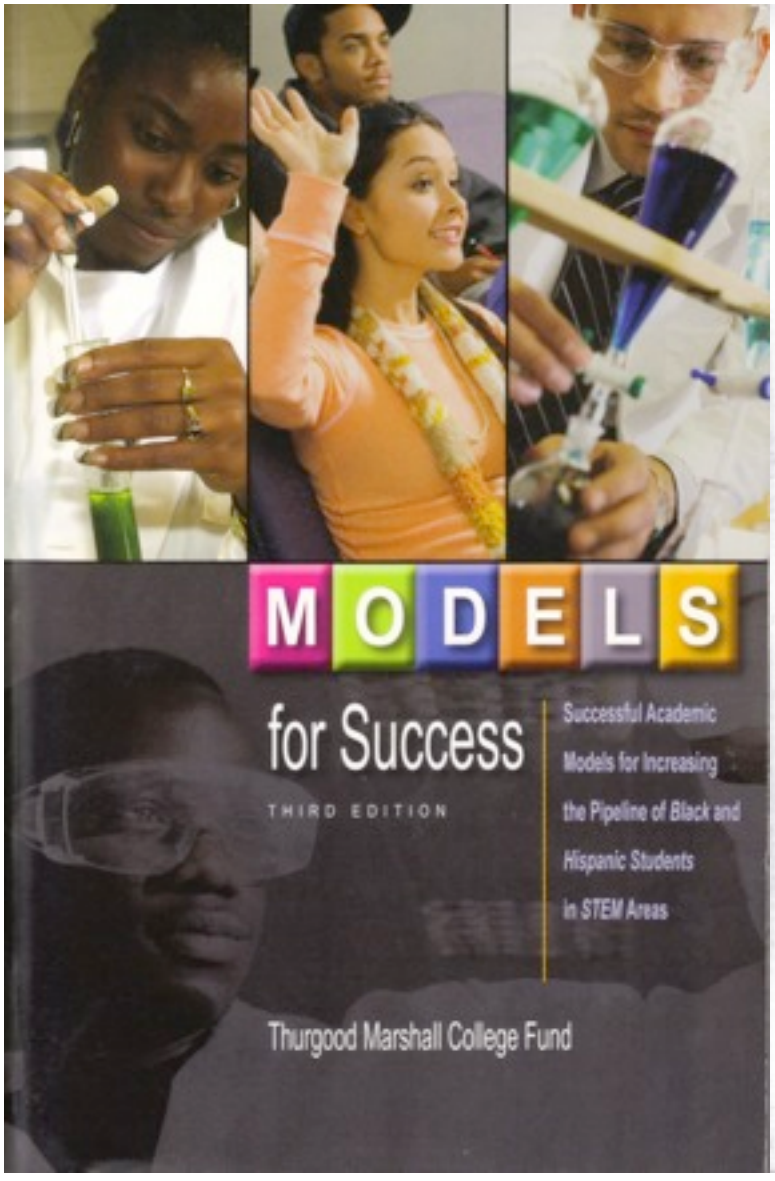
a) Morehouse College
b) Georgia Tech
c) Emory University

The answer is d) None of the above. That distinction goes to Spelman College — a small, historically black, private liberal arts college for women.

Spelman, with a student body of about 2,200, sent 150 black students on to Ph.D. degrees in those traditionally male disciplines from 1997 to 2006, according to a survey released in August by the National Science Foundation. That's more than any other undergraduate program in the country except the much larger, coed Howard University, with 224. Howard, also historically black, has about 7,000 undergraduates.

For the record, Morehouse ranked fifth in the country with 99; Georgia Tech came in 48th with 32; and Emory didn't make

Publications



CHAPTER

8

AFRICAN AMERICAN WOMEN IN CHEMISTRY

Spelman College as a National Model for Baccalaureate Degree Production

By Olivia A. Scriven, Ph.D.
Albert N. Thompson, Jr., Ph.D.

Introduction

The past several decades have given rise to increased attention to the topic of women in science, particularly during the post-WWII period and later. With the release of Margaret Rossiter's (1995) *Women Scientists in America*[1], we now know that the Cold War-inspired campaign for "women power" resulted in a record number of women earning doctorates in science and engineering disciplines. Further studies have shown that despite an increase in degrees awarded, systemic inequalities and structural limitations significantly hampered the quality of women's access to and advancement in the profession[2]. Feminists, scholars of women's studies, and historians and sociologists of science and technology argue that this increased attention has helped to construct a better sense of the experiences of women scientists in America, especially when placed within the larger context of the growth of U.S. science and the role of higher education as a nexus for that growth.

