Announcement

# A conversation with Bianca Falcidieno: SMI 2021 Tosiyasu Kunii Achievement Award winner

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## ABSTRACT

The 2021 Shape Modeling International Tosiyasu Kunii Achievement Award is presented to Dr. Bianca Falcidieno for her outstanding career achievements in shape modelling research. We are also pleased to honour her valuable service to the research community, recognizing the work she has put in as editor-in-chief of the International Journal of Shape Modeling, and the SMI conference series.

This year, 2021 is the year, which marks the passing of our founder, Professor Kunii, and the introduction of the new SMI awards. Achievement awards in other venues, include a publication by the award winner to be included in the proceedings. The SMI steering committee decided that the publication should take an interview format. This permits a casual discussion of the research areas, insights, and contributions of the award winner. What follows is an edited transcript of a conversation between Bianca Falcidieno and Brian Wyvill (University of Victoria, Canada Research Chair), a long term SMI steering committee member and research contributor in shape modelling.

The interview took place on the 22nd October, 2021, via Zoom.

## 1. Introduction

The highly influential and creative, Professor Tosiyasu Kunii passed away in November 2020 (See Fig. 1) [1].

The Shape Modeling International Steering Committee decided to honour the memory of Kunii, who was the founder of SMI, with two awards, one to recognize shape modeling researchers with distinguished careers, and the second for young researchers who have made a significant contribution to the shape modeling.

The recipients of the awards are selected by the SMI Awards Committee, based on proposals from the research community in Shape Modeling. We have formed an Awards Committee that is chaired by Brian Wyvill. The members were Ergun Akleman, Loic Barthe, ad Michela Spagnuolo in alphabetical order. This publication provides an interview with Dr. Bianca Falcidieno, who is the first recipient of the Tosiyasu Kunii Award.

## 2. The interview

**Brian:** Hello Bianca. Congratulations on being recognized as the 2021 SMI Kunii Achievement Award winner. You are the first of what we hope to be a long series of Kunii award winners in future years to come.



**Fig. 1.** Tosiyasu Kunii in his 60th birthday celebration in 1998.

**Bianca:** Thank you, Brian, and the awards committee. This award has special meaning to me because Professor Kunii was very important for my professional career and my personal growth. Without his support, in an important period of my life, it would have been impossible to produce the results I strived for. With Kunii's support I was also able to grow a group of competent and brilliant researchers (See Fig. 2).

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**Fig. 2.** Bianca Falcidieno.

**Brian:** What a wonderful impetus to your career. You've been in computer graphics a very long time, in many ways since the beginning of modern computer graphics. Now you're a Eurographics fellow and leading light in European and International Computer Graphics. So, how did you get started, and what made you interested in a field where there was nobody else at the beginning?

**Bianca:** It was by chance, because I have a degree in mathematics, and my master's thesis professor was involved in a computer project for teaching mathematical analysis to students of engineering. He decided to buy graphical devices: storage tubes built by Tektronics. They were the leading graphical displays at that time. All of us back in the 1970s remember these devices. He asked me to help him develop a library of graphical functions for use by the students. So I started to study how to display functions graphically. This I extended from functions of one variable, to two-dimensional formulas and mathematical symbols, to give the students an easy graphical interface for their exercises.

This project lasted for a few years. The computer was a central mainframe, a very large machine in the university computing centre, and the Tektronix display was connected to it via an acoustic coupler. When the project finished, and my professor changed his focus, I wanted to deepen my knowledge of computer graphics. So I started looking around in the late 1970s. But at that time very few people worked in computer graphics in Italy, and even in the world. Therefore I decided to open a new field of research within the National Research Council and, in 1981, I was able to start the first research group in computer graphics officially. At that time, I was already a permanent researcher, and therefore, I had a certain autonomy in defining my research and directing other researchers.

**Brian:** It sounds fabulous to be able to figure out how to start a new field like that. So, I understand that you became a faculty member very early on in your career and unlike the more common route in other parts of the world, you didn't actually do a PhD. So, how did that work in Italy?

**Bianca:** Yes, I was very young when I had my permanent position. I got a fellowship in the early '70s; after two years, I applied for a position at the CNR Institute in Rome, and I won it at the age of 25. It was quite unusual, even for that time, to have a permanent position at such a young age. I think it allowed me to start new fields of research and plan my activities with great freedom. As for the PhD, there were no PhD degrees in Italy until 1983, so you had to go abroad. Many people went to the United States for this. When earning a doctoral degree in Italy became possible, I had already been a researcher for years, and for the CNR and also the University it was not necessary to have a doctorate for those who had a permanent position.

