

---

## PRESRIPT

Present dissertation is documenting my last three years of research work as an industrial Ph.D. student supported by the Danish Academy of Technical Sciences (ATV). The work has been conducted in a joint collaboration between the research group Food Technology, Dept. of Dairy and Food Science at the Royal Veterinary and Agricultural University, Denmark and the company SFK Technology A/S, Herlev, Denmark. This collaboration has been set up the perfect framework for working with applied research combining computer sciences with the food industry, and I am grateful to the two institutions and to ATV for being granted this opportunity.

I am especially indepted to Professor Lars Munck at the Food Technology group, who introduced me to the world of explorative data analysis and has induced an impressive multivariate spirit at his research group. I am also grateful to Svend Aage Jensen, Director at SFK Technology, who has given me much space to dynamically follow the leads that occurred during the project.

During the project, I had the fortune to visit The Iowa Pork Industry Center at Iowa State University for 7 months. This stay was partially funded by National Pork Producers Council, USA where Dr. David Meisinger provided a superb environment for research and industrial relations.

Much of the research work in this study has been carried out in a close collaboration with the meat industry, and I am in this relation thankful for a good collaboration with Steff Houlberg, Ringsted, Denmark, Hatfield Quality Meats, PA, USA and Hormel, MN, USA. appreciate

My thanks for three great years go to the Food Technology group and in particular to Søren B. Engelsen, John Hørlyck and Rasmus Bro. Thanks also go to Max Egebo, SFK Technology, Poul Henckel, Hans Busk and Anders Karlsson, Danish Institute of Agricultural Sciences, Jeff Arner Hatfield Quality Meat, John Forrest, Purdue Univeristy, Eric Berg, University of Missouri and Eva Tornberg, Lund University for help and collaboration throughout the study. Finally, my thanks go to Michael Schneider, Jesper Pram, Gilda Kischinovsky, Hanne Nielsen and Helle Fenger for proof reading the thesis.

This thesis consists of an introduction, where the issues dealt with in the study are briefly touched upon. Chapter 2 gives a more specific introduction to the technological issues of meat quality measurements. Chapter 3 and 4 present the Autofom system, and extensive image analysis on the Autofom images are described in chapter 5 and 6. Chapter 7, 8 and 9 present studies with spectroscopy on porcine, cooked porcine and beef respectively. Chapter 10 outlines an imaging spectrograph combining the advantages from spectroscopy and imaging. An integrating discussion follows in Chapter 11, and finally the conclusion is found in Chapter 12.

The thesis contains the following papers:

- New Sensors and Techniques for Meat Quality Measurements  
Published in Reciprocal Meat Conference Proceedings, Volume 51, 1998
- On-line Pork Carcass Grading with the Autofom Ultrasound System  
Published in *Journal of Animal Science*, **76**, 1858:1868, 1998
- Determination of Lean Meat in Pig Carcasses with the Autofom Classification System  
Accepted for publication by *Meat Science*
- Two-dimensional Angle Measure Technique for Image Texture Analysis  
Submitted to *Pattern Recognition*.
- Detection of Structures in Low Resolution Biological Ultrasound Images using Active Contour Principles  
Submitted to *Bioimaging*
- Prediction of Water-holding Capacity and Composition of Porcine Meat with Comparative Spectroscopy  
Submitted to *Journal of Food Composition and Analysis*
- Warmed-over Flavour in Porcine Meat - A Combined Spectroscopic, Sensory and Chemometric Study  
Submitted to *Meat Science*
- Pre-rigor Conditions in Beef under Varying Temperature- and pH-falls, Studied With Rigometer, NMR and NIR  
Submitted to *Journal of Food Chemistry*
- Imaging Spectroscopy in Food Quality Measurements  
To be submitted for publication.