Intelligent Block Copolymers of Acrylamide Derivatives

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This dissertation is submitted for the degree of
Doctor of Philosophy

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I would like to dedicate this thesis to my loving parents …

Declaration

I hereby declare that except where specific reference is made to the work of others, the contents of this dissertation are original and have not been submitted in whole or in part for consideration for any other degree or qualification in this, or any other university. This dissertation is my own work and contains nothing which is the outcome of work done in collaboration with others, except as specified in the text and Acknowledgements. This dissertation contains fewer than 65,000 words including appendices, bibliography, footnotes, tables and equations and has fewer than 150 figures.

Rop Aron Kipyegon
November 2025

Acknowledgements

And I would like to acknowledge ...

Abstract

This is where you write your abstract ...

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Nomenclature

Roman Symbols

F	complex function

Greek Symbols

γ	a simply closed curve on a complex plane
$\imath$	unit imaginary number $\sqrt{-1}$
μ	Deviation
π	$\simeq 3.14\ldots$
σ	Mean

Superscripts

j	superscript index

Subscripts

0	subscript index

Other Symbols

$\oint_\gamma$	integration around a curve γ

Acronyms / Abbreviations

CIF	Cauchy's Integral Formula
GC-MS	Gas Chromatography-Mass Spectrometry
NAM	N-acryloylmorpholine
NIPA	N-isopropylacrylamide

Chapter 1

Introduction

1.1 What is loren ipsum? Title with math σ

Lorem Ipsum is simply dummy text of the printing and typesetting industry (see Section 1.3). Lorem Ipsum [1] has been the industry's standard dummy text ever since the 1500s, when an unknown printer took a galley of type and scrambled it to make a type specimen book. It has survived not only five centuries, but also the leap into electronic typesetting, remaining essentially unchanged. It was popularised in the 1960s with the release of Letraset sheets containing Lorem Ipsum passages, and more recently with desktop publishing software like Aldus PageMaker including versions of Lorem Ipsum [2–4]

The most famous equation in the world: $E^2 = (m_0c^2)^2 + (pc)^2$, which is known as the **energy-mass-momentum** relation as an in-line equation.

A *LaTeX class file* is a file, which holds style information for a particular LaTeX.

$$CIF: \quad F_0^j(a) = \frac{1}{2\pi\imath} \oint_\gamma \frac{F_0^j(z)}{z-a} dz \tag{1.1}$$

1.2 Chemistry training

This section will test some common chemistry typeface. For example $N-$isopropylacrylamide and H_2O and the relaxation in proton ^{1}H NMR and relaxation of Gd(III) complexes. Even it is important to check how paragraphs are rendered. How degrees symbol is printed out 17°C. The next is finding out about nomenclature. e.g. NIPA (N-isopropylacrylamide) is a common thermoresponsive monomer

I would like to cite Hungarian names, with accent [5] HoAc
This is a new paragraph and hopefully it turns out well. How citations are rendered is also important [2] as well as in-text [6][1] and [2]

It is a long established fact that a reader will be distracted by the readable content of a page when looking at its layout. The point of using Lorem Ipsum is that it has a more-or-less normal distribution of letters, as opposed to using 'Content here, content here', making it look like readable English. Many desktop publishing packages and web page editors now use Lorem

Ipsum as their default model text, and a search for ‘lorem ipsum’ will uncover many web sites still in their infancy. Various versions have evolved over the years, sometimes by accident, sometimes on purpose (injected humour and the like).

1.3 Where does it come from?

Contrary to popular belief, Lorem Ipsum is not simply random text. It has roots in a piece of classical Latin literature from 45 BC, making it over 2000 years old. Richard McClintock, a Latin professor at Hampden-Sydney College in Virginia, looked up one of the more obscure Latin words, consectetur, from a Lorem Ipsum passage, and going through the cites of the word in classical literature, discovered the undoubtable source. Lorem Ipsum comes from sections 1.10.32 and 1.10.33 of "de Finibus Bonorum et Malorum" (The Extremes of Good and Evil) by Cicero, written in 45 BC. This book is a treatise on the theory of ethics, very popular during the Renaissance. The first line of Lorem Ipsum, "Lorem ipsum dolor sit amet..", comes from a line in section 1.10.32.

The standard chunk of Lorem Ipsum used since the 1500s is reproduced below for those interested. Sections 1.10.32 and 1.10.33 from “de Finibus Bonorum et Malorum" by Cicero are also reproduced in their exact original form, accompanied by English versions from the 1914 translation by H. Rackham

“Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum."

