

## A word of gratitude

A lot that cannot be said is at times best expressed in the words: “Thank you”. Here, I mention some of the countless number of persons who are instrumental, in more ways imaginable, for the fruits of my studies and making my stay in The Netherlands a delight.

To the following people, I share my deepest gratitude.

Prof. Jenneke Klein-Nulend, for her uncompromised support for her students, which I consider a priceless gift in my journey as a PhD researcher, and for that peculiar way of providing me the challenge to strive, which has proven most useful for reaching the finish line with energy left for an extra mile- something I would not exchange for gold, and for those invaluable lessons on how to express thoughts into scientifically legible writing and explicable presentations. Prof. Rob Heethaar, for his careful mentoring at the crucial moments and for being my link to Medical Physics, which attests to the possible applications of my studies. Dr. Theo Smit, for his guidance and expressing the joyous collaboration between Biology and Physics by coming up with piercing scientific questions and insightful summaries. Dr. Jack van Loon, also for his guidance and keeping the spirit(s) high despite our hectic preparations for FLOW, and for his natural appeal for finding scientific pursuits, terrestrial or extra-terrestrial (ground or microgravity, that is). Prof. Els Burger, for her inspired presence, intuitive discussions during anyone’s presentation, and for assuring me that there is Physics in the study of cells. Prof. Vincent Everts, for setting the example for me to be early at work, and for his generous interest in my research.

I also do not forget other professors and scientists whose influence and generous collaboration ever remain invaluable. Prof. Christoph Schmidt and Prof. Fred MacKintosh, for providing the venue for Physics and for reminding me that science is cool. The late Prof. Frans Nieuwstadt, for his enthusiasm and welcoming collaboration. Dr. Mathieu Pourquieu, for making numerical fluid dynamics fun on *non-microsoft* machines. Prof. Steve Cowin, who is always prompt in returning emails, for your inspired articles and lectures.

Colleagues whose expertise was key to the Molecular Biology of the PhD project and will be helpful for the upcoming research. Dr. Marco Helder and Dr. Behrouz Zandieh Doulabi, for designing the primers for our FLOW experiment. Dr. Ruud Bank, for the connection to tissue engineering, and your thoughts on cell mechanics, clinics, and physics.

For my paranymphs, and constant source of support Cor Semeins and Jolanda de Blieck. *Corski*, for providing the practical steps to stress cells with fluid shear, and for not losing faith that I might someday learn Dutch; Jolanda, for calling me *Mellie*, for your contagious laughter and ever tireless hospitality, and for the long days spent on our bench work for FLOW. The unofficial paranymph and colleague Ette Tadjoeidin, for her cooking that has become indispensable for my hungry off-days, and for her company that easily became familiar. Dirk-Jan Bervoets, for the orders *today* that arrives *yesterday*. Marion van Duin, for providing the venue to learn an afternoon Dutch sport, which probably spawned bowling, golf, and hockey. Don Lyaruu, for being my OCB supervisor for my three-month SEM work in the *doctorandus*. Ton Bronckers, for our conversations on imaging molecules and for your curious questions about the Philippines. Clara Korstjens, for showing me how to operate the *Leica microscope* without wreaking havoc for other users. Paulien Holzmann, for her hushed *Monalisa smile*. *The Wan and only*, for the glass and plastic containers, and the exotic snacks.

Wonderful acquaintances from the *merging of brains* between sections and fields. Margriet Mullender, for our abstracts and papers on fluid flow. Theo van den Bos, Teun de Vries. Roel Breuls, for helping me explain *viscoelasticity*. Ineke Jansen and Ton Shoenmaker, for *osteoclasts*. Elena, for *theoretical physics*.

