

Research Internship Report
Research to Develop Particle Analysis Devices @ HORIBA, Ltd.
Department of Physics, School of Science, 35-217013, Hideaki Ota, ota-hideaki612@g.ecc.u-tokyo.ac.jp, D1, 27646(extension)
Supervisor: Hideo Higuchi

1. Outline of internship

<Basic information of internship>

-Company: Particle Analysis Team, Science Development Department, Analysis and Measurement Development Headquarters, HORIBA, Ltd.

-Acceptor: Yasuhiro Tatewaki; Particle Analysis Team Leader

-Schedule: 2022/1/18-2022/3/18

<Background of internship>

This internship was realized by applying for the theme of "Development of particle size distribution measuring device" that was recruited at HORIBA, Ltd. in the C-ENGINE.

My research at the university aims to quantify the degree of cell damage using the movement of intracellular particles, and the theme itself originates from physical interest and is not rooted in social applications. Therefore, there were not many internship themes that were close to my research including the themes in the C-ENGINE. Under such situation, although the theme of "Development of particle size analysis device" is different from my research at university in that the target is not cells, the theme is interesting me from the viewpoint of particles. Also, the particle analysis method I'm using is very basic, so there was a good possibility that there was a better method in the field that specializes in particle analysis. Then, I think it is a good opportunity to learn about the method for particle analysis. Furthermore, HORIBA, Ltd. is interested in my skills about biotechnology in addition to particle analysis because HORIBA, Ltd. is going to apply particle size analysis device to the biological field. In this way, I was able to find a good match between my own technical level improvement and the company's outlook, which led to realize this internship.

2. What did you do this internship?

I have been involved in various themes, and I have achieved results mainly in two themes.

The first is the performance improvement of the tracking type particle size analysis device (ViewSizer 3000). However, I would like to omit details because it is a confidential matter.



ViewSizer 3000

The second is the study of solvent density gradient conditions in a centrifugal sedimentation type particle size analysis device (Partica CENTRIFUGE). In Partica CENTRIFUGE, the density gradient liquid is used for measurement, and the density gradient condition is an important factor that determines the measurement resolution, range, and time, so understanding the characteristics of the density gradient condition is important to expand applications. I used Partica CENTRIFUGE to measure the particle size distribution of the standard sample under various density gradient conditions. As a result, I found a condition with better resolution than the previously recommended conditions. In addition, I considered the conditions that were unexpectedly inappropriate, and suggested to consider the factor of the relationship between the sample density and the solvent density as a new viewpoint.



Partica CENTRIFUGE

(Pictures of devices was quoted from HORIBA's web page.)

3. Your comment of internship

I feel that I had a very fulfilling two months as a whole internship, including activities at the company and life in Kyoto. During the internship, I was completely away from university research, so I was able to concentrate on my internship at HORIBA. In addition, I was able to put myself in an environment, Kyoto, that is different from my daily life, so I can look at myself objectively and surely learn in the internship.

By the way, there are three main things I learned through activities at the company.

The first is that development work is fun. Before going to the internship, I had the image that

there is little freedom in researching at a company and it is not very fun. However, while I was involved in development work, even if the content of the research was different, the process itself of doing experiment based on the hypothesis and developing a new hypothesis from the experimental results was common, and I enjoyed the process. I sometimes got a surprising discovery in an experiment with the intention of confirming what was clear. The degree of freedom of theme may certainly be small, but I found that the process of devising within the limits is fun. In addition, I had no experience in making "things" as a team, and I felt that it is the real pleasure of developing in a company, and that there are many things that can be achieved only in a company.

The second is that I can do development work. I want to make use of the experience in graduate school after getting a job in the future, but since I have researched only in the university, I was worried if I could make use of my strength in society. However, during the actual development work this time, I found that the process of research activities is common and that I can suggest productive opinions about on unfamiliar themes. The ability that was needed there was not so much professional knowledge as it was the ability to carry out the process of improving ideas from the experimental facts. Therefore, if I do research while valuing that I think on my own at graduate school, it is possible to acquire enough skills to be accepted in society. I feel more confident about what I have done so far, and what I will do from now on at the university.

The third is that there is a big difference between intracellular particle analysis and non-biological particle analysis. Before the internship, I had the expectation that the particle analysis technology at HORIBA could be applied to my research. However, through the internship, many of the particle analysis technologies used for non-living organisms are achieved because they are non-living organisms, and it cannot be immediately utilized for the analysis of intracellular particles that are performed on the premise of being alive. The findings were not as expected, but on the contrary, it was useful knowledge that the method for analyzing intracellular particles, which was considered at the very basic level, was not so much wrong. Also, in my future research, I can reconsider my research from a new perspective I got in this internship, so I would like to continue to search for points of contact.



This picture was taken at a final day with HORIBA, Ltd. members who took care of me.

4. Comments from Company

Thank you very much for two months. Although work you did was a part of the development and research activities in the company, I think that you could have an image about development work. At the presentation on the final day, you said the image that you held before the internship, "There is little freedom in development and research at companies.", changed. I think that is a big outcome in this internship. Of course, it is difficult to conduct research that does not lead to profits in a corporation, but if you are aware of profits for continuous corporate activities and can think about and carry out contributions to society, there is no lack of freedom. I feel that it was very meaningful for you to be able to realize this point. Thank you very much for your many achievements and the discussion with you was inspiring for me and young engineers. If we have any chances to meet somewhere, I would like to talk to you. (Acceptor Yasuhiro Tatewaki)

5. others

An internship at a company is a good opportunity to objectively reassess your research and abilities. In that meaning, I would like to recommend the internship not only to those who are going to get a job at a company, but also to those who are not.

6. Acknowledgements

I would like to thank Mr. Tatewaki and the Particle Analysis team for accepting me as internship students while they are busy with their main work. In addition, I would also like to thank the personnel department of HORIBA, Ltd. and the GMSI secretariat who mediated the administrative procedures for the internship, and Professor Higuchi who kindly allowed me to suspend research activities at the graduate school and participate in the internship.