



## UvA-DARE (Digital Academic Repository)

### Complete subvarieties of moduli spaces of algebraic curves

Zaal, C.G.

**Publication date**  
2005

[Link to publication](#)

#### **Citation for published version (APA):**

Zaal, C. G. (2005). *Complete subvarieties of moduli spaces of algebraic curves*. [Thesis, fully internal, Universiteit van Amsterdam].

#### **General rights**

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

#### **Disclaimer/Complaints regulations**

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: <https://uba.uva.nl/en/contact>, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.

# Contents

INTRODUCTION	9
1 Algebraic curves and their moduli	9
2 Complete subvarieties	11
3 Results	12
4 Speculations	13
<b>CHAPTER 1 Overview of known results</b>	<b>15</b>
1.1 Complete subvarieties: a survey	15
1.1.1 <i>Constructions of complete curves in <math>M_g</math></i>	15
1.1.2 <i>Bounds on the dimension of complete subvarieties</i>	18
1.1.3 <i>Examples of higher-dimensional complete subvarieties</i>	19
1.2 Some calculations	21
1.2.1 <i>Kodaira's construction revisited</i>	21
1.2.2 <i>The construction of González-Díez and Harvey revisited</i>	23
<b>CHAPTER 2 Explicit complete subvarieties of dimension <math>d</math> in <math>M_{2d+1}</math></b>	<b>29</b>
2.1 The basic step	29
2.2 A refinement	32
2.3 Minimality of the construction	32
<b>CHAPTER 3 Explicit complete curves in the moduli space of curves of genus three</b>	<b>35</b>
3.1 The construction	36
3.2 The corresponding family of curves	37
3.3 Pryms of ramified double coverings of genus 3 curves	39
3.4 The degree of $\lambda$ and the number of hyperelliptic fibers	41
3.5 The surjectivity of the Prym map	44
<b>CHAPTER 4 A complete surface in <math>M_6</math> in characteristic <math>&gt; 2</math></b>	<b>47</b>
4.1 The construction	47
4.2 Blowing down the diagonal	48
4.3 Characteristic 0	50
<b>CHAPTER 5 Families of curves without sections</b>	<b>51</b>
5.1 Basic construction	51
5.2 A family of smooth curves without sections	53

<b>CHAPTER 6 Some results on complete surfaces</b>	<b>55</b>
6.1 Complete surfaces in $M_g$ and the classification of surfaces .....	55
6.2 Surfaces in the locus of curves with nontrivial automorphisms .....	57
<b>CHAPTER 7 Speculations</b>	<b>61</b>
7.1 The genus of the base curve .....	61
7.2 Can $M_4$ contain a complete surface? .....	63
7.2.1 A computation in the Chow ring of $M_4$ .....	63
7.2.2 The Prym construction for $M_4$ .....	64
7.2.3 Diaz's filtration of $M_4$ .....	65
<b>REFERENCES</b>	<b>67</b>
<b>SAMENVATTING</b>	<b>71</b>
<b>CURRICULUM VITAE</b>	<b>79</b>