Section 1.10.32 of “de Finibus Bonorum et Malorum", written by Cicero in 45 BC: “Sed ut perspiciatis unde omnis iste natus error sit voluptatem accusantium doloremque laudantium, totam rem aperiam, eaque ipsa quae ab illo inventore veritatis et quasi architecto beatae vitae dicta sunt explicabo. Nemo enim ipsam voluptatem quia voluptas sit aspernatur aut odit aut fugit, sed quia consequuntur magni dolores eos qui ratione voluptatem sequi nesciunt. Neque porro quisquam est, qui dolorem ipsum quia dolor sit amet, consectetur, adipisci velit, sed quia non numquam eius modi tempora incidunt ut labore et dolore magnam aliquam quaerat voluptatem. Ut enim ad minima veniam, quis nostrum exercitationem ullam corporis suscipit laboriosam, nisi ut aliquid ex ea commodi consequatur? Quis autem vel eum iure reprehenderit qui in ea voluptate velit esse quam nihil molestiae consequatur, vel illum qui dolorem eum fugiat quo voluptas nulla pariatur?"

1914 translation by H. Rackham: “But I must explain to you how all this mistaken idea of denouncing pleasure and praising pain was born and I will give you a complete account of the system, and expound the actual teachings of the great explorer of the truth, the master-builder of human happiness. No one rejects, dislikes, or avoids pleasure itself, because it is pleasure, but because those who do not know how to pursue pleasure rationally encounter consequences that are extremely painful. Nor again is there anyone who loves or pursues or desires to obtain pain of itself, because it is pain, but because occasionally circumstances occur in which toil and pain can procure him some great pleasure. To take a trivial example, which of us ever undertakes laborious physical exercise, except to obtain some advantage from it? But who has any right to find fault with a man who chooses to enjoy a pleasure that has no annoying consequences, or one who avoids a pain that produces no resultant pleasure?"

Section 1.10.33 of “de Finibus Bonorum et Malorum", written by Cicero in 45 BC: “At vero eos et accusamus et iusto odio dignissimos ducimus qui blanditiis praesentium voluptatum deleniti atque corrupti quos dolores et quas molestias excepturi sint occaecati cupiditate non provident, similique sunt in culpa qui officia deserunt mollitia animi, id est laborum et dolorum fuga. Et harum quidem rerum facilis est et expedita distinctio. Nam libero tempore, cum soluta nobis est eligendi optio cumque nihil impedit quo minus id quod maxime placeat facere possimus, omnis voluptas assumenda est, omnis dolor repellendus. Temporibus autem quibusdam et aut officiis debitis aut rerum necessitatibus saepe eveniet ut et voluptates repudiandae sint et molestiae non recusandae. Itaque earum rerum hic tenetur a sapiente delectus, ut aut reiciendis voluptatibus maiores alias consequatur aut perferendis doloribus asperiores repellat."

1914 translation by H. Rackham: “On the other hand, we denounce with righteous indignation and dislike men who are so beguiled and demoralized by the charms of pleasure of the moment, so blinded by desire, that they cannot foresee the pain and trouble that are bound to ensue; and equal blame belongs to those who fail in their duty through weakness of will, which is the same as saying through shrinking from toil and pain. These cases are perfectly simple and easy to distinguish. In a free hour, when our power of choice is untrammelled and when nothing prevents our being able to do what we like best, every pleasure is to be welcomed and every pain avoided. But in certain circumstances and owing to the claims of duty or the obligations of business it will frequently occur that pleasures have to be repudiated and annoyances accepted. The wise man therefore always holds in these matters to this principle of selection: he rejects pleasures to secure other greater pleasures, or else he endures pains to avoid worse pains."

Chapter 2

Literature Review

2.1 Reasonably long section title

The SI Units for dynamic viscosity is $\mathrm{N\,s\,m^{-2}}$. I'm going to randomly include a picture Figure 5.1.

If you have trouble viewing this document contact Krishna at: kks32@cam.ac.uk or raise an issue at https://github.com/kks32/phd-thesis-template/