I do not forget students of science like myself, whose acquaintance and backing I can never do without. Aviral Vatsa, for being the *beerless* company that is surprisingly (and *culinary-ly*) superb, and for sharing interests on bone cells. Djien Tan, for our kindred fondness for the insightful interactions in our *cell mechanics meetings*, and for selflessly volunteering to transcribe the minutes. Agnes Aggie Berendsen, for making inimitable acoustic reverberations (and having *conversationality*) that's refreshing during long days in front of a computer, for

her kind soul. Marlene Knippenberg, for her similar tastes in movies (books?), and her ready bag of chocolates tucked hidden in a secret table drawer. Sandra Tjabringa, for making the process of printing the PhD thesis a *piece 'o cake*. Zufu Lu, for our parallel stature amid the familiarity of the colossal. Ana Santos, just in time, for being a gracious neighbor, for her honesty. Roel Hoogendoorn, *the goat guy*, for letting me help him calculate *something* using *mathematica*. Daisuke Mizuno, for joining me in confusing *all-nighter* experimentation and *eurekas* (*damn-I'm-good* moments) with billiards and beers (startlingly, *damn-I'm-good* moments too).

I do not forget old acquaintances that has undergone the rigors of study in our group and succeeded, whose company is dearly missed. Astrid Bakker, for sharing protocols, providing perceptive discussions on cells that never failed to keep my attention and for that day in Belgium, that miraculously left me untainted by my allergy to shrimps. Manon Joldersma, also for providing protocols, for teaching me how to open and close the CO<sub>2</sub> tank and for being the generous seer of the “stickies” (or post-its) at the villa-AIO, for liking *Tanuki* too. Saskia Dijcks, for being the student I can look in the eye (despite heels), and for her discipline. Chris Faber and Hein Stallmann, the duo whose company with beers, one time in Leiden, brought out appealing conversations. Ilara Zerbo, who unconsciously reminded the old lesson, that a smile brings wonders.

All the people involved in making it possible for us to participate in the Dutch Expedition for Life Science, Technology and Atmospheric Research (DELTA), mission to the International Space Station (ISS), made possible in part, by the Dutch Ministry of Economic Affairs and the Ministry of Education, Culture and Science. Dr. Marc Heppener of the European Space Agency (ESA) and his staff, for the scientific implementation in DELTA. Prof. André Kuipers, also of ESA, as the Dutch cosmonaut, who was flight engineer for the Soyuz flight to the ISS, that hosted our experiment FLOW (to test the sensitivity of bone cells to stress at microgravity). The Dutch Experiment Support Center (DESC), whose presence was beneficial to many aspects of the DELTA mission.

Dr. Rolf de Groot of SRON Netherlands Institute for Space Research, for funding the project “Bone cell mechanosensitivity and microgravity”, project nr. MG-055.

The technical team of the Centre for Concepts in Mechatronics (CCM), Edwin Langerak, Jan Rietema, and Antoon Koppen, whose tireless efforts, *night and day*, accompanied our experimental preparations throughout the DELTA mission.

The Russian team, whose expert management and hospitality provided the venue for our scientific preparations before the Soyuz flight in Kazachstan and for hosting us in Moscow.

The two other PhD students, Maarten Moes and Björn Sieberer, who were with me in Moscow and Kazachstan, who also prepared experiments for the Dutch Soyuz Mission, for the *vodka* and *beer* concocted with a twist of scientific discussions.

Moving towards where the sun rises, I express my gratitude to the people I met in Cebu, The Philippines, who have provided me the first difficult steps towards science (away from philosophy). Of the University of San Carlos’ (USC’s) Physics, Math and Chemistry Departments, Mario Tan, Tony Mayo, Rene Cabrera, Dioscy Villagonzalo, Marcedon Fernandez, Nelson Rosaroso, Susan Cahig, Cherile Yap, Helen de los Reyes, Joy Luna, Sir Romel, ma’am Joy and ma’am Gallos, who all taught the basis of it all. The Dutch Physics Development Project (PDP) team, who has made Physics teaching and doing research an example of excellence to the country. Gerrit Kuik (and Mae-Anne), for reconstructing the meaning of “no problem” and for your indispensable *computer software*, also, for finding people in Cebu, outside USC, with whom we shared our amusements on research. Onno Dijkstra, for the challenging assignments (that costs tons of yellow paper—the same goes for Gerrit). Ben Zuidberg, for his enthusiastic support of my stretch in Holland, and for being influential for granting funds for the *optical tweezers*. Kees Karremans, for your expertise on lasers and the evenings with the gang, losing our way in Cebu on my *beetle* or the borrowed *sakbayan*. Ed and Daday Van den Berg, for conjuring magic tricks to demonstrate science reminiscent of alchemists and wizards of old.

