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Foreword

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Generally, one of the main areas for progress in science is the exchange of methods and techniques amongst laboratories working in the same area. Firstly, this allows for a better understanding of how results were obtained and what could be improved. Secondly, it facilitates continuous improvement, including progress towards better repeatability, better sensitivity and lower costs. Such exchanges then improve the quality of research and accelerate the delivery of new findings and opportunities. This exchange is especially important in some disciplines, such as nuclear physics, where the cost of the instruments means that many teams may only be able to access them through sharing systems involving different countries. Working on a single instrument, such as a particle accelerator, leads to sharing of methods and techniques. Sharing methods does not limit discoveries made by different research groups, often in competition, but can accelerate them.

In life sciences, the situation is different, and how methods are shared, depends on the specialist field concerned. In molecular biology, where every research laboratory owns its own methods and techniques, this exchange is generally done through publication of results in scientific journals, or during collaborative projects. When approaching animal physiology in live animals, I think that the situation is somewhere between nuclear physics and molecular biology: Some labs can develop methods and techniques in live animals without strong collaborations with other laboratories. However, these types of experiment are increasingly expensive and complicated, for technical and administrative reasons, leading to a greater interest in collaborations and sharing.

The aim of this book is to share methods for investigation of physiology and behaviour in cattle. As we know, cattle are large and expensive to maintain in experimental conditions, and therefore, sharing refined methods and techniques for monitoring parameters such as rumination, reproduction, metabolism, behaviour, health and milk production is highly important for economic reasons. This is particularly relevant at a time when funding for animal science research is at risk of being reduced, linked to the position of animal production in society and to the environmental impact that large ruminants are often thought to have.

Such exchanges of knowledge also accelerate the speed of discoveries and innovations, whilst at the same time reducing the need to repeat experiments, therefore reducing the ethical concerns about animal experimental use. This acceleration of discoveries comes firstly from the increase in exchanges between scientists; criticisms of experimental design, involvement in experiments conducted by other groups, and analysis of the results. Secondly, it comes from the fact that young scientists, such as Masters and PhD students, are involved in such exciting projects, providing the possibility to inject fresh, new views into the system. Finally, innovation is also boosted by the multidisciplinary questions raised by these projects. In the case of SmartCow, for example: how to reduce the environmental impact of bovine production whilst continuing to produce high quality products for consumers?

I know that SmartCow is far from a particle accelerator but we retain some of the lessons from research done in nuclear physics – share methods and techniques to explore cattle physiology!

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