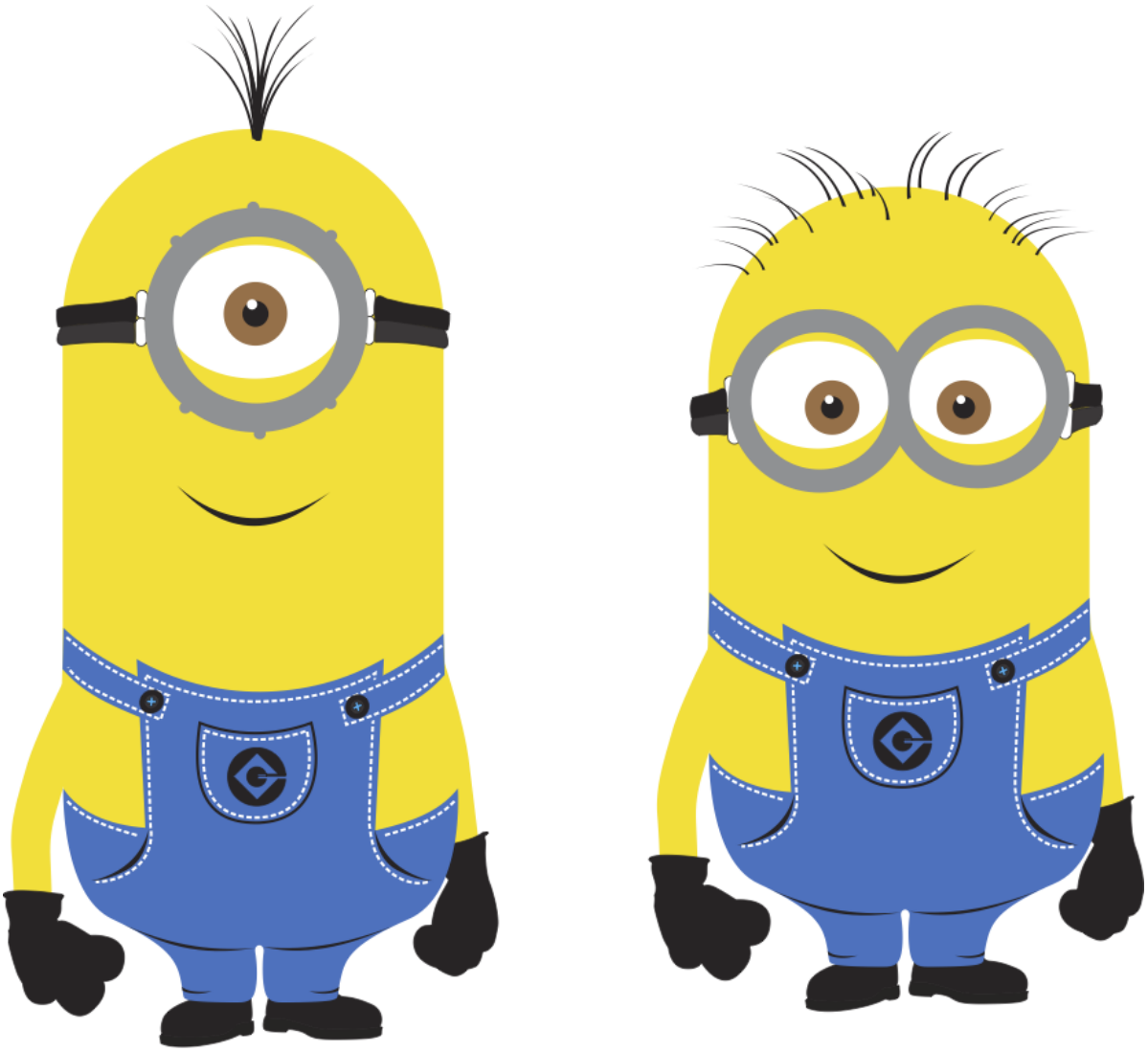

Fig. 2.1 This is just a long figure caption for the minion in Despicable Me from Pixar

Enumeration

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1. The first topic is dull
2. The second topic is duller
    (a) The first subtopic is silly
    (b) The second subtopic is stupid
3. The third topic is the dullest

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Itemize

- The first topic is dull
- The second topic is duller
  - The first subtopic is silly
  - The second subtopic is stupid
- The third topic is the dullest

Description

The first topic is dull

The second topic is duller

The first subtopic is silly

The second subtopic is stupid

The third topic is the dullest

2.2 Hidden section

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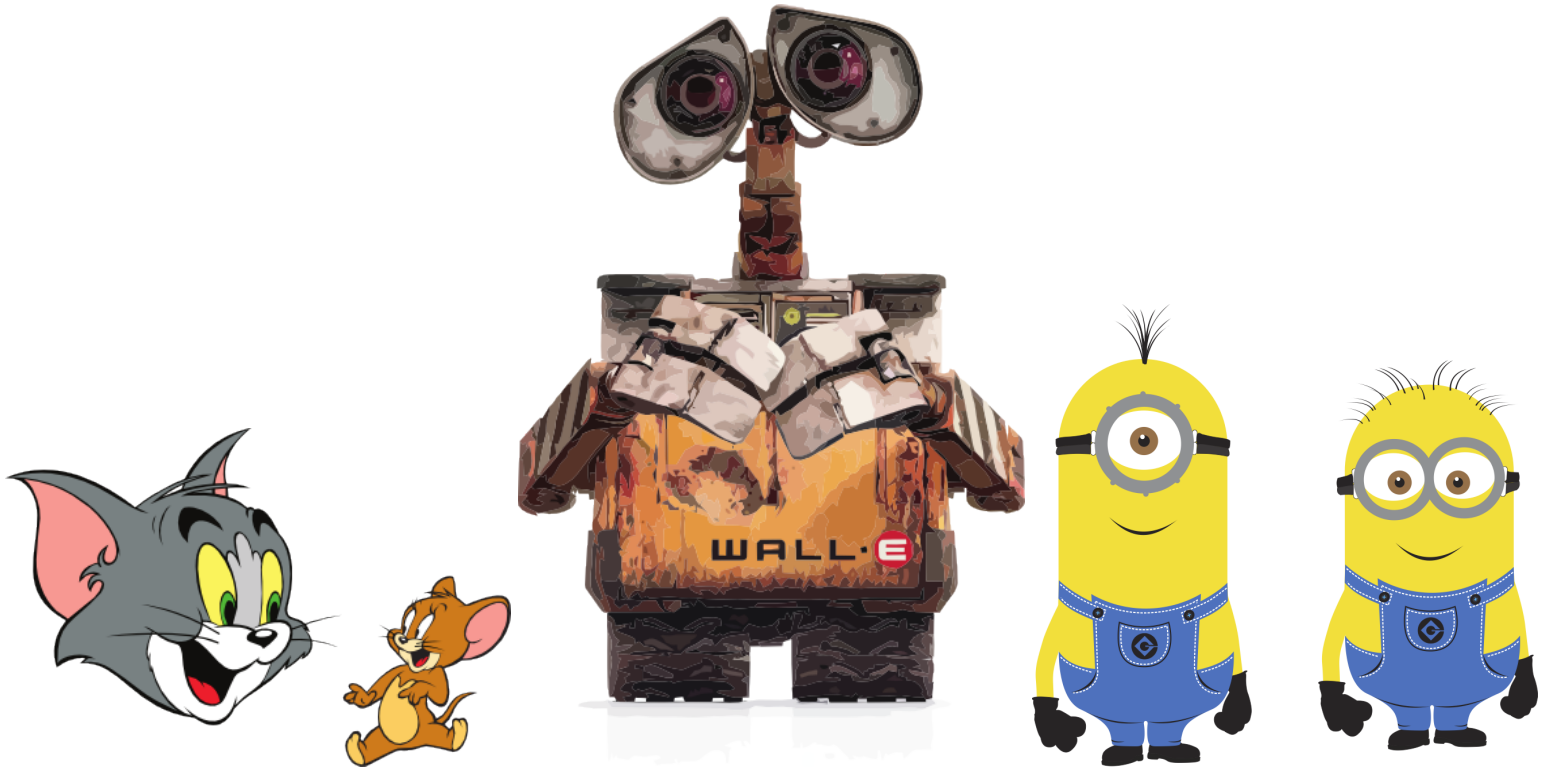
[1] My footnote goes blah blah blah! . . .

