REQUIRED COVER PAGE

APPLICATION FOR FACULTY RESEARCH GRANT

**All questions must be completed to be considered for grant award.

Choose one: [x] Creative [ ] Research	**Date of Last FRG Award** (Semester and Year awarded): _____ **Date of ATU Faculty Appointment** (Semester and Year): FALL, 2004

1. Project Title: Morrey Spaces, Op Spaces, and Their Properties
2. Name of Principal Investigator/Project Director: Chunping Xie
3. School (abbrev): SS **4. Department:** MATH

5. Campus Mail Address: CORLEY 237 **6. PI/PD Campus Phone:** 968-0658

7. Amount Requested: $2,000 **8. Total Cost of Project:** $10,000

9. Does this project involve: **10. Duration of Project:** Five to six years

Yes	No	
[ ]	[x]	human subjects?
[ ]	[x]	animals/animal care facility?
[ ]	[x]	radioactive materials?
[ ]	[x]	hazardous materials?
[ ]	[x]	biological agents or toxins restricted by the USA Patriot Act?
[ ]	[x]	copyright or patent potential?
[ ]	[x]	utilization of space **not** currently available to the PI/PD?
[ ]	[x]	the purchase of equipment/instrumentation/software currently **available** to the PI/PD?

NOTE: If the answer is "yes" to any of the above questions, the investigator must attach appropriate documentation of approval or justification for use/purchase.

SIGNATURES

Department Contribution (if applicable): $_____

Account Number: _____

Don Cameron 9/30/04
Chairperson **Date**

School Contribution (if applicable): $_____

Account Number: _____

John White 9-30-04
Dean **Date**

This Section to be completed by the Office of Academic Affairs

FSBA Committee Award Recommendation: Yes____ No____
FSBA Committee Proposal Rank: _____ of _____ Total Proposals.
Recommendation of VPAA: Yes____ No_____
Recommendation of President: Yes____ No_____
Award Date: _____

PROPOSED BUDGET
FACULTY RESEARCH GRANT
(include budget categories as appropriate)

1.	Graduate assistant stipend		$____
	Fringe benefits @ .4% (4/10 percent) of graduate assistant stipend		____
2.	Non-work study stipend		____
	Fringe benefits @ .4% (4/10 percent) of non-work study stipend		____
3.	*Supplies (please list items to be purchased and estimated price per item including taxes and shipping, if appropriate):		
	Item No. 1 (e.g., software)	Estimated Price	____
	Item No. 2 (e.g., copying costs)	Estimated Price	____
	Item No. 3 (books, etc.)	Estimated Price	$600
	(additional lines as needed)		
	Total estimated supplies		$600
4.	Travel (please list travel expenditures by date and estimated costs):		
	Travel No. 1	Estimated Price	$750
	Travel No. 2	Estimated Price	$650
	Travel No. 3	Estimated Price	____
	(additional lines as needed)		
	Total estimated travel		$1400
5.	*Capital Outlay (please list items to be purchased and estimated price per item including taxes and shipping, if appropriate):		
	Item No. 1	Estimated Price	____
	Item No. 2	Estimated Price	____
	Item No. 3	Estimated Price	____
	(additional lines as needed)		
	Total estimated capital outlay		____
	TOTAL PROPOSED BUDGET		$2,000

*Items purchased under $2,500 (including taxes and shipping) are considered supply items. Capital Outlay items are those which cost $2,500 or more (including taxes and shipping). Please contact the Purchasing Office for questionable items.

Research Project

Chunping Xie

Department of Mathematics

Function spaces, especially Morrey and Qp spaces, and their natural extensions, are now a central concept in modern analysis. In particular, they play a decisive role in the theory of partial differential equations (PDE). While capacities originally grew out of the theory of the gravitational potential and the Laplace equation, they now play an essential role in the development of functional analysis and mathematical physics. Many problems have definitive solutions in terms of capacities, however capacities have the drawback that their geometric meaning is not transparent. For this reason, I will devote my research project to the study of the interplay between function spaces and the geometry of capacities, with its applications to certain partial differential equations describing the motion of a fluid in Euclidean spaces. In the past several years, my work in analysis and operator theory was closely linked to complex function theory, Lebesgue integration and geometric measure theory, but during the last four years more sophisticated real-variable methods were developed which allowed applications to a variety of new problems. The activity in this field shows no sign of abating. The object of my research project is to push this analysis forward and to explore an opportunity for making significant progress.

