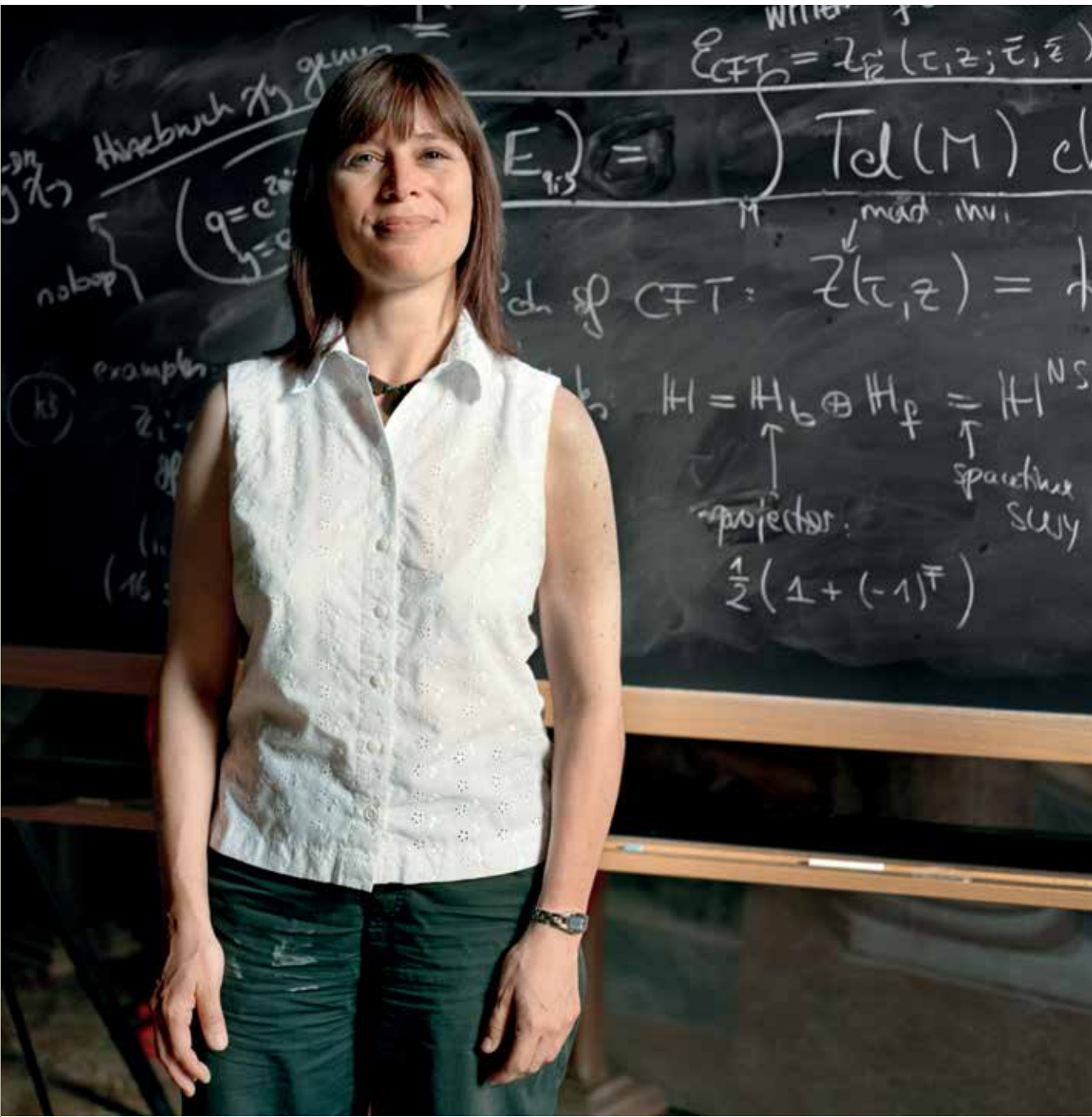


Katrin Wendland

$$\begin{aligned} \mathcal{E}_X(\tau, z) &= \chi(\mathbb{E}_{q, -y}) \\ &= \int_X \text{Td}(X) \text{ch}(\mathbb{E}_{q, -y}) \end{aligned}$$