The Center for International Cooperation (CIS)- for providing a haven for assurance in foreign territory, especially in the early years of my studies. Rob Merkus, for overseeing *the Filipino connection* in Amsterdam, and for your help on purchasing the countless parts of the *tweezer setup*. Rien Kool, for being the *cool liaison* in the early years of the PDP. Dr. Gerard Thijs, for being the link between Cebu and Amsterdam, and for safeguarding my studies with zeal. The CIS staff, Dia, for helping me find apartments. Henny, for your invaluable help in keeping the equipment orders and setting the transfer of my future equipment for research to USC. Yeng, for conversing in *Tagalog*, and for that one fine afternoon of *salo-salo* with *adobo*.

The *Filipino gang*, who came to *Holland* with me to study (and to see for ourselves whether the *windmills* are actually functional). Dr. Roland Otadoy, who were in Holland when I arrived, for preparing the *coffee* religiously. Edcel Salumbides, with whom I found my own *proof* for the *Pythagorean theorem* in unseemly places. Arni Sicam, for learning Dutch. Renante Violanda, for almost setting up the *tweezers*. Marlo, for not losing my equipment orders. Raymund Sarmiento, for keeping up with interesting topics to talk about. All, for their selfless aid for my *annual-moving-to-another-apartment-in-Amsterdam* (which became tradition).

People I met in the early years of my studies in The Netherlands, who were avid practitioners of the culinary arts as I once were. Etsuko, for teaching me how to roll a *sushi*, fry an *okonomoyaki* (Osaka style) without breaking it, serve (well, drink) *sake*, for warning me of *wasabe*, and for having a very hospitable family who tolerated my cooking when I had my short laboratory visits in Japan. Teri, for *Wednesday poetry*, for the steaks *ala africana*, and showing me how to use spices and mushrooms in cooking, and for trusting my cooking. For their friends, who, like me, also enjoyed *wine and laughing*.

I do not forget too my old pals and prefects in the seminary days, who taught the value of a *study period* and its alternative, the *extended study period*. The community that taught the virtues of life found in *poverty*, to treasure the essence

of one's soul, in *chastity*, to desire the joy of human contact, and in *obedience*, to liberate one's true path.

Members of the *Societas Verbi Divini* (SVD) from Cebu, Fr. Herman van Engelen, my earliest mentor for Physics. Fr. Ted Murnane, whose support is a ready ally. Fr. Heinz Kulueke, for his leadership. Fr. Ding Fabiosa, for his spirituality. Br. Rick *Atienza* and Br. Tony Flores, Br. Mike Ancheta and Dong for easing my early Cebu days. Br. Eugene Orog and Br. Noel Tecson, for the discipline. SVD's here in Europe, Fr. Kees Maas, for welcoming my presence in the *Nederlands-Belgische Provincie*, and for his hospitality in Breda.

Least forgotten is home. Mom, dad and my sisters, for their warmth. My parents, for the *Ilonggo* and *Mindoreño* heritage that mixes well with being *Manileño*. Mom, for her unceasing devotion, for calling me *nonoy*, for being the only one in this universe who can cook my favorite spaghetti and *adobo*, and for your faith in all of us. My late dad, for the nickname *nonoy*, for teaching me what *sine* and *cosine* was (before I even heard of *trigonometry*), and for giving me a *slide rule* (when I was 12) that amazed my miniscule mind. My sisters: Ma. Karen (*Kae*), for being eldest in my absence; Ma. Ethel (*Et*), for being the other one who can dance; Ma. Michelle Anne (*I-an*), for the movies we like watching and the lazy afternoon's *pork & beans*; Ma. Diane *Fae* (*Jing*), for your emails, and for lending me your oversized t-shirts when I'm on vacation at home. My dear sisters, for calling me *kuya*-- no matter what.