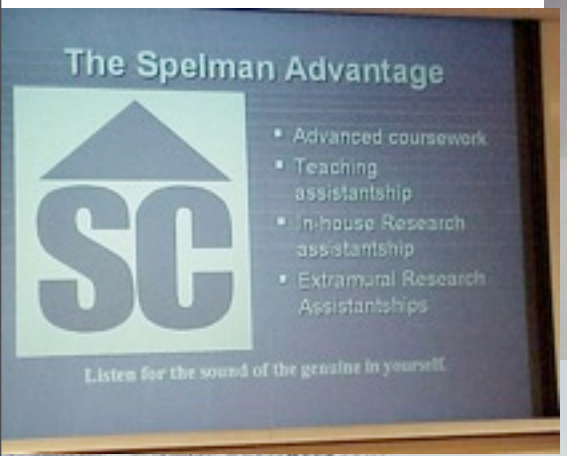
Most of these offerings focus on a particular group of women and make implicit, if not explicit, assumptions about undergraduate degree origins. By contrast, the history, experiences, contributions, contemporary status, and undergraduate degree origins of African American women scientists remain largely under-explored. James M. Jay's *Negroes in Science* was the first comprehensive study to trace the undergraduate and graduate origins of African Americans that had earned doctorates in the natural sciences through the late 1960's[3]. The Jay study documented that African American scientists did exist, provided crucial baseline data, and was especially unique in that

SUCCESS FACTORS

- Visionary Leadership
- Committed Faculty
- Role Models
- Resources
- Talented Student Pool
- Administration

ALBRO-FALCONER-MANLEY SCIENCE CENTER

Dedicated April, 2002



MODEL INSTITUTIONS FOR EXCELLENCE PROGRAM

SPELMAN COLLEGE

SUMMARY

- We measure our success in science education by the achievements of our graduates
  - Completion of B.S. Degree Requirements
  - Admission into graduate & professional schools
  - Ability to obtain careers (employment) in their discipline

HOW TO BUILD AND SUSTAIN A SUCCESSFUL MODEL

- Challenge the low visibility of role models in STEM disciplines for students from underrepresented groups.
- Build self-confidence and promote a sense of belonging in science and mathematics.
- Create nurturing environments and supportive communities that maintain high expectations and show confidence in the ability of ALL students to achieve.
- Increase student scholarships and maintain high quality educational infrastructure - - including the curriculum, personnel and physical facilities.

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- http://www.spelman.edu/

MODEL INSTITUTIONS FOR EXCELLENCE PROGRAM

SPELMAN COLLEGE

ENRICHMENT PROGRAMS CONT.

- PIPS Program, 1994

  Program in Physical Sciences, DoD,Office of Naval Research

- NSA & EDGE Programs (Math Majors)

  National Security Agency Internships & Enhancing Diversity in Graduate Education (www.edgeforwomen.org)

- RIMI Program, 1995

  Research Infrastructure in Minority Institutions, NIH funded

- Howard Hughes Biomedical Summer Science Program

  Rising 12th Graders

- MIE Program, 1995

  Model Institutions for Excellence

  NSF sponsored and NASA funded

DUAL DEGREE ENGINEERING PROGRAM

The Dual Degree Engineering Program provides the opportunity to obtain both a liberal arts education and a professional engineering education. In the program, the student spends a minimum of three academic years at Spelman College and two academic years at a participating engineering school.

Upon completion of all requirements at both institutions, the student is simultaneously awarded a Bachelor of Science degree from Spelman College and a Bachelor of Engineering degree from the engineering institution.