Subplots

I can cite Wall-E (see Fig. 4.2b) and Minions in despicable me (Fig. 4.2c) or I can cite the whole figure as Fig. 4.2



(a) Tom and Jerry **(b)** Wall-E **(c)** Minions

Fig. 2.2 Best Animations

Chapter 3

Materials and Methods

3.1 First section of the third chapter

And now I begin my third chapter here . . .

And now to cite some more people [7, 6]

3.1.1 First subsection in the first section

. . . and some more

3.1.2 Second subsection in the first section

. . . and some more . . .

First subsub section in the second subsection

. . . and some more in the first subsub section otherwise it all looks the same doesn't it? well we can add some text to it . . .

3.1.3 Third subsection in the first section

. . . and some more . . .

First subsub section in the third subsection

. . . and some more in the first subsub section otherwise it all looks the same doesn't it? well we can add some text to it and some more and some more and some more and some more and some more and some more and some more . . .

Second subsub section in the third subsection

. . . and some more in the first subsub section otherwise it all looks the same doesn't it? well we can add some text to it . . .

3.2 Second section of the third chapter

and here I write more ...

3.3 The layout of formal tables

This section has been modified from "Publication quality tables in LaTeX*" by Simon Fear.

The layout of a table has been established over centuries of experience and should only be altered in extraordinary circumstances.

When formatting a table, remember two simple guidelines at all times:

1. Never, ever use vertical rules (lines).
2. Never use double rules.

These guidelines may seem extreme but I have never found a good argument in favour of breaking them. For example, if you feel that the information in the left half of a table is so different from that on the right that it needs to be separated by a vertical line, then you should use two tables instead. Not everyone follows the second guideline:

There are three further guidelines worth mentioning here as they are generally not known outside the circle of professional typesetters and subeditors:

3. Put the units in the column heading (not in the body of the table).
4. Always precede a decimal point by a digit; thus 0.1 *not* just .1.
5. Do not use 'ditto' signs or any other such convention to repeat a previous value. In many circumstances a blank will serve just as well. If it won't, then repeat the value.

A frequently seen mistake is to use '\begin{center}' ... '\end{center}' inside a figure or table environment. This center environment can cause additional vertical space. If you want to avoid that just use '\centering'

3.3.1 ctable

You can use ctable package to create highly customizable tables. Check documentation for further explanation and see table 3.4

3.3.2 lenghty table that cover whole width

In case of double column layout, tables which do not fit in single column width should be set to full text width. For this, you need to use `\begin{table*} ... \end{table*}` instead of

	Species I		Species II	
Dental measurement	mean	SD	mean	SD
I1MD	6.23	0.91	5.2	0.7
I1LL	7.48	0.56	8.7	0.71
I2MD	3.99	0.63	4.22	0.54
I2LL	6.81	0.02	6.66	0.01
CMD	13.47	0.09	10.55	0.05
CBL	11.88	0.05	13.11	0.04

Table 3.1 A badly formatted table

Dental measurement	Species I		Species II	
	mean	SD	mean	SD
I1MD	6.23	0.91	5.2	0.7
I1LL	7.48	0.56	8.7	0.71
I2MD	3.99	0.63	4.22	0.54
I2LL	6.81	0.02	6.66	0.01
CMD	13.47	0.09	10.55	0.05
CBL	11.88	0.05	13.11	0.04

