

JOHN K. KARLOF  
Professor of Mathematics  
The University of North Carolina at Wilmington

**1. Education:**

<u>INSTITUTION</u>	<u>CONCENTRATION</u>	<u>YEARS</u>	<u>DEGREE</u>
SUNY at StonyBrook	operations research	1981-82	M.S.
University of Colorado	mathematics	1968-73	Ph.D.
SUNY at Oswego	mathematics	1964-68	B.A.

**2. Professional History:**

<u>INSTITUTION</u>	<u>YEARS</u>
University of North Carolina at Wilmington	1984-present
University of Nebraska at Omaha	1973-84

**3. Masters Theses Directed:**

1. "Bilevel Programming of the Flow Shop Scheduling Problem", Ping Wang
2. "Stochastic Modeling of Signalized Intersections", Rhonda Thompson
3. "Geometric Programming: Method and Applications in Coding Theory", Wei Wang
4. "Minimizing the Total Cost with Minimum Makespan in the Flow Shop Problem", Charlie Hu
5. "An Implementation of an Affine Scaling Interior Point Algorithm for Linear Programming", Mingja Gao
6. "Spherical Codes for the Gaussian Multiple Access Channel", Yuhong Huang
7. "Flow Shop Scheduling with Resource Flexibility", Wenlan Lu
8. "Decoding Spherical Codes Generated by Binary Partitions of Symmetric Pointsets", Guodong Liu
9. "Coding and Decoding for the Gaussian Multiple Access Channel", Eric Kliewer
10. "Minimizing the Cost in a Multi-Channel Queueing System", John Jenkins
11. "Job Scheduling with Hard Real Time Constraints", Guogiang Peng
12. "Optimally Locating Nuclear Waste Dump Sites", Hongtao Xu
13. "A New Algorithm for a Special Class of P-Median Problems, Yinggang Li

**4. Professional Interests:**

- Coding Theory
- Scheduling Problems
- Integer Programming

**5. Professional Memberships:**

- Mathematical Association of America
- American Mathematical Society
- Institute of Electrical and Electronics Engineers - Senior member

## 6. NSF Grants:

1. Faculty Research and Development Grant - \$37,000., 81-82, (spent the year at SUNY at StonyBrook in the Applied Mathematics Department)
2. *Group Codes for the Gaussian Channel* - \$100,000., 86-88, research grant
3. *The Initial Vector Problem for Group Codes for the Gaussian Channel* - \$229,091., submitted January, 2001, status: not funded

## 7. Refereed Publications:

1. *The Subclass Algebra Associated with a Finite Group and Subgroup*, Transactions of the American Math Society, Vol. 207, 1975.
2. *On the Existence of  $[M,n]$  Group Codes for the Gaussian Channel*, IEEE Transactions on Information Theory, Vol. 23, No. 4, 1977. with C. Downey (University of Nebraska)
3. *Odd Group Codes for the Gaussian Channel*, SIAM Journal of Applied Mathematics, Vol. 34, No. 4, 1978. with C. Downey
4. *Optimal  $[M,3]$  Group Codes for the Gaussian Channel*, IEEE Transactions on Information Theory, Vol. 24, No. 6, 1978. with C. Downey
5. *Group Codes for the Gaussian Broadcast Channel with Two Receivers*, IEEE Transactions on Information Theory, Vol 26., No. 4, 1980. with C. Downey
6. *On the Subclass Algebra*, The International Journal of Mathematics and Mathematical Sciences, Vol. 3, No. 2, 1980.
7. *The Analysis of Optimal  $[M,3]$  Group Codes for the Gaussian Channel*, Utilitas Mathematica, March, 1980. with C. Downey
8. *Group Codes for the  $M$ -Receiver Gaussian Broadcast Channel*, IEEE Transactions on Information Theory, Vol. 29, No. 4, 1983. with C. Downey
9. *An Evaluation of Typing Procedures for Quantitative Data*, Human Immunology, Vol. 15, 1986. with N. Mendell (SUNY at StonyBrook)
10. *Permutation Codes for the Gaussian Channel*, IEEE Transactions on Information Theory, Vol. 35, No. 4, 1989.
11. *Decoding Spherical Codes for the Gaussian Channel*, IEEE Transactions on Information Theory, Vol. 39, No. 1, 1993.
12. *Large Scale Geometric Programming: An Application in Coding Theory*, Computers in Operations Research, vol. 21, No. 7, 1994. with Y. Chang (UNCW)
13. *Bilevel Programming Applied to the Flow Shop Scheduling Problem*, Computers in Operations Research, 23, 1996. with W. Wang (UNCW graduate student)
14. *Spherical Codes for the Gaussian Multiple Access Channel*, Proceedings of the 1996 International Symposium on Information Theory and Its Applications, Victoria, B.C., 211-213, 1996. with Y. Huang (UNCW graduate student)
15. *Optimal Permutation Codes for the Gaussian Channel*, IEEE Transactions on Information Theory, Vol. 43, 1997. with Y. Chang
16. *Representing Group Codes as Permutation Codes*, IEEE Transactions on Information Theory, 45, Sept. 1999. with E. Biglieri and E. Viterbo (Politecnico di Torino, Italy)