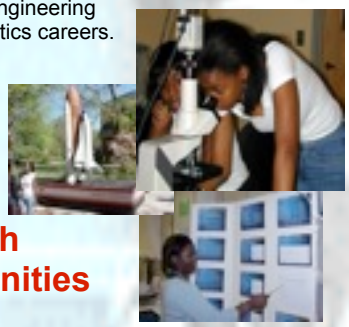
Participating engineering schools are: Auburn University, Boston University, California Institute of Technology, Clarkson University, Columbia University, Dartmouth College, Georgia Institute of Technology, North Carolina A&T State University, Rensselaer Polytechnic Institute, Rochester Institute of Technology, University of Alabama at Huntsville, University of Michigan, University of Missouri, and University of Florida. ***http://www.spelman.edu/dualdegree***

Model Institutions for Excellence Program

Spelman College, Atlanta Georgia

Enhancing a Rich Tradition

Spelman has prepared more than six generations of African Americans to reach the highest levels of academic, community and professional achievement. Sponsored by the National Aeronautics and Space Administration (NASA), the MIE Program enhances Spelman's impressive record of preparing women for science, engineering and mathematics careers.



Research Opportunities

The MIE Research Intern Program introduces sophomores and juniors to the exciting world of research. Interns work with Spelman Faculty individually or in teams on selected projects during the academic year.

Highlights include:

- Competitive partial scholarships
- Seminars on emerging research in science, mathematics and engineering
- Participation in Spelman Science Day
- Travel support for research presentations
- Opportunity to conduct summer research at other institutions

Expansive Research and Learning Opportunities

Undergraduate Research

- *MIE Research Interns*
- *Project Focus Teams*
- *Research at External Sites*
- *Scholar-Teacher Program*
- *Professional Meetings*

Student Development

- *Summer Programs*
- *Freshman Success Program*
- *Office of Science, Engineering and Technical Careers*

Undergraduate Education

- *Curriculum Development*
- *Teaching Reforms*
- *Faculty Development*
- *Facilities and Equipment*

Infrastructure Development

- *Computing and Information Technology*
- *Systems for Monitoring Student Progress*
- *Cooperative Endeavors*

Preparation for Graduate Education and Professional Life

Summer Academic Enrichment

MIE offers rising SEM sophomores a special opportunity to strengthen their scientific and mathematics backgrounds. By participating in the **PostFreshman Summer Science Program (PFSSP)**, SEM students can have an experience that provides a rich academic, career development, and personal foundation for the years that follow.

Highlights include:

- Opportunities to visit local and national research sites
- Weekly seminars on careers in science and engineering
- Opportunity to earn college credit at no cost
- Meal and lodging expenses covered

Application Deadlines

Deadline for MIE Research Intern Program same as for Spelman College Scholarship Applications. Late April for PFSSP.

For More Information

For information on eligibility and other specifics contact Dr. Kerri Burton-Danner at 404-221-2024 or kbdanner@spelman.edu.

Etta Falconer, Ph.D., Principal Investigator
Albert Thompson, Jr., Ph.D., Co-Principal Investigator

MODEL INSTITUTIONS FOR EXCELLENCE PROGRAM

SPELMAN COLLEGE

SPELMAN COLLEGE
CLARK ATLANTA UNIVERSITY
MORRIS BROWN COLLEGE
THE I.T.C.
MOREHOUSE COLLEGE
MOREHOUSE SCHOOL OF MEDICINE
STRENGTH IN DIVERSITY

- Albert N. Thompson, Jr.
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- http://www.spelman.edu/academics/research/mie
- http://www.systemic.com/mie

13. Not Used
14. Packard Hall
15. Rockefeller Hall
16. Reynolds Cottage
17. Sisters Chapel
18. Read Hall
19a. Academic Computing Center
19b. Tapley Hall
19c. Albro-Falconer-Manley Science Center
20. Laura Spelman Hall
21. Morehouse-James Hall
22. Abby Aldrich Rockefeller Hall
23. Giles Hall
24. Milligan Building
25. The Suites
Spelman College
To Downtown Atlanta
1. West Campus Parking Deck Public Safety
2. Sally Sage McAlpin Hall
3. Dorothy Shepard Manley Hall
4. Howard-Harreld Hall
5. Donald and Isabel Stewart Living & Learning Center I
6a. Johnnetta B. Cole Living & Learning Center II
6b. LLC II Auditorium
7. Bessie Strong Hall
8. MacVicar Health Services
9. Manley College Center
9a. Bookstore/Post Office
10. Facilities Management & Services
11. Camille Olivia Hanks Cosby, Ed D. Academic Center
12. Rockefeller Fine Arts Building
RWWL. Robert W. Woodruff Library
EXIT 55
GREENSFERRY AVENUE
WESTVIEW DRIVE
LEE STREET
WEST END AVENUE
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RWWL
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