Table 3.2 A nice looking table

Dental measurement	Species I		Species II	
	mean	SD	mean	SD
I1MD	6.23	0.91	5.2	0.7
I1LL	7.48	0.56	8.7	0.71
I2MD	3.99	0.63	4.22	0.54
I2LL	6.81	0.02	6.66	0.01
CMD	13.47	0.09	10.55	0.05
CBL	11.88	0.05	13.11	0.04

Table 3.3 Even better looking table using booktabs

	$H(Mu)+F_2$	$H(Mu)+Cl_2$
β(H)	80.9° [b]	83.2°
β(Mu)	86.7°	87.7°

[a] for the abstraction reaction, $Mu + HX \rightarrow MuH + X$.
[b] 1 degree $= \pi/180$ radians.
[c] this is a particularly long note, showing that footnotes are set in raggedright mode as we don't like hyphenation in table footnotes.

Table 3.4 The Skewing Angles (β) for $Mu(H)+X_2$ and $Mu(H)+HX$ [a]

`\begin{table} ... \end{table}` environment. confirm if footnotes are getting printed and find a fix if not or convert to ctable

	Element 1[a]			Element 2[b]		
Project	Energy	σ_{calc}	σ_{expt}	Energy	σ_{calc}	σ_{expt}
Element 3	990 A	1168	1547 ± 12	780 A	1166	1239 ± 100
Element 4	500 A	961	922 ± 10	900 A	1268	1092 ± 40

Table 3.5 Example of a lengthy table which is set to full textwidth

Note: This is an example of table footnote. This is an example of table footnote this is an example of table footnote this is an example of table footnote this is an example of table footnote.

[a]Example for a first table footnote.
[b]Example for a second table footnote.

3.3.3 sideways table

You can use sideways environment to create sideways table to carry more data in a single page.

	Element 1[a]			Element[b]		
Projectile	Energy	σ_{calc}	σ_{expt}	Energy	σ_{calc}	σ_{expt}
Element 3	990 A	1168	1547 ± 12	780 A	1166	1239 ± 100
Element 4	500 A	961	922 ± 10	900 A	1268	1092 ± 40
Element 5	990 A	1168	1547 ± 12	780 A	1166	1239 ± 100
Element 6	500 A	961	922 ± 10	900 A	1268	1092 ± 40

Table 3.6 Tables which are too long to fit, should be written using the "sidewaystable" environment as shown here

Note: This is an example of table footnote this is an example of table footnote this is an example of table footnote this is an example of table footnote this is an example of table footnote.

[a] This is an example of table footnote.

[b] A very important table footnote

3.4 Equations

Equations in LaTeX can either be inline or on-a-line by itself ("display equations"). For inline equations use the `$. . . $` commands. E.g.: The equation $H\psi = E\psi$ is written via the command `$H \psi = E \psi$`.

For display equations (with auto generated equation numbers) one can use the equation or align environments:

$$\|\tilde{X}(k)\|^2 \leq \frac{\sum_{i=1}^{p} \left\|\tilde{Y}_i(k)\right\|^2 + \sum_{j=1}^{q} \left\|\tilde{Z}_j(k)\right\|^2}{p+q}. \tag{3.1}$$

where,

$$\begin{aligned} D_\mu &= \partial_\mu - ig\frac{\lambda^a}{2}A_\mu^a \\ F_{\mu\nu}^a &= \partial_\mu A_\nu^a - \partial_\nu A_\mu^a + g f^{abc} A_\mu^b A_\nu^a \end{aligned} \tag{3.2}$$

Notice the use of `\nonumber` in the align environment at the end of each line, except the last, so as not to produce equation numbers on lines where no equation numbers are required. The `\label{}` command should only be used at the last line of an align environment where `\nonumber` is not used.

$$Y_\infty = \left(\frac{m}{\mathrm{GeV}}\right)^{-3}\left[1 + \frac{3\ln(m/\mathrm{GeV})}{15} + \frac{\ln(c_2/5)}{15}\right] \tag{3.3}$$

Chapter 4

Results and Discussion

4.1 Reasonably long section title

The SI Units for dynamic viscosity is $\mathrm{N\,s\,m^{-2}}$. I'm going to randomly include a picture Figure 5.1.