Katrin Wendland studied at the University of Bonn, where she obtained her diploma in Mathematics in the group of Prof. Werner Müller, and her PhD in Theoretical Physics in the group of Prof. Werner Nahm. She was a postdoc at UNC Chapel Hill and became Lecturer at the Mathematics Institute of the University of Warwick in 2002. In 2006, she was appointed Professor (Chair for Analysis and Geometry) at the University of Augsburg, and since 2011 she is Professor for Mathematics at the University of Freiburg. In 2008, she was awarded a Starting Independent Researcher Grant in Mathematics by the European Research Council. In 2010, she was an invited sectional speaker in Mathematical Physics at the International Congress of Mathematicians 2010 in Hyderabad, India. In 2013, she was elected full member of the Akademie der Wissenschaften und der Literatur Mainz.

- Research topics:
- Geometry and quantum field theory
 - Calabi-Yau manifolds
 - Conformal and topological quantum field theory



Cortona, Italy, 2015



How and when did you choose to do mathematics?

I chose mathematics and physics after secondary school. I also liked other subjects, such as German; I used to like reading and writing, and still do. I was also intrigued by history of arts and architecture, but did not think I was creative enough for those subjects. Philosophy and ancient Greek also attracted me. But most of all, I loved mathematics and physics.

I found mathematics easy and physics somewhat difficult, succeeding all the same. My father is a mathematician, which actually made me hesitate whether or not to follow his path.

I then decided that I should go for the subjects I liked most, but I was not sure whether to choose mathematics or physics and followed his advice to do both, but to concentrate first on one of the two. He thought that learning abstract topics is easier while you are young, and he suggested to leave the more applied ones for later on. This is why I first focused on mathematics but kept on studying physics.

