

H. Bahlouli

NAME : **Hocine Bahlouli**

RANK : **Professor**

DEGREE/YEAR/INSTITUTION : Ph.D./1988/
University of Illinois, Urbana, USA

SUPERVISOR : **PROF. A. J. LEGGETT, NOBEL PRIZE IN PHYSICS**
(2003).

FIELD : Theoretical Condensed Matter Physics

SPECIALIZATION : Superconductivity, Quantum and Transport
Phenomena in Solids and disordered systems,
Nanostructure devices, Mathematical Physics.

I. PROFESSIONAL EXPERIENCE:

1. Dec. 1999 – present
Professor, Physics Department, KFUPM, Saudi-Arabia.
2. June 1993 – Dec. 1999
Associate Professor, Physics Department, KFUPM, Saudi Arabia.
3. September 1989 - June 1993
Assistant Professor, Physics Department, KFUPM, Saudi Arabia.
4. September 1988 - September 1989
Post-Doctor, Theoretical Physics Institute, University of Minnesota, U.S.A.
5. January 1987 - May, 1988
Research Assistant, Physics Department, University of Illinois, U.S.A.
6. September, 1985 - January 1987
Teaching Assistant, Physics Department, University of Illinois, U.S.A.

II. RESEARCH:

1. PAPERS IN REFEREED JOURNALS

1. **H. Bahlouli**, "Temperature dependence of nuclear spin-lattice relaxation in heavy-fermion superconducting state", Physics Letters A, Vol.118, pp.209-212 (1986).
2. **H. Bahlouli** and B. Arfi, "Thermal conductivity and thermally induced charge imbalance in heavy fermion systems" Journal of Low Temperature Physics Vol. 69, pp.327-347 (1987).
3. B. Arfi, **H. Bahlouli**, C.J. Pethick, and D. Pines, "Usual transport effects in anisotropic superconductors", Physical Review Letters Vol. 60, pp.2206-2209 (1988).
4. B. Arfi, **H. Bahlouli**, C.J. Pethick, "Transport properties of anisotropic superconductors: influence of arbitrary electron-impurity phase shifts", Physical Review B, Vol.39, pp.8959-8983 (1989).
5. **H. Bahlouli**, "Anisotropic nuclear spin relaxation rate", Physics Letters A, Vol.139, pp.261-264 (1989).
6. **H. Bahlouli**, "Gap relaxation and its effect on sound attenuation near T_c ", Physical Physics Review B, Vol. 40, pp.6538-6547 (1989).
7. **H. Bahlouli**, "Thermally generated magnetic fields in heavy fermion superconductors", Physical Review B, Vol. 41, pp.10972-10977 (1990).
8. **H. Bahlouli**, "Effect of strong potential scattering on the local moment relaxation in anisotropic superconductors", Physics Letters A, Vol.146, pp.265-268 (1990).
9. **H. Bahlouli**, "Ruderman-kittel-kasuya-yosida interaction in dirty superconductors", Physical Review B, Vol. 44, pp. 5328-5331 (1991).
10. **H. Bahlouli**, "Nuclear spin relaxation rate in disordered superconductors", Physics Letters A, Vol. 164, pp. 206-210 (1992).
11. S.W. Pierson, O.T. Valls and **H. Bahlouli**, "Critical behavior of a layered superconductor model", Physical Review B, Vol. 45, pp. 13035-13046 (1992).