If you have trouble viewing this document contact Krishna at: kks32@cam.ac.uk or raise an issue at https://github.com/kks32/phd-thesis-template/

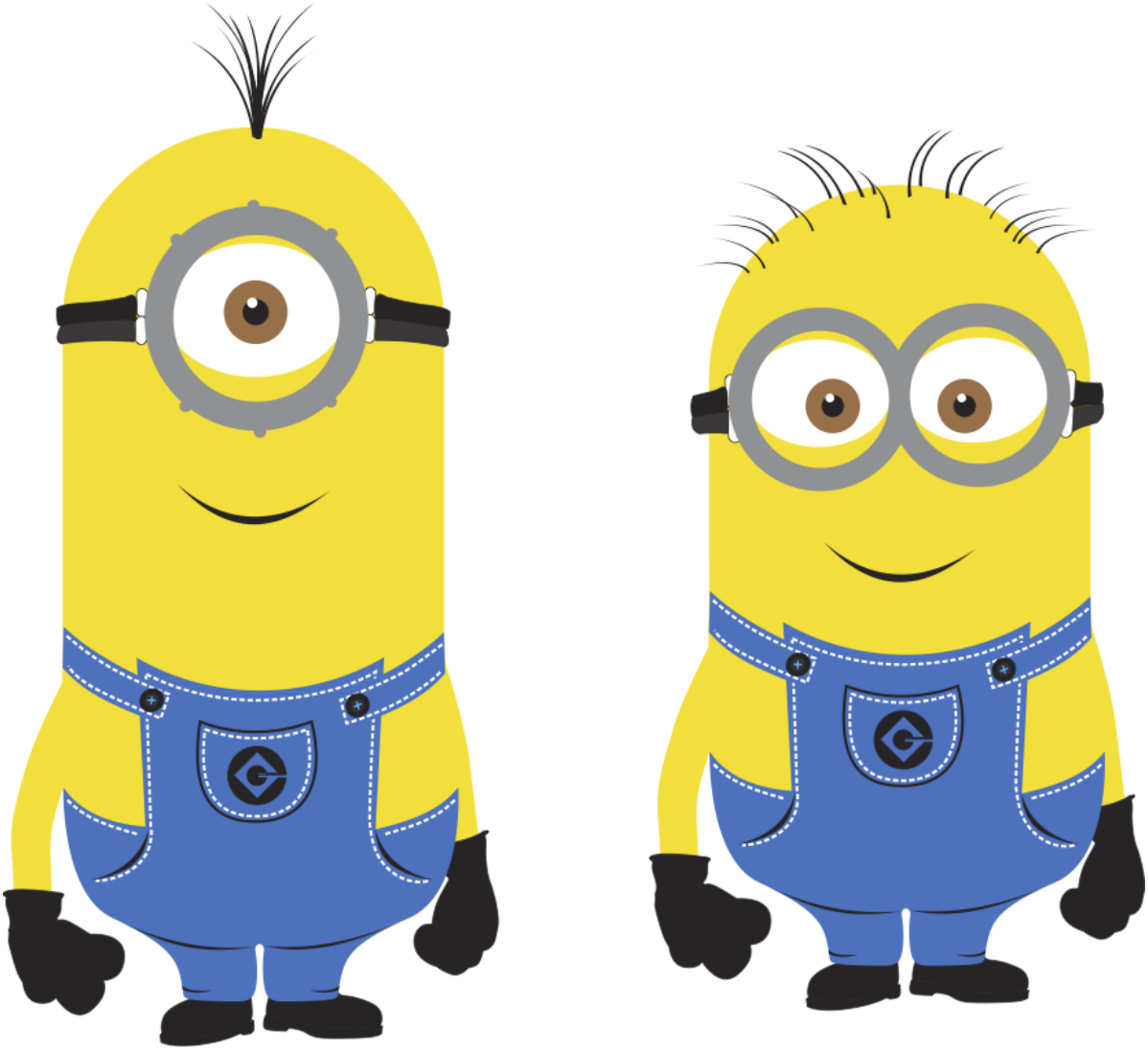


Fig. 4.1 This is just a long figure caption for the minion in Despicable Me from Pixar

Enumeration

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2. The second topic is duller
    (a) The first subtopic is silly
    (b) The second subtopic is stupid
3. The third topic is the dullest

