

The Lady in Baghdad

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Abstract

What would most of us do with only three hours of electricity per day? Yet that is what Dr. Sabiha Al-Jabbar did when she was working on her PhD in Baghdad. She had to design her experiments so that she could have the results she needed before the lights went out.

Dr. Al-Jabbar suspected she would observe some of the properties of superconductivity at room temperature in bismuth if she made filaments by suspending colloids of the metal in hot molten epoxy. She inserted copper pins in the solution and applied voltage across them. Filaments formed between the pin points. After they hardened, she passed current through them. At some value of current, the resistance dropped to near zero, as did the voltage. Her power supply, she reports, blew a fuse at this point. She had become accustomed to that and simply replaced it from a supply of fuses she kept close by. Her power supply, she says, saw the sudden entry into the high conducting state as an electrical short and blew a fuse. She kept fuses handy to be able to continue her tests with as little interruption as possible. Three hours is not a long time. Once a filament entered the high conductive state, she wanted to see at what point it broke down. At three amperes, she says. Three amperes through a filament one micron diameter is a current density of almost a billion amps per square centimeter, which is comparable to the current density in graphene, touted presently to have the highest current density of any conductor in the world. The advantage offered by bismuth, she says, is that the bismuth (Bi) filaments can handle large power and could serve, among other things, as a grounding means. Bi passes amps, and graphene passes only milliamps, she quips.

She was motivated by the fact that only one electron per every million atoms enters the conduction process in bismuth. Copper and silver, on the other hand, contribute one electron for

every atom, and yet bismuth is nearly as good a conductor at room temperature as they are. Dr. Al-Jabbar then reasoned that the electrons in Bi have to be moving like mad, as fast as they are moving in graphene. She then began to suspect that Bi could provide ballistic electron transport, just like graphene. When she made her filaments, she was excited to see the sudden drop in resistance down to near zero. She had an ohmmeter that could measure only out to the sixth decimal place, and it showed zero. Zero ohms! She looked at her voltmeter, and it recorded zero too. Her ammeter needle was pegging out on maximum, and her power supply blew a fuse. She didn't care if she blew all the fuses in her bag, she said: she was going to measure how much current these filaments could really take. The very most she passed through any filament was 3½ amps. When she reported the results of current saturation to her dissertation committee, they were incredulous. Finally, at some point, somebody on the committee actually looked at her experiment and recommended she be awarded the PhD.

It is enlightening to see how determination can lead to success in spite of circumstances. Dr. Al-Jabbar scrounged around everywhere to find the supplies she needed. Very little money was available for her research project. She also developed lab procedures that coincided with the very limited time that electric power was available to her. She didn't spend a lot of time whining about it. Instead she rolled up her sleeves and went to work. This has to be an excellent example of enthusiasm overcoming adverse circumstances.

Although I too did some work on Bi filaments, this essay could be construed as self-serving, but, no, this is an example of what the human spirit can accomplish even in dire circumstances. Anyone who thinks he has having a bad day needs to reflect on the lady in Baghdad. She wrote to me on November 2, 2005 and asked if I would help because her research supervisor had fled the country and she had no-one else to turn to. I did not have the heart to say no. We worked together for two years. I worked harder than ever before, but I did it out of respect for the fact that she dodged bullets and missiles to get to her lab. The least I could do was assist her. She has become an inspiration, and I tell her story to all I meet, especially students who think their life is difficult.

Bibliography

1. Sabiha A. Al-Jabbar, "Preparation of Bi Filaments as Ultraconductors at Room Temperature and Studying the Effect of Gamma Radiation on their Electric Properties", PhD dissertation, Women's College of Science, Baghdad University, Baghdad, Iraq, October, 2007.
2. Sabiha A. Al-Jabbar, "Electrophoretic Mechanism Technique of Bi Filament Preparation", *Infinite Energy* **15**, 88, Nov./Dec. 2009.

3. Sabiha Jabbar and Ron Bourgoïn, “The Unique Nature of a Room-Temperature Superconductor”, *Infinite Energy* **15**, 89, Jan./Feb. 2010.
4. Ron Bourgoïn, “High Superconductivity in Microwires”, *Infinite Energy* **14**, 70, May/June 2008.