12. **H. Bahlouli**, "Particle hole asymmetry in anisotropic superconductors", Physics Letters A, Vol. 175, pp. 361-365 (1993).
13. D.E., Ephron, M.R. Beasley, **H. Bahlouli** and K.A. Matveev, "Correlated hopping through thin disordered insulators", Phys. Rev. B, Vol. 49, pp. 2989-2992 (1994).
14. **H. Bahlouli**, K.A. Matveev, D. Ephron and M.R. Beasley, "Coulomb correlations in hopping through a thin layer", Phys. Review B, Vol. 49, pp. 14496-14503 (1994).
15. **H. Bahlouli**, "The effect of coulomb blockade on resonant tunneling", Phys. Letters A, Vol. 193, pp. 485 -490 (1994).
16. **H. Bahlouli**, "Hopping contribution to tunneling in nis junction", Physics Letters. A, Vol.194, pp.210-214 (1994).
17. **H. Bahlouli**, "Coulomb correlations of resonant tunneling in nis junctions", Supercond. Sci. Technol. Vol. 8,pp. 900-903 (1995).
18. **H. Bahlouli**, "Hopping transport through amorphous junctions", Solid State Communications Vol. 98, pp. 457-461 (1996).
19. **H. Bahlouli**, "The nuclear spin-lattice relaxation time in d-wave superconductors", Supercond. Sci. Technol. Vol. 9, pp. 145-148 (1996).
20. **H. Bahlouli**, "Density of states effect on resonant tunneling", Solid State Communications, Vol. 102, pp. 883-886 (1997).
21. N. Zekri, **H. Bahlouli**, and F. Brouers, "Filtering of light in randomly layered media", Physics Letters A, Vol. 234, pp. 391-395 (1997).
22. N. Zekri and **H. Bahlouli**, "Nonlinearity effect on a 1D periodic lattice", J. of Phys. Stat. Sol. B, Vol. 205, pp. 511-517 (1998).
23. N. Zekri, **H. Bahlouli** and A. Sen, "Amplification and disorder effects in Kronig-Peney chains of active potentials", J. of Phys. Condensed Matter, Vol. 10, pp. 2405-2416 (1998).
24. N. Zekri, **H. Bahlouli**, "Crossover between localization and delocalization in a random Non-integer n-Mer chain", Modern Phys. Lett. B, Vol. 12, pp. 743-751 (1998).
25. **H. Bahlouli** and N. Zekri, "Coulomb correlations in resonant tunneling", Modern. Phys. Lett. B, Vol. 12, 839-848 (1998).

26. K. Senouci, N. Zekri, **H. Bahlouli**, and A.K. Sen, "The effect of non-linearity on 1d periodic and disordered lattices", J. Phys. Cond. Matt. Vol. 11, Issue 7, pp. 1823 - 1832 (1999).
27. N. Zekri and **H. Bahlouli**, "Nonlinearity interaction effect on the phase distribution in 1D disordered lattices", Journal of Physics: Cond. Matt. Vol. 11, pp. 6197 - 6206 (1999).
28. **H. Bahlouli**, "The I-V Characteristic of Resonant tunneling Junctions", Phys. Stat. Sol. Vol. A179, 475-483 (2000).
29. E. Abu-Azzah, N. Zekri and **H. Bahlouli**, "Propagating modes in chains with arbitrary n-Mer", Alg. Rev. Nucl. Sci. Vol.3, issue 1& 2, 71-78 (2001).
30. **H. Bahlouli**, "Transport Through a Small Interacting System", Arabian Journal of Science and Engineering Vol. 26, 1A, 43-52 (2001).
31. M. Molina and **H. Bahlouli**, "Conductance through a single nonlinear magnetic impurity", Physics Letters Vol. A 294, 87-94 (2002).
32. **H. Bahlouli** and A. Al-Sunaidi, "Magnetoconductance Through a Small Nonlinear 1D System", Journal of Physics : Cond. Matter Vol. 14, 12477 (2002).
33. U. Al-Khawaja, **H. Bahlouli**, S. Al-Amoudi, and A. AlSunaidi, "Collisional Damping and Resonance Behavior of Coupled Scissors Modes of a Bose-Einstein Condensate", Journal of Low Temperature Physics Vol. 131, issue1/2, 113 (2003).
34. A. Berkane-Krachai, N. Zekri, and **H. Bahlouli**, "Absorption effect on light filtering", Waves in Random Media Vol.13, 303 (2003).
35. S. Marouf, N. Zekri and **H. Bahlouli**, "Non-Hermiticity and its Dual Role in Double Barrier Structures", (2004).
36. E. Abu-Azzah, S. Al-Amoudi and **H. Bahlouli**, "Charging Effect on Transport Through a Nonlinear Impurity", Physics Letters Vol.330, 181 (2004).
37. A. Al-Sunaidi and **H. Bahlouli**, "Transport and resonance phenomena through a single nonlinear magnetic impurity", AJSE Vol.30, 237 (2005).
38. **H. Bahlouli**, A.D. Alhaidari, A. Al Zahrani and E.N. Economou, "Study of electromagnetic wave propagation in active medium and the equivalent Schrodinger equation with energy-dependent complex

potential”, Physical Review B Vol.72, 094304 (2005).

