

Surrounded by physics

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Preface

This book is the result of a series of lectures I gave for a number of years to first year students in applied physics at Delft University of Technology. The idea for such a course started from discussions with our students. They uttered the general complaint, that the freshmen year of their studies was, to their taste, too much dominated by classes and courses in mathematics. Obviously, the response of the staff was that it is absolutely necessary to have a good understanding of mathematics, especially calculus and linear algebra, at an early as possible stage. Otherwise, it would be virtually impossible to bring the physics course to university level. The common language of all physicists and many other scientists and engineers is math. Nevertheless, the students made it clear that more physics in their first year curriculum would be very welcome.

It was decided to grant their wish and set up a course with as theme Physics of Daily Life. This idea was of course inspired by the series of books that Prof. Dr. M. Minnaert wrote in the 30s of the twenties century. In the course, no specific topics like quantum mechanics or thermodynamics would be taught, but the aim was rather to stroll along all kinds of more or less familiar phenomena. By touching on these phenomena, different parts of physics and the accompanying theory would be discussed with the students. Being exposed to phenomena and open questions and being encouraged to think as a physicist was more important than providing the theoretical background along the traditional lines of the sub-disciplines and theories of physics.

I was asked in the fall of 1999 by the director of education of Applied Physics, Prof. F. Tuinstra, whether I could prepare and give such a course. The idea was challenging and I agreed. But, I didnt want to lecture by story telling and picture viewing; it had to be a course in which we would do physics, be it at the level of a freshmen. Moreover, I didnt want to end with a written exam. In stead all students had to prepare an essay in which they discussed a topic they had chosen themselves from the physics of daily life in a broad sense. Moreover, they had to write a Physics Essay. The result would vary, but there were some amazing examples, showing that if challenged, young and bright people can achieve a lot. Finally, I think we all enjoyed the classes and the essays. Physics is a beautiful subject once you dive into it.

I would like to thank all my students, who came up with ideas and questions about physics in daily life. Furthermore, I would like to thank my colleague, Prof. Chris Kleijn, who was always willing to listen to my ideas and help sorting out what the

physical explanation was and how to convey that to freshmen students as best we can.

This book is dedicated to the memory of my loving father, who unfortunately did not live long enough to see the printed version.

‘Who loves nature observes her the same way he/she breathes and lives: from a native inner drive’. This is the opening sentence of Prof. Dr. M. Minnaert’s series of three books about the physics of our environment ([9]).

Minnaert (a Belgian physicist who died in 1970) published his books in 1937 for the first time. They have been translated in many languages and are still in press, showing that a basic understanding of the physics of the world around us is still popular. This can also be seen in the weekly science sections of the broadsheet newspapers: many of them have a column that deals with questions from its readers asking for an answer to some remarkable observation. In many cases the answer is found in the physics of every day life. Some of the questions are for a physicist rather obvious, others are not so easily to answer. In many cases the observation seems trivial, but the answer can push you deeper and deeper into the world of physics. And as always, with an increasing level of understanding the phenomena in question gain in beauty. This book is written with the idea that the world around us is full of beauty and that appreciation of it is raised as the understanding in terms of physical reasoning is brought to a higher level. Furthermore, it is just fun to think about what we see, hear, feel and try and find an explanation.

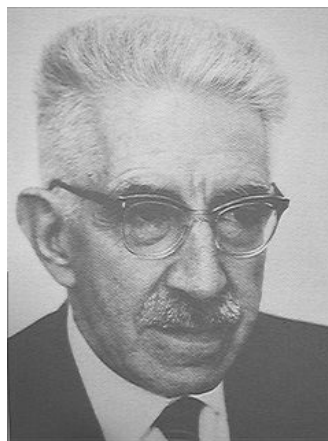


Figure 1 Minnaert (1893-1970).

Since Prof. Minnaert’s book saw the light, many other books about the physics of daily life have been published. Some relatively superficial, others just for fun reading but also quite a few that try to give answers and insight based on sound physical reasoning.

This book tries to provide a level that is adequate for anyone with a basic knowledge of physics and an engineering degree. It is not aimed at the general public. Hence, equations have not been avoided, on the contrary, equations and derivations help physicists understanding what is going on. Moreover, they provide the possibility to quantify and make predictions. This allows scientists to further build up their knowledge about phenomena. I assume that the reader will have some basic knowledge of physics and is capable of following mathematical manipulation.

However, I do understand that many potential readers will have had their educa-

tion years ago and will not memorize all the laws. So, I have tried to put these in as refreshment. Sometimes, this might be a little overdone. Never mind, the main text can still be followed and the idea behind the phenomena captured.

October 2008

Robert F. Mudde

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