

My scientific itinerary for rising in photovoltaic



I suppose only few persons from the international scientific community know me or at least heard about me. This is why I believe it should be more convenient first to introduce myself to the readers of the present essay.

I am Professor Abdelfattah BARHDADI. I was born on August 15, 1959, in an old district of the former imperial city of Fez, which is the scientific and spiritual capital of kingdom of Morocco. Since my young age, I began to frequent the traditional Koranic preschool of my district in which I learned by heart a good part of Koran, and I began to write my first words of classic Arabic and to do the simplest of mathematical operations. I was regular and very good pupil from what my family told to me later. What I learned at the Koranic preschool helped me a lot thereafter in my training. Indeed, I was usually the first of my promotion in the primary school levels as well as in the higher cycles. In addition, it

has been easy for me to choice the scientific branch at the high school, more especially the domain of experimental sciences in which I studied and worked during many years later. In June 1982, I received my undergraduate degree in physics from Mohammed V University of Rabat. I always keep a very good memory of two of my best professors of physics at the university. It is about Prof. O. Fassi Fihri, the perpetual secretary of the Moroccan academy Hassan II of sciences and techniques, and Prof. A. Benyoussef, recently nominated resident-member of this academy. These two eminent scientists and highly distinguished professors in physics made a big impression on me by their very strong scientific personality, their teaching methods and techniques, and their very well knowledge transfer. May be, they had developed in me the desire to become also professor at the university.

On July 1985, I received my PhD degree in the field of semiconductors and solar energy conversion, from Louis Pasteur University of Strasbourg, France. Then, I had been working as an assistant professor from 1985 to 1991. After, I received my highest degree of Doctor in Physics Science (Doctorat d'Etat Es-Sciences) from Mohammed V University. Currently, I am full professor and the head of physic department at Ecole Normale Supérieure of Rabat. I am also permanent researcher and head of semiconductors physic and solar energy laboratory in which I am leader of many research projects conducted on various form of silicon material used in photovoltaic conversion and, most particularly, in solar cells new technologies. I am also coordinator-founder of the Pedagogical Action Group and member-founder of the Research Group for Training and Educational Evaluation. I am also active member and/or regional coordinator in many other scientific and learning international organizations, commissions, institutions, and research structures actively operating in the field of renewable energies.

Collaborating with partners from CNRS-France and some other international and national institutes, I have developed many research topics including the study of structural, electrical and optical properties of semiconductors used in photovoltaic conversion, the thermal activation and chemical passivation of defects in semiconductor materials, the conventional and optical isothermal processing for solar cells new technologies, the investigation of minority carriers electronic parameters by imaging techniques and quantitative mapping, and the laser new applications in photovoltaic technology.

My work is presently focused on the study of structural, optical and electrical properties of hydrogenated amorphous silicon thin films (a-Si:H) prepared to be used in photovoltaic solar energy conversion technology. I examine separately the influence of various experimental parameters during

film growth, and the effect of post-deposition thermal annealing. Recently a new research topic focused on the study of nanosilicon material has been added to my research activities. Therefore, currently, an experimental apparatus based on Hg-sensitized photo-CVD technique is under development in home laboratory to perform the nanosilicon thin films deposition at low temperature. The scientific program I am carrying out on this new topic registers within the framework of a research project financed by the Moroccan Government. It mainly consists in depositing good quality a-Si:H and nanosilicon thin films allowing developing powerful terrestrial solar cells.