39. A. D. Alhaidari, **H. Bahlouli** and A. Al-Hasan, ,, The Dirac and Klein Gordon equations with equal scalar and vector potentials “, Physics Letters A Vol.349, 87 (2006).
40. A.D. Al-Haidari, **H. Bahlouli**, M.S. Abdelmonem, F. Al-Ameen and T. Al-Abelaal, “ Scattering Theory with Special Regularization: Rediscovering the J-Matrix Method”, Physics Letters A 364, 372-377 (2007).
41. A.D. Al-Haidari, **H. Bahlouli.**, A. Alhassan and M.S. Abdelmonem, “ Relativistic Scattering with Spatially Dependent Effective Mass in the Dirac Equation”, Physical Review A75 , 062711 (2007).
42. **H. Bahlouli**, A.D. Al-Haidari and M. S. Abdelmonem, “ Density of States Extracted from Modified Recursion Relations”, Phys. Letters A 367, 162 (2007).
43. I. Nasser, S. Abdelmonbem, **H. Bahlouli** and A.D.H. Al Haidari,, “ Bound States for Rotating Morse Potential using Tridiagonal Representation”, J. Phys. B: At. Mol. Opt. Phys. 40, 4245-4257 (2007).
44. A.D. Al-Haidari and **H. Bahlouli.**, “ Electron in the Field of a Molecule with an Electric Dipole Moment”, Physical Review Letters, in press (2008).
45. A.D. Al-Haidari, **H. Bahlouli** and S. Abdelmonem,” Taming the Yukawa potential singularity: improved evaluation of bound states and resonance energies”, Physical Review A, (2007).
46. H. Al-Aaoud, **H. Bahlouli** and A.D. Al-Haidari, “Solution of the Wave Equation in a Tridiagonal Representation Space”, Phys. Letters A (2008).
47. A.D. Al-Haidari, **H. Bahlouli** and S. Abdelmonem,” The one Dimensional J-Matrix of Scattering ”, (2008).
48. A. Al-Sunaidi and **H. Bahlouli**, “ Mesoscale Simulation of Field Induced Alignment in Rod-Like and Rod-Coil Copolymers”, (2008).
49. I. Nasser, M. S. Abdelmonem, H. Bahlouli and U. El-Khawaja, “Computation of Resonances and Bound States Using the J-Matrix Approach”, submitted (2008).

2. CONFERENCES PRESENTATION:

1. **H. Bahlouli**, "Phonon Contribution to Tunneling "Proceedings of the 5th International Conference on Microelectronics, KFUPM, Dhahran, Saudi Arabia. Edited by M.S.T. Benten, S.M. Sait, Abdul Raouf and S.H. Abdul-Jawad, pp. 64-66 (1993).
2. **H. Bahlouli**, "The effect of coulomb blockade on resonant tunneling", Proceedings of the 6th International Conference on Microelectronics, ICM' 94, Sept. 5-7, Istanbul, Turkey, pp. 36-39 (1994), edited by F. Olcaytug et al.
3. **H. Bahlouli**, "Electron transport through amorphous materials", Proceeding on "Tunneling and its implications", July 30-August 02, ICTP, Trieste, Italy, 1996.
4. N. Zekri, A. Berkane-Krachai and **H. Bahlouli**, "Filtering of light in randomly Layered Media", Saudi French Workshop on "Recent Development in Material Processing and Modeling", KFUPM, Dhahran, Saudi Arabia, Nov. 11-12, (1997).
5. N. Zekri, **H. Bahlouli**, A. Sen, "Amplification and Disorder in KP Chain of Active Potentials", Communication in STATPYS. 20, Paris 20-24 July (1998). This proceeding is not yet published.
6. E. Abu-Azzah and **H. Bahlouli**, "Quantum confinement and nonlinear effects in mesoscopic magnetic systems", Proceedings of the second Saudi science conference, King Abdulaziz University, Jeddah, 15-17 March (2004).
7. **H. Bahlouli**, AlZahrani, Al-Amoudi and Al-Haidari "Quantum confinement and nonlinear effects in mesoscopic magnetic systems", Proceedings of the Saudi science conference, King Abdulaziz University, Jeddah, 15, March (2004).
8. **H. Bahlouli**, A.D. Alhaidari,S. AlAmoudi and A. Alzahrani, " Gain and Nonlinearity Effects on the Transmission a Small 1D System", NanoTech Insight 2005, International Conference, Luxur, Egypt, Februrary 20-25, 2005. Proceeding page 106.
9. A. Al-Sunaidi and **H. Bahlouli**, " Mesoscale Simulation of Field Induced Alignment in Rod-Like and Rod-Coil Copolymers", **Canadian Computational Chemistry Conference, published in the conference proceedings, August (2006).**