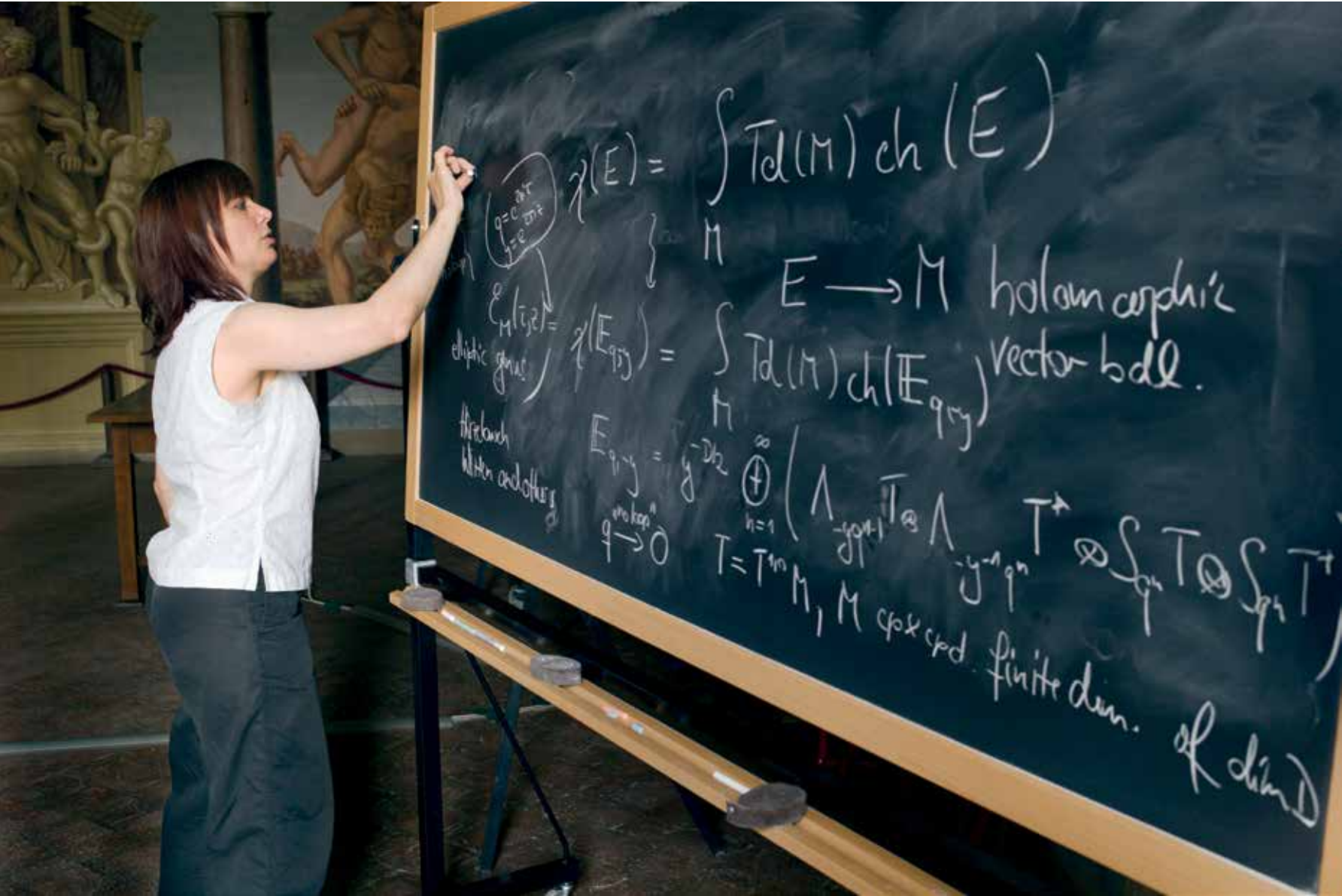
I actually dreamt of becoming an astronomer, and attended courses at the planetarium at the age of 16. At the University, I took physics and mathematics courses, attending astronomy classes as well. A PhD student in astronomy that I knew offered



to organise a one week internship at a radio-telescope near Bonn for me. I went from one research or technician's group to another, which gave me a glimpse into the techniques they used, that all looked very exciting. But seeing them staring at their screens in the evenings looked much less appealing. I did not like this part of their work and decided I enjoyed mathematics much more!

Then during my study, after a talk I gave at a representation theory seminar led by a physics professor who had a very mathematical approach to physics, I was lucky enough to be approached by him, offering to take me under his supervision for a PhD. I thought this was a good opportunity to become bilingual in mathematics and physics and therefore decided to do my PhD in theoretical physics.

Mathematics requires a lot of creativity. I will not judge whether or not I am creative, but I definitely have a lot of curiosity. This is similar to the enjoyment that I feel when I travel to new places, exploring them and then, too, experiencing the thrill of being lost in a city I do not know.



Were you then encouraged by your family, friends or other people around you?

Yes, absolutely, I was always encouraged by my parents to do what I liked doing, they let me follow my intuition. Knowing that I had support from my family helped me. However, seeing my father work non-stop throughout my childhood made me think I was not going to do the same type of job, but I later changed my mind.

Did you come across obstacles in pursuing your career as a mathematician?