17. *Decoding Spherical Codes Generated by Binary Partitions of Symmetric Pointsets*, in *Coding Theory, Cryptography and Related Areas*, Buchmann, Hoholdt, Stichtenoth eds., Springer, 1999. with G. Liu (UNCW graduate student)
18. *The Behavior of a Multichannel Queueing System under Three Queue Disciplines*, Proceedings SEInforms Annual Meeting, Myrtle Beach, SC , Oct. 2002. This paper won the award for best paper in track.

## 8. Recent Professional Presentations:

1. *Coding and Decoding for the Gaussian Multiple Access Channel* at the International Congress of Mathematicians, Berlin, August, 1998
2. *Decoding Spherical Codes Generated by Binary Partitions of Symmetric Pointsets*, at the International Conference on Coding Theory, Cryptography and Related Areas Guanajuato, Mexico, April, 1998
3. *Representing Group Codes as Permutation Codes*, International Symposium on Information Theory, Matsovo, Greece, June, 1999.
4. *Group Codes for the Gaussian Channel*, Center for Advanced Computing and Communication, NC State University, November, 1999. Invited
5. *An Integer Programming Solution to Locating Radioactive Waste Sites*, INFORMS Annual Meeting, San Antonio, November, 2000
6. *A New Decoding Algorithm for Spherical Codes Generated by Binary Partitions of Symmetric Pointset*, IEEE International Symposium on Information Theory, Sorrento, Italy, June 2000.
7. *Geometric Programming Applied to Coding Theory*, INFORMS International, Maui, June, 2001
8. *The Behavior of a Multichannel Queueing System under Three Queue Disciplines*, SEINFORMS, Myrtle Beach, S.C., October, 2002. This paper was awarded "The best paper" in the Quantitative Method and Theory track.

## Current Research:

### **Integer Programming applied to Locating Low Level Nuclear Waste Treatment Sites:**

The US. government has many regulations for locating nuclear waste treatment sites. I am working with Dr. R. Amey, professor of Geography and Environmental Science at the University of Maryland-Baltimore County, on how to optimally locate nuclear waste treatment sites in the United States. I have modeled the problem as a integer programming problem. It turns out this is a very interesting problem since it is too big to be solved by commercial software, even the latest professional version of LINDO. I have developed a new branch and bound integer programming algorithm with penalties to solve this problem. I am also working on a heuristic algorithm based on p-median solutions to solve the problem.

**Group Codes Generated from Subgroups:** There are many ways of using two groups to construct another group (direct product, semidirect product, wreath product etc.). I am working on using these group constructions to form new group codes from two given group codes. The plan is to generate new optimal group codes and associated decoding algorithms.