3. INVITED TALKS

1. “Transport in Anisotropic Superconductors”, Physics Department, Ohio State University, USA (1988).
2. “Electron Transport through Amorphous Materials” at Conference on Tunneling and its Implications”, August 01, ICTP, Trieste, Italy (1996).
3. “Non-Hermitian Matrices and their Applications”, One-Day Workshop on “Matrix Theory and Applications”, KFUPM, Dec. 16, 1997.
4. “ Resonant tunneling in a-Si Junctions “, King Saud University, Riyadh (Spring, 1997).
5. “Correlation effects on Resonant Tunneling”, Physics Department, University of Bahrain, April 14, 1999.
6. “ Effect of Noise on Wave Propagation in Nonlinear Media “, University of Oran, Algeria, July 16, 2002.
7. “ Transport in Dissipative Media”, King Khaled University, Abha, May 16, 2006.
8. “Impurity Effect on the Density of States of 1D Systems”, KAU, Jeddah, October 2006.
9. “Wave Transmission in Gain Media”, UAE University, March 01, 2007.
10. “Density of States Associated with Jacobi Matrices”, third Saudi Science Conference, KSU, Riyadh, March 11, 2007.

4. THESIS SUPERVISION:

- *Abu Azzah Ezzat Umar Abdullah*, Physics Department, “Localization and delocalization studies in one-dimensional electronic disorder systems”, M.Sc. *Thesis Advisor*, March (1998).
- *Said Al-Marzoug*, Physics Department, “ Noise Effect on Nonlinear Wave Propagation “, *M.Sc. Thesis Advisor*, *Dcember (2002)* .
- *Abdallah Al-Zahrani*, Physics Department, “ Wave Propagation in Gain Media “, *M.Sc. Thesis Advisor*, *June (2005)* .

- **Ahmad Al-Hasan**, Physics Department, “ *New issues and problems in the Dirac equation and their solutions* “, **M.Sc. Thesis Advisor, December (2005)** .

I have also been member of M.Sc. thesis of many other students as shown below:

No.	Students Name	Year
1	Farook Mahmmd Al-Shamali	1992
2	Said Mohammad Said Al-Amoudi	1993
3	Maher Mahmoud Abdelhadi	1993
4	Pramana Agosto Astra	1995
5	Umar dujain Ubaid Al-Kabi	1997
6	F. Al-Ameen (Girls College)	2007
7	T. Al-Abdulaal (Girls College)	2007
8	Abdelaziz Al-Ahmari (KKU)	2007

5. Research Projects:

Serial	Title	Role	Period
1	Real Time Dynamics of Bose Einstein Condensates	Co-Investigator	09/2002 up to 09/2004
2	“ Mesoscale simulation of the response of liquid crystal molecules to external aligning fields “	Co-Investigator	15/03/05 up to 15/03/2007
3	“Density of States Associated with a Finite Hamiltonian Matrix”	Co-Investigator	01/09/2005 up to 01/09/2006
4	“New Issues and Problems in Dirac Equation and their Solutions”	Principal Investigator	01/09/2006 up to 01/03/2008
5	“Faculty Code of Ethics “	Member	09/2006 to 03/2007

6. RESEARCH RELATED MATTERS:

A. Research Interest:

The following areas of research are of interest to me:

1. Superconductivity and all related phenomena.
2. Transport properties of Semiconductors.
3. Tunneling phenomena.
4. Disorder effect on transport and relaxation.
5. Wave propagation in nonlinear media.
6. Applied mathematical physics.

The most active of this areas is the first one as reflected in my attached list of publications but recently I got deep interest in 6 and we are getting some interesting results.