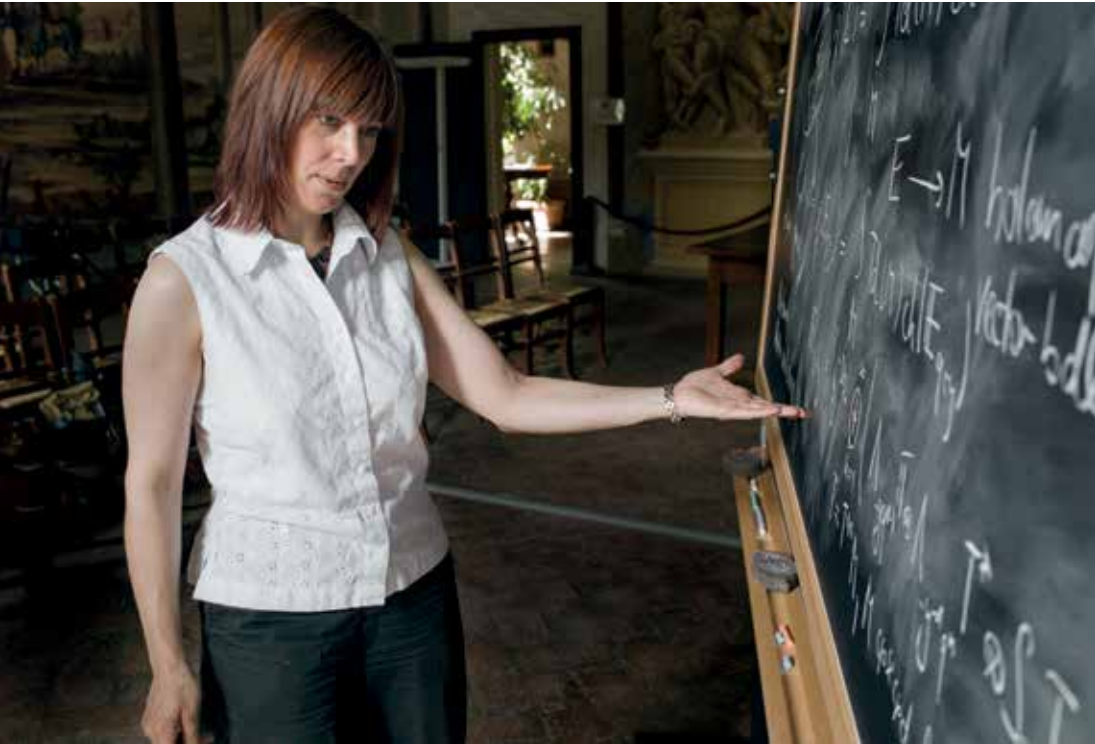
In Germany, there is social pressure which can be discouraging for women wanting to become professional mathematicians. I personally did not experience such obstacles, probably because my family taught me not to care too much what other people think. I believe this helped me to steer through situations where only much later I understood that they were supposed to be obstacles. I used to have many doubts about myself, particularly when between my Masters and my PhD. With time I learned to gain in patience, and doubt less. I now realise from my experience as a mentor for young women mathematicians, that women have more doubts about themselves than men do. During the rough time I had between my Masters and my PhD, I kept myself going by thinking that, since I had the privilege over many others to have gone that far, it was my duty to keep going.

In retrospect, are you happy to have chosen mathematics or do you have some regrets?

For you, what are the joys of mathematics?

What are the hardships?

I do not have any regrets, as a principle, not only in mathematics; you never know how things might have turned out, had you made other choices. I enjoy being surprised by mathematics and its intrinsic difficulty. The moment I enjoy best is when the pieces of the puzzle fall into one coherent whole. Understanding or solving a problem is a real source of joy. I do not mind working alone, which can be a hardship for some. But I love discussing mathematics with others, for it gives you other viewpoints on things. Teaching is also a very nice part of my job. I enjoy helping students out when they get stuck on a problem. The many different aspects of mathematics make it a very appealing subject. Frustration sometimes gets in the way. I can get very angry with myself when I make mistakes, but with time and experience, I have learned that it is a good thing to explain



a mistake – even in front of students: They will not question your expertise for a mistake you have made.

What would you recommend to a young woman in your country wanting to start a career in mathematics?