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Itemize

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Description

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4.2 Hidden section

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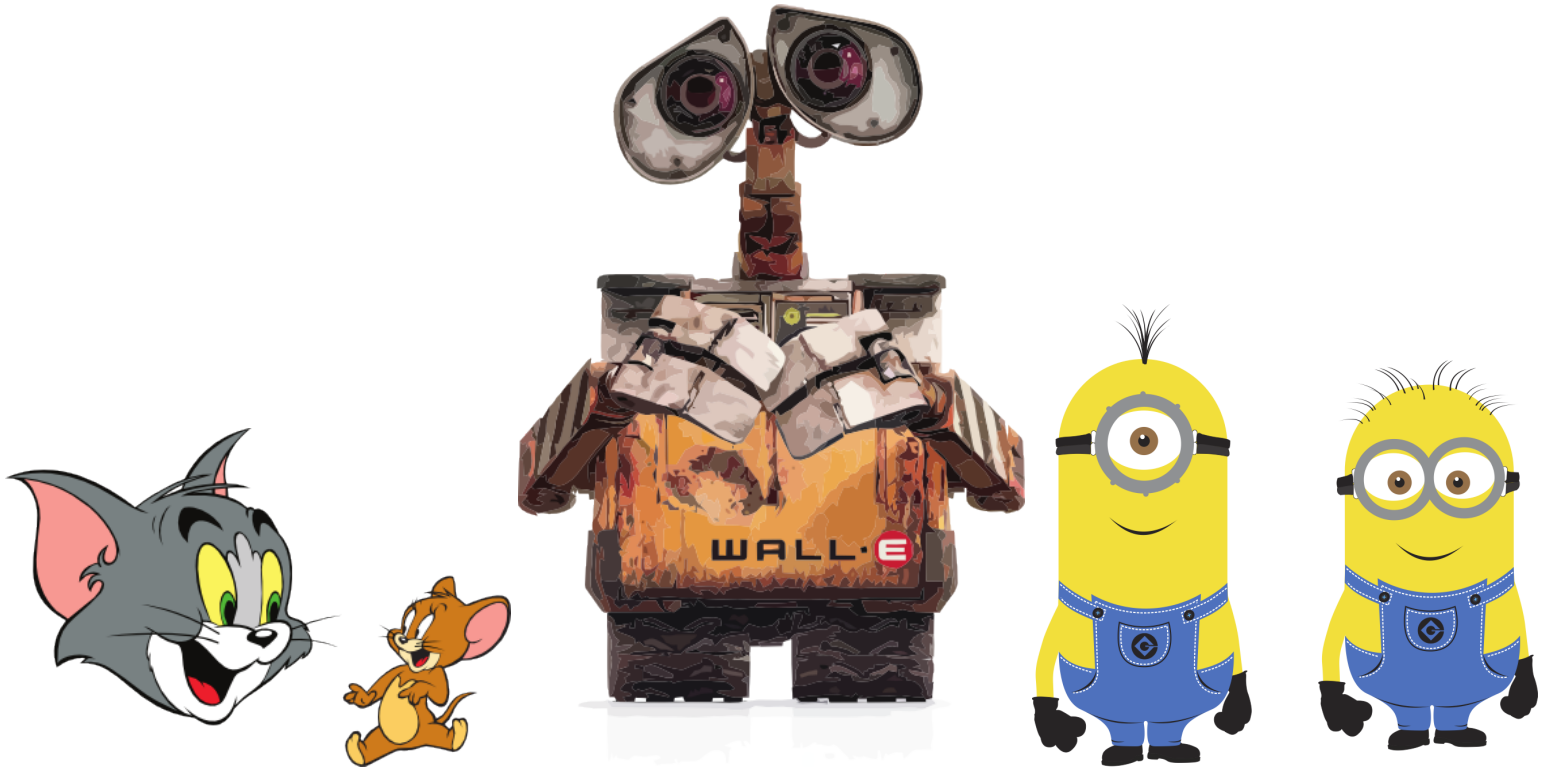
Subplots

I can cite Wall-E (see Fig. 4.2b) and Minions in despicable me (Fig. 4.2c) or I can cite the whole figure as Fig. 4.2



(a) Tom and Jerry **(b)** Wall-E **(c)** Minions

Fig. 4.2 Best Animations

Chapter 5

Conclusion

5.1 Reasonably long section title

The SI Units for dynamic viscosity is $\mathrm{N\,s\,m^{-2}}$. I'm going to randomly include a picture Figure 5.1.

If you have trouble viewing this document contact Krishna at: kks32@cam.ac.uk or raise an issue at https://github.com/kks32/phd-thesis-template/