B. Personal Research:

As it is clear from the list of publications, most of the research was independent. That is, the origination of ideas, their development and all necessary steps were based on my own efforts. Presently most of my recent research is concentrated in the area of mathematical physics where I am conducting a collaborative research.

C. Collaborative Research:

I did some collaborative research with the following:

- Prof. O.T. Valls, Physics Department, University of Minnesota, USA.
- Dr. D. Ephron, Physics Department, Stanford University, USA.
- Dr. K.A. Matveev, Physics Department, Duke University, USA.
- Prof. D. Pines and C.J. Pethick, Physics Department, University of Illinois, USA.
- Prof. E. N. Economou, University of Crete, Greece.
- Prof. A. Sen, LTP Division, Saha Institute of Nuclear Physics, India.
- Prof. Mario Molina, University of Chile, Chile.
- Dr. N. Zekri, U.S.T.O., Physics Department, Algeria.

D. Theoretical Physics Research Group:

I have established a theoretical physics research in our department whose members include Drs. Al-Haidari, Abdelmonem, Al-Amoudi, Nasser and a lecturer Mr. Al-Zahrani in addition to some collaborators

from outside KFUPM. Our hope is to strengthen this group so as to make it very visible in the near future.

7. CONTRIBUTION IN MY FIELD OF RESEARCH

1. During my graduate studies at Urbana-Champaign, Illinois (1984-1988) I worked under the supervision of **Professor A.J. Leggett who got the Nobel prize in Physics in 2003**. Under his supervision and in collaboration with Professors David Pines and Chris Pethick and B. Arfi we developed a transport theory that explains most of the experimental data on different transport coefficients in anisotropic superconductors. Papers 3-4 in my list of publications refer to this collaborative work.
2. During my post-doctoral Period at the **Theoretical Physics Institute** at the University of Minnesota I continued to work on transport and relaxation properties in anisotropic superconductors all these work was published in high quality journals papers 5-7 in my list of publication. I also started a collaborative work with Professor O.T. Valls, which was continued later on by his Ph.D. student Steve Pierson (paper 11).
3. After I joined KFUPM in the fall of 1989 I continued to work in the area of superconductivity but due to the lack of theorists in Condensed Matter Physics in our Department I could not keep my excitement at a high level along the years. So, I decided after my summer visit to USA in 1992 to start working in the area of transport in amorphous material. I was lucky to collaborate with experts in this fields from the theoretical (K.A. Matveev, University of Minnesota), and experimental (D.E. Ephron and M.R. Beasley from Stanford University). Our collaborative work resulted in two important papers 13-14 in my publication list.
4. My recent work with Drs. Al-Haidari, Abdlmonem and Nasser on quantum scattering, is a field of growing interest and we hope that in the near future we succeed in imposing our views in this field. Our research group in this area is increasing in size and our hope is that we will excell and make our work more visible in the literature.

III. PROFESSIONAL ACTIVITIES:

1. **Organization of a Mini Workshop on Semiconductor Physics and Technology**

I was responsible for initiating and completing all the necessary steps that led to the organization of this first physics mini-workshop which

was held on Tuesday, 11 March 1997, in the presence of leading international figures in the field.

2. **Organization of the “ First Saudi Science Conference “ on “ New trends for the colleges of sciences in Saudi-Arabia : creative education and industrial research “. Held on April 9 – 11, 2001, at KFUPM, Dhahran, Saudi-Arabia.**
3. **Organization of the “ First Physics Day “ at the physics department, KFUPM , May 13 (2007).**
4. **Organization of the “ Second Arab Conference on “ Future of Higher Education and Research in the Arab World”**
To be held on **February 24 – 27, 2008**, at KFUPM, Dhahran, Saudi-Arabia.

IV. AWARDS:

1. ***Fellowship*** of the Algerian Ministry of Education **1981-1987**.
2. Nominated **Best Teacher** at the Physics Department, KFUPM in **1993, 1995, 1998 and 1999**.
3. ***Associate Member*** of the International Center for Theoretical Physics, Italy (**1997-2002**).
4. **Best Research Award**, King Fahd University of Petroleum and Minerals, **1998**.
5. **Physics Editor for the AJSE**, Arabian Journal of Science and Engineering, since March, **1999 - up to present**.