I discovered the Abdus Salam International Centre for Theoretical Physics ICTP during my first visit on August 1990 to attend the Adriatico Research Conference on Defects in Hexagonal Close-Packed Crystals (SMR 522), and to participate to Research Workshop in Condensed Matter-Atomic and Molecular Physics (SMR 465). My second visit was for the month of September 1995 after I received a grant under the special arrangement between ICTP and the Kuwait Foundation for the Advancement of Sciences (KFAS). This granted visit allowed me to attend the famous Workshop on Materials Science and Physics of Non-Conventional Energy Sources (SMR 872) which was organized by Prof. G. Furlan who has well appreciated my participation in this event, and he strongly encouraged and supported my application for the ICTP Associate Membership. Almost one year later, I have been first awarded Regular Associate for the period of January 1997 - December 2003. Next, I received a new award through my nomination Senior Associate for six years starting from January 2004. During my membership, I nearly every year visited the centre for periods always exceeding one month each. Such visits have allowed me to participate in more than twenty selected scientific activities held in the centre and to publish many international scientific preprints. Most of them have been also published elsewhere as scientific papers in specialized journals or as communications in international meetings. This is because ICTP offers an optimum climate for thinking and concentrating to write valuable scientific papers in the best conditions. So, my scientific production during my associate membership has become efficiently rich and significant.

My ICTP visits and participations in its scientific activities were also helpful and very useful to perform and progress successfully in my research work. They provided me with very important opportunities to discuss with outstanding high scientists from different countries. They also allowed me to conduct well thesis achievement of my PhD students and young collaborators, to improve my own research projects and to increase the cross section for close co-operation and collaboration in some great international and regional scientific programs. From the fruitful discussions I had with many distinguished scientists I have met at the centre, informal national and regional cooperation projects involving the organization of scientific meetings and scientists mobility have been launched and actually in progress. While visiting the centre, I also have had the opportunities to perform many other significant scientific actions including the very important bibliographical research work I carried out and the very well preparation of the International Second Arab Congress on Materials Science (ACMS-II) I have organized in Rabat, Morocco, from 25 to 27 October 2001 thanks to the generous financial support from ICTP through its External Activities Program. Because of my ICTP associate membership and the numerous contacts and interactions I developed with scientists visiting of the centre, I became more and more known and considered as being a confirmed physicist, active, dynamic, specialized in the semiconductors field and international expert in the photovoltaic conversion. This good scientific reputation allowed me to be many times solicited as invited speaker, scientific referee, chairperson, or co-chair in many international scientific meetings. It is also behind my becoming member, associate member, or regional coordinator in so many international scientific institutions and structures. Moreover, I am presently co-editor and/or member of the editorial board in several scientific reviews and scientific referee in many others. Being involved in so many international scientific activities, I moved too much over the world and I visited so many countries.

With Prof. G. Furlan, my ICTP scientific coordinator, I have had many fruitful scientific discussions and common projects. The most important of them was the tripartite scientific co-operation established, in the frame of his TRIL Program, between LAMEL Institute in Bologna and home

laboratory. This co-operation has been well prepared and conducted during nearly one year because of the efficiency developed and demonstrated by one of my former Ph.D. student who has received a generous grant from TRIL Program to carry out training and research work in LAMEL Institute. The close scientific and friendly relationship I developed with Prof. Furlan has been well demonstrated when he invited me to participate and contribute scientifically in the preparation and organization process of his last International Workshop on Physics for Renewable Energy. I hope this particular ICTP scientific activity, which had known a big success in the past, recovers its regularity especially because the present international conjuncture is very favorable to actions in connection with the development of clean energies and environment protection. In this context, I would like to greet the Prof. Furlan's initiative when had invited me to be member of the selection commission of the aforementioned workshop participants. I think this appreciated initiative should be encouraged and ICTP associates become more and more involved in the organization of its scientific activities either as members of the organizing and/or scientific committees or as advisers. I wish also ICTP continues to support his associate members scientifically and, most of all, to help them efficiently to integrate their national scientific academies and other prestigious international institutions that honor the distinguished scientists.

Finally and in view of the above, I wish to express my deep and sincere thanks to ICTP, which for a long time now, is still generously helping scientists from and working in developing countries. Its grants allowed to progress efficiently in research work, to attend some of the most interesting international scientific activities and meetings, and to have the opportunity to benefit by its multiple available facilities and its very important research services offered by its various offices. I wish also to record my deep and sincere gratitude to the ICTP Director K. R. Sreenivasan and his staff for their kind, efficient, and precious cooperation.

Before signing this essay, I would want to say if it were to redoing, I would choose to be a physicist.

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