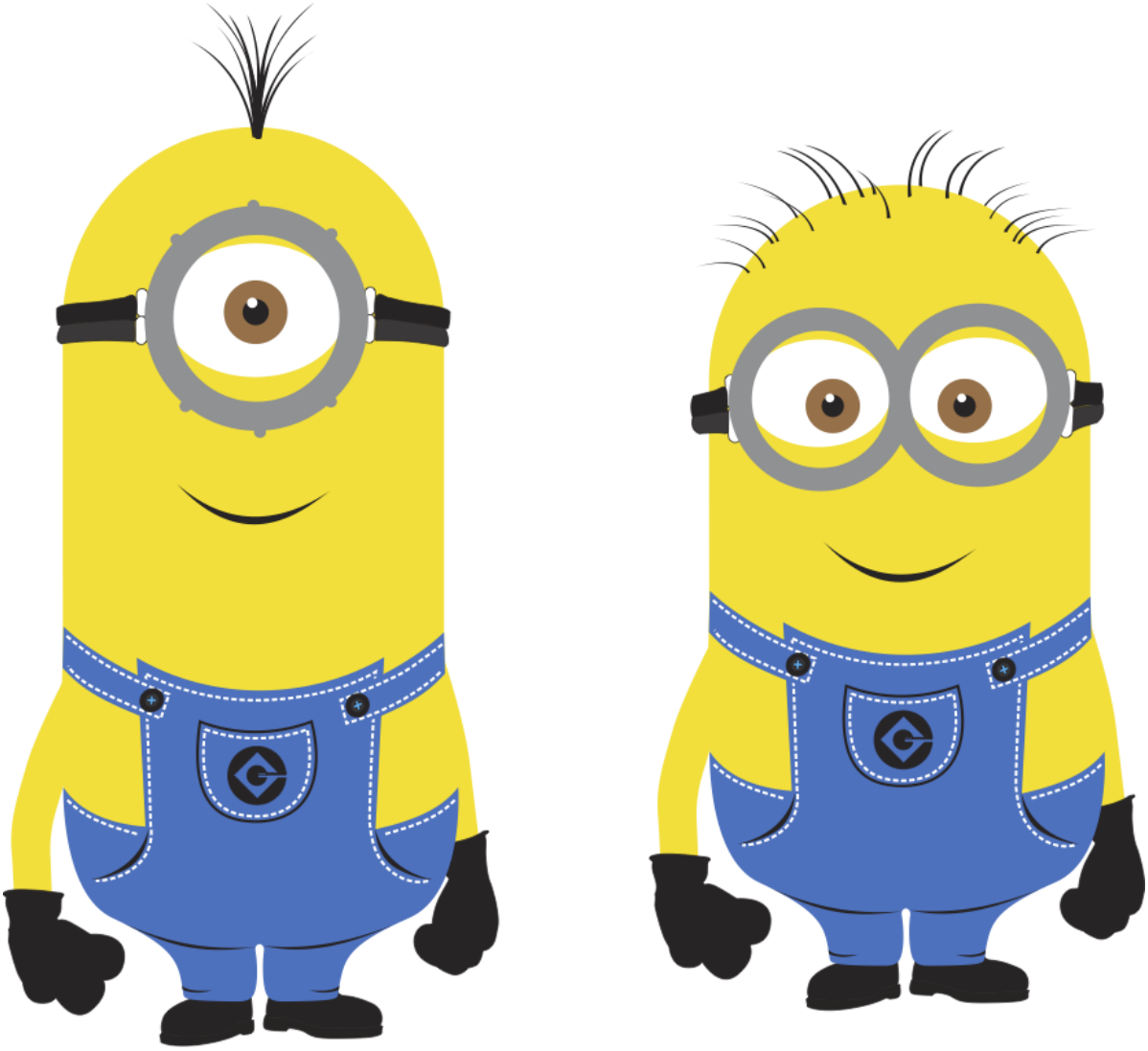


Fig. 5.1 This is just a long figure caption for the minion in Despicable Me from Pixar

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[1] My footnote goes blah blah blah! ...

Summary

The PhD thesis presents ...

The dissertation consists of three major parts. In Chapter...

Work I.

Intro

In Chapter 2, brief...

Work II.

Intro

In Chapter 3, brief...

Work III.

Intro

In Chapter 4, brief...

Contributions of the thesis

In the **first thesis group**, the contributions are related to .. . Detailed discussion can be found in Chapter 2.

I/1. Contrib I.

I/2. Contrib II.

I/3. Contrib III.

I/4. Contrib IV.

In the **second thesis group**, the contributions are related to the .. . Detailed discussion can be found in Chapter 3.

II/1. Contrib I.

II/2. Contrib II.

II/3. Contrib III.

II/4. Contrib IV.

In the **third thesis group**, the contributions are related to the .. . Detailed discussion can be found in Chapter 4.

III/1. Contrib I.

III/2. Contrib II.

III/3. Contrib III.

III/4. Contrib IV.

Journal publications

[1] Gergő Róth, Ákos Kuki, **Aron Kipyegon Rop**, Lajos Nagy, Zuura Kyzy Kaldybek, Máté Benedek, Miklós Zsuga, Tibor Nagy, Sándor Kéki Rapid Copolymer Analysis of Unresolved Mass Spectra by Artificial Intelligence. *Analytical Chemistry*, VOL(97), 19801-19808, 2025.

Full papers in conference proceedings

[5] **Rop Aron**, G. W, P. V, H.B. R, M. M, Á. L. Paper Title. In *Proceedings of the Xth Annual International Conference on Conference*, DISTRIBUTOR, PP-PP, YEAR.

Further related publications

[8] **Rop Aron**, A. B, G. K, G. H, and L. G. N. Paper Title. In *The Xth Jubilee Conference of Something: Volume of extended abstracts.*, YEAR.

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[1] B. Aupetit. *A Primer on Spectral Theory*. Springer-Verlag, New York, 1991.

[2] Y. A. Abramovich, C. D. Aliprantis, and O. Burkinshaw. Another characterization of the invariant subspace problem. *Operator Theory in Function Spaces and Banach Lattices.* The A.C. Zaanen Anniversary Volume*, Operator Theory: Advances and Applications*, 75:15–31, 1995. Birkhäuser Verlag.

[3] J. B. Conway. *Functions of One Complex Variable*. Springer-Verlag, New York, 1978.

[4] J. Daughtry. An invariant subspace theorem. *Proc. Amer. Math. Soc.*, 49:267–268, 1975.

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[6] Christophe Ancey, Philippe Coussot, and Pierre Evesque. Examination of the possibility of a fluid-mechanics treatment of dense granular flows. *Mechanics of Cohesive-frictional Materials*, 1(4):385–403, 1996.

[7] C. J. Read. A solution to the invariant subspace problem on the space l_1. *Bull. London Math. Soc.*, 17:305–317, 1985.