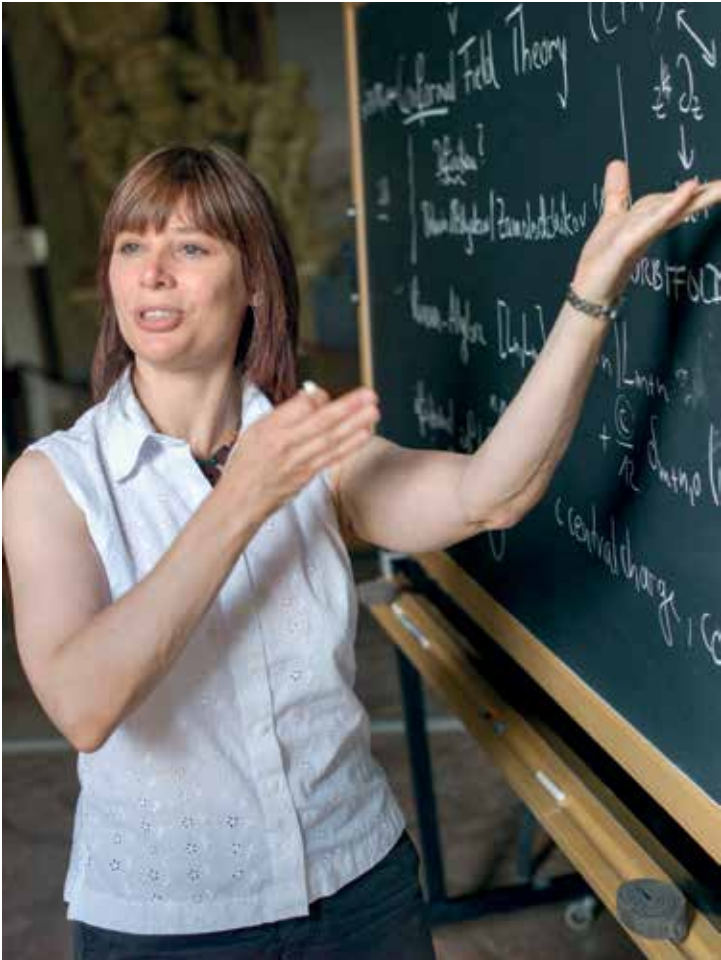
A young woman who has just finished school I would advise to give it a try, and be honest with herself as to whether she enjoys mathematics or not. I would recommend that she be patient, and to keep on trying

when an obstacle comes in the way.

If doubts emerge later on in her career, such as thinking that she is not “good enough”, I would ask her why and tell her to trust her own abilities. Such doubts often arise from a mere lack of self-confidence. It is a good thing to be self-critical, but you should not put yourself down! I personally proceeded step by step, not allowing myself to plan too far ahead. This said, if this young woman does not “burn for mathe-

matics”, then it might not be the right choice for her. It is important to love the subject, because one should expect to come across difficulties.

In any case, I would recommend that she asks for advice from her peers and her seniors, maybe in the form of mentoring, and that she shares the problems she might encounter with people she trusts. There are lots of mentoring programs, but talking to people is a first and very useful step.



Could you say a few words on your research topic in a manner understandable to non-experts, describing your topics of research?

I am a geometer, and geometry is everywhere in this world. I am fascinated by symmetries, patterns you find in very diverse

forms and everywhere around you. The type of geometry I am interested in is inspired by physics and my research work lies between mathematics and physics.

I work on very abstract physical models such as conformal field theory, inspired by string theory, which is supposed to describe

our universe. A motivation for string theory is the description of particles and their interactions. String theory is built on the idea that instead of point-like objects which evolve along curves, you should consider extended string-like objects that evolve along surfaces, which in turn can be placed within complicated geometric objects. These strings can vibrate – their “sound” so to speak encodes their properties – but the quantum behaviour of such strings is mathematically difficult to describe. We know now that string theory is not a completely satisfactory model, so there are new paths and many related geometric questions to explore.

Could you describe your favourite personal achievement in mathematics?

I am very proud whenever I can cross boundaries between subjects, finding myself at the interface of different fields of research. Such a position is a source of great pleasure even if it might feel rather uncomfortable at times. The difficult but challenging part is explaining my work to people in other fields, a very rewarding exercise. I often feel like an outsider at conferences, but conveying my work to a community I do not belong to is a source of great pride.