The Qp and Morrey spaces can be viewed as a natural extension of the BMO spaces. This scale of spaces also include the classical Dirichlet spaces and Bloch spaces. The study focuses on BMO part and involves naturally functional analysis and operator theory. The potential application extends to applied sciences, such as system science and automatic control.

To give a rough idea of the type of problems which I am interested in, I will briefly describe some of my recent progress in research activities. The Properties of Function Space Qp deal with finding important characteristics or retrieving information about Qp space.". We have found the decomposition for the function in Qp spaces([1]). We have proved the relationship between Morrey spaces and Qp spaces in the paper ([2]). Up to now I have two papers ([1] and [2]) published. Another one ([3]) is submitted.

I plan to investigate the following problems that are suggested by my current research:

- The strong type capacities of Morrey spaces.
- The capacities of Qp spaces.
- The predual and second predual of Morrey spaces
- Investigating the multiplier of Qp spaces.
- The Corona problem of Morrey spaces.
- How to characterize the predual and second predual for Qp spaces.
- The basic properties of Hankel and Toeplitz operators on Qp spaces.
- The extrema problems of the Qp spaces?
- The isometric space of Qp spaces.

Briefly, my intention is the following: Working on this project in the near future I gradually will extend my research towards the related fields that are closely related to my current research program.

REFERENCE

[1] Chunping Xie, *The Decomposition Theorems for Qp Spaces,* Arkiv för Matematik, **40**(2002), No.2, 383-401 (with Zhijian Wu)

[2] Chunping Xie, *Qp Spaces and Morrey Spaces,* Journal of Functional Analysis, **201** (2003), No.1, 282-297 (with Zhijian Wu)

[3] Chunping Xie, *Littlewood-Paley Functions and Morrey Spaces,* Submitted.

BUDGET

1. Attending AMS and MAA joint meeting in Atlanta, GA , January 5-8, 2005. $750

2. Attending SEAM meeting at Washington and Lee University in Lexington, Virginia. April 8 and 9, 2005. $650

3. Planning to buy 5 books. $500

4. Supplies. $100

I will devote about three hours every day to this project.

Chunping Xie

Assistant Professor
Department of Mathematics
School of Systems Science

Education

- Ph.D. Mathematics, The University of Alabama, 2001
- M.A. Mathematics, The University of Alabama, 2001
- M.S. Mathematics, Beijing Normal University, 1988

Teaching Experience

- Assistant Professor, Arkansas Tech Univeristy, 2001 - Present
- Associate Professor, Yantai Teacher's University , China, 1997 – 1998
- Lecturer, Yantai Teacher's University, China, 1993 – 1997
- Assistant Professor , Yantai Teacher's University, China, 1988 – 1993
- Instructor, Yulin Teacher's College, China, 1981 – 1985

Scholarly and Professional Activities

Presentations:

- "The Decomposition Theorems for Qp spaces" A.M.S. Southeast Meeting, Nov. 2000, University of Alabama at Birmingham, AL
- "Littlewood-Paley Functions and Morrey Spaces" MAA section meeting, Mar, 2004, The University of Central Arkansasa, Conway, AR

Publications:

1. Chunping Xie, *Littlewood-Paley Functions and Morrey Spaces*, Submitted
2. Zhijian Wu and Chunping Xie, *The Decomposition Theorems for Qp spaces*

   Arkiv för Matematik, **40**(2002), No.2, 383-401
3. Zhijian Wu, Chunping Xie, *Qp spaces and Morrey Spaces* of Functional Analysis, **201** 2003), No.1, 282-297

4. Zhao, Yu Song; Xie, Chunping, *The Schwarz problem for bianalytic functions.* Acta Math. Sci. **19** (1999), no. 5, 597—600

5. Chunping Xie, Yusong Zhao, *Basic Boundary-Value Problems for Complex Harmonic Function.* Beijing Mathematics Vol.3, No.2, 1997, 20-25

6. Xie, Chunping, *The Higher Derivatives of Bianalytic Functions.* Chinese Quarterly Journal of Mathematics , Vol.12, No.3, 1997, 256-261

7. Xie, Chunping, *Mixed Boundary Value Problems for Bianalytic Functions.* Journal of Ningxia University, Vol.18, No.4 ,1997, 313-315

