

# Carl-Friedrich Bödigheimer



## Academic career

1979	Diploma, University of Heidelberg
1980	Master-of-Science, Oxford University, England, UK
1982 - 1984	Graduate studies, University of Heidelberg
1984	PhD, University of Heidelberg
1984 - 1985	Postdoc, University of Göttingen
1985 - 1991	Assistant Professor (C1), University of Göttingen
1990	Habilitation, University of Göttingen
1991 - 1992	Visiting Assistant Professor, Johns-Hopkins-University, Baltimore, MD, USA
1992 - 1993	Heisenberg grant
1992 - 1993	Guest at Institute for Advanced Studies, Princeton University, NJ, USA
Since 1993	Professor (C3), University of Bonn

## Research Projects and Activities

Bonn International Graduate School in Mathematics

Director, 2001 - 2008

DFG Research Training Group GRK 1150 "Homotopy and Cohomology"

Coordinator, 2005 - 2008 and 2009 - 2014

## Research profile

My research interests are centered around the moduli spaces of Riemann surfaces. The surfaces have always (a) at least one boundary curve, or (b) have their boundary curves partitioned into at least one incoming and at least one outgoing curve. These moduli spaces are manifolds and classifying spaces of the corresponding mapping class groups; in case (b) they are spaces of bordisms and are therefore important for string topology and topological field theories. We have developed theses moduli spaces simplicial models (up to homeomorphism), built out of strata of classifying spaces of symmetric groups. Furthermore, there is an operad structure of the little-2-cube operads and a plentitude of further homology operations. Using these operations we could describe the integral homology and its generators in case (a) for genus 2.

In the future we want to extend this description of the integral homology and its generators for  $g = 3$  and to the case (b). This should lead to connections with Sullivan diagrams used in string topology.

A second project is the description of the Mumford-Miller-Morita classes in the concrete models mentioned above.

A third project concerns the generalisation of such a description of the homology to moduli spaces of bundles over surfaces; so this, the symmetric groups need to be replaced by Coxeter groups.

**Research Area F\*** The main achievement was the calculation of the homology and cohomology groups of the moduli space  $M_{g,1}$  of Riemann surfaces with one boundary curve in the cases  $g = 2$  and  $g = 3$ . For genus 3 we could compute the groups; in genus 2 we can also describe generators of these groups in terms of homology operations such as Dyer-Lashof operations. The methods used include models for moduli spaces and the calculation of homology operations as well as smaller chain models, based on discrete Morse theory and certain normal forms on symmetric groups and their bar resolution.

## Supervised theses

Master theses: 6

Diplom theses: 44

PhD theses: 16, currently 2

### **Selected PhD students**

Michael Eisermann (2000): “Knotengruppen-Darstellungen und Invarianten von endlichem Typ”,  
now Professor, University of Stuttgart

Birgit Richter (2000): “Taylorapproximationen und kubische Konstruktionen von Gamma-Moduln”,  
now Professor, University of Hamburg

Johannes Ebert (2006): “Characteristic Classes of Spin Surface Bundles: Applications of the  
Madsen-Weiss Theory”,

now Professor, University of Münster

Viktoriya Ozornova (2012): “Factoribility, discrete Morse theory and a reformulation of the  $K(\pi, 1)$ –  
*conjecture*”,

*now Assistant, University of Bochum*

### **Habilitations**

Ulrike Tillmann (1995), now Professor, University of Oxford, England, UK