

FIVE QUESTIONS WITH DR. ROBERT APSIMON

RELIEF project: a green technology for leather manufacture

When people talk about particle accelerators, we usually think of high-energy research centers such as the LHC at Switzerland, SNS at the U.S, or J-PARC in Japan. However, only a small fraction of the current particle accelerators is used to study high-energy physics. Most of them are employed for medical purposes such as medical diagnostic or industrial applications like ion implantation [1]. The **RELIEF** project proposes the use of electron beams for leather manufacture that has advantages to the traditional technology [2].

Could you introduce yourself?

I am Robert Apsimon from the United Kingdom. I got my doctorate from Oxford University. During my doctoral research, I performed several experiments at the High Energy Accelerator Research Organization (KEK). After that, I became a Postdoctoral research fellow at the European Organization for Nuclear Research (CERN). Then, I started a Postdoc at Lancaster University. Currently, I am Lecturer at Lancaster University.



Figure 1: Dr Rob Apsimon at the RELIEF collaboration workshop in 2019.

Could you tell me about your institute and research topic?

I belong to the Electronic Engineering department at Lancaster University. My research is focused on beam dynamics, as well as the design and modeling of RF systems. Right now, I am working on two main topics. One of them is the **RELIEF** project that uses accelerator-based technology for the tanning of leather. This is a novel process that drastically reduces the impact on the environment with respect to the conventional ones. This work is developing in collaboration with people from the University of Guanajuato. The other topic is energy recovery linacs (ERL). In particular, I am studying how the order in which the bunches are injected in the ERL affects the beam stability and the maximum sustainable current.

How or why did you choose that topic?

For the **RELIEF** project, I was working with another Academic of Lancaster who has been working with several Mexican researchers. The Mexican researchers wanted to work in some accelerator applications for the leather industry. After the success of an initial funding proposal, the project becomes an international collaboration with people in Mexico, Canada, and the U.K. In addition, people from Turkey and Italy have shown interest in the project.

Right now, what is the biggest challenge of your work?

Finding partners who help us to commercialize, or at least they can obtain licensed technologies from us. One of the barriers to prevent us from moving forward is to do a complete proof of principle. We have done low energy testing that indicates that the principle works; however, we required higher energy testing. Right now, COVID-19 restrictions are preventing us doing this. Besides, there are some issues with securing the funding.

What did you think that will be the future of you research area?

It is to move to other industrial processes with similar chemical processes, such as dye fixation in the textiles industry. These are chemical processes that bind chemicals directly to the proteins or polymers. These changes in leather's properties make them more durable. Dye fixation and other processes that use heavy transition metals have similar environmental issues to leather tanning and a similar chemical process.

References

[1] O. Barbalat, "Application of Particle Accelerators", CERN/ac/93-04 (BLIT)/Rev.

[2] R. Apsimon, S. Setiniyaz, R. Seviour, W. Wise, T. Junginger, M. Juarez Hernandez, E. Ortiz, "Initial Studies of Electron Beams as a Means of Modifying Collagen," MDPI Physics 2021, 3(2), 200-239, <https://doi.org/10.3390/physics3020017>