8. Xie, Chunping, *Boundary-Value Problem with Free Boundary for Elliptic System Equations.* Journal of Beijing Normal University, Supplement 1989, 15-20

9. Gao, Shuchun, Xie, Chunping, Zou, Huichao and Wang, Tiancheng, *a-Time Integrated Semigroup.* Advances in Applied Functional Analysis, International Academic Publication 1993, 51-55

10. Xie, Chunping, *The Cauchy Integral Formula of Bianalytic Functions.* Journal of Yantai Teacher's University, Vol.12, No.3, 1996, 167-171

11. Chunping Xie, Yusong Zhao, *Semi-bianalytic Functions.* Journal of Yantai Teacher's University, Vol.13, No.4, 1997, 252-254

12. Xie, Chunping, Yusongzhao, *The Cauchy Integral Theorem of Semibianalytic Functions.* Journal of Yantai Teacher's University , Supplement 1997, 1-3

13. Xie, Chunping, *The Cauchy Integral Formula of the Complex Harmonic Functions.* Journal of Yantai Teacher's University,Vol.14, No.3, 1998, 161-164

14. Zhang, Jijia, Wang, Huiping and Xie, Chunping, *The Analysis of Teacher's Grading Terms.* Applied Psychology of China , 24 Vol.1,No.1, 1995, 27-33

Meetings attended:

- Mar, 2004: MAA section meeting, The University of Central Arkansas, Conway, AR
- Mar, 2003: MAA section meeting, The University of Tulsa, Tulsa, OK
- Mar,2003: A .M. S. Southeast Analysis Meeting, The University od Tennessee, Knoxville, TN
- Mar,2002: MAA section meeting, Henderson State University , Arkadelphia, AR
- Mar, 2001: A. M. S. Southeast Analysis Meeting, University of Georgia, Athens, GA
- Feb, 2001: AACTM Meeting , University of West Alabama, Livingston, AL
- Dec, 2000: Applied Mathematics Meeting, University of Alabama in Huntsville, Huntsville, AL

- Nov, 2000: Mini-conference on Harmonic Analysis, Auburn University, Auburn, AL
- Nov, 2000: A. M. S. Southeast Meeting, University of Alabama at Birmingham, Birmingham, AL
- Mar, 2000: A .M. S. Southeast Analysis Meeting, University of Virginia, Charlottesville, VA
- Dec, 1999: Applied Mathematics Meeting, University of Alabama at Birmingham, Birmingham AL
- Nov, 1999: Mini-conference on Harmonic Analysis, Auburn University, Auburn, AL
- Jul, 1999: YAMS Meeting, Furman University, Greenville, SC
- Mar, 1999: A. M. S. Meeting,University of Florida, Gainsville, FL

Memberships & Service to Professional Organizations:

1998-present, member of the American Mathematical Society

Services

- Aug 2001-present Department of Mathematics
  Arkansas Tech Univeristy (Assistant Professor)

- Aug 1998-Aug 2001 Department of Mathematics
  The University of Alabama (T. A.)

- July,1997-July,1998 Department of Mathematics
  Yantai Teacher's University (Associate professor)

- July,1993-July,1997 Department of Mathematics
  Yantai Teacher's University (Lecturer)

- July,1988-July,1993 Department of Mathematics
  Yantai Teacher's University (Assistant Professor)

OFFICE OF ACADEMIC AFFAIRS

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November 5, 2004

Dr. Chunping Xie
Assistant Professor of Mathematics
Arkansas Tech University
Corley Building, Room 237
Russellville, AR 72801

Dear Dr. Xie:

Congratulations! Academic Affairs is pleased to announce your application for the Spring, 2005 Faculty Research Grant has been recommended by the Faculty Salary, Benefits, and Awards Committee. Based on this recommendation, Academic Affairs has approved the $2,000 budget for your research of Morrey Spaces, QP Spaces, and Their Properties. Requisitions regarding the grant will be processed through your Dean's office and should be expended by June 30, 2004.

Your research on this project is sure to not only benefit your department, but Arkansas Tech University as a whole. We wish you success with this endeavor.

Sincerely,

Jack Hamm
Vice President for Academic Affairs

Copy: Dr. Don Carnahan
Dr. John Watson
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