**Brian:** And do you remember what your first publication was?

**Bianca:** Ah, yes, I remember my first publication was about this graphical interface for distance computer learning. So, I presented it in Rome in front of 500 people.

**Brian:** That must have been exciting.

**Bianca:** Yes, it was exciting, but also risky. We were connected to the computer centre in Genova and I showed how to use the computer-aided learning system in real time.

**Brian:** So you actually did a live demo on stage?

**Bianca:** Yes, but then one of the audience raised his hand, stood up, and said "this is not true, you are lying to us". I was worried, but also really angry. I asked him to come to the stage, and tell me any function he wanted. I was able to display the function he gave me, with its first and second derivatives. The audience applauded, and he returned to his seat speechless. As a first presentation it was a rather shocking experience.

**Brian:** And the line didn't drop to the computer or anything like that?

**Bianca:** No, not at tall. Everything was working, and I was lucky he asked me something simple.

**Brian:** This is the Kunii award. I would like to hear about your work with Professor Kunii. You mentioned he was very influential in your research. When did you first meet him, and maybe you'd like to talk about some of the projects. I know you collaborated with him for a very long time, so please tell us something of your collaborations?

**Bianca:** After starting in computer graphics, I worked in different areas, geometric modelling [2,3], computational geometry [4], graphical software, I was the Italian expert for standards in computer graphics, and applications in computer aided design [5] and geographic information systems [6]. Consider that I was in an Institute of Applied Mathematics within the CNR, so I had to bring out the mathematical content within my research.

For me, it was quite easy to understand that there was a big need for non-trivial mathematics for computer graphics. I say so, because this was the topic that I wanted to push when I met Professor Kunii. The first time I met the Professor was in 1991, when I organized a workshop in computer graphics and mathematics [7], a Eurographics workshop. I put together mathematicians and computer graphics people to push this link because the two communities were reluctant to integrate. In the same year, Professor Kunii invited me to Tokyo. He was a very brilliant researcher with excellent insights, and he had started a study of Morse theory [8] that I immediately found very, very interesting.

This is how our collaboration started. After the meeting in Tokyo, we initiated a bilateral project, Italy–Japan, based on common research that would integrate mathematical skills with computer science technologies in geometric modelling (See Fig. 3). I introduced Michela Spagnuolo to the project (See Fig. 4). At that time she was starting her PhD under my guidance. The research done in her PhD contributed a lot to the collaboration with Professor Kunii.

After a few years, I think in the middle of the 90s, for my personal experience in computer-aided design, computer-aided manufacturing and geographic information system applications, I realized that we could include more applications if we broadened the focus from geometric modelling [9–11]. There was the need for something more to describe the meaning of a shape not only its geometrical or graphical aspect.

After discussing the issue with Professor Kunii, we decided to launch a new topic: Shape Modeling. Professor Kunii was moving to Aizu at that time, as the president of the University of Aizu.

**Fig. 3.** Bianca Falcidieno, Tosiyasu Kunii, and Michela Spagnuolo in Genoa.



**Fig. 4.** Bianca Falcidieno and Tosiyasu Kunii in Bianca's Summerhouse.

We started the first conference on Shape Modeling in 1997 along with the International Journal of Shape Modeling. We also created a big project on digital terrain modelling, that a company in Japan financed. Therefore, thanks to this collaboration we began to work in this new field. I was able to build a larger research group, fund new students, and acquire equipment suitable for our research. So for us, it was really important. Many people, who are now at the institute or elsewhere, started their cutting edge research with me due to this collaboration with Kunii.

**Brian:** Shape Modelling International has been very successful. How did this develop after the 1997 meeting in Japan?

**Bianca:** There was a second edition of SMI in Aizu in 1999, Later, I organized Shape Modeling in Genova in 2001. After this year, the conference became an annual event. Also, the implicit modelling workshop merged with us that year. At that time it was a good, specialized Eurographics workshop, so the merger was good for Shape Modeling and Implicit Surfaces. So thanks to you, Brian, Marie-Paule Cani, and your brother, Geoff Wyvill. I remember we had a successful conference in 2001, helped by this important merger.

**Brian:** Getting back to your work with Professor Kunii. He became very interested in homotopy. I just wondered, were you involved with this move from talking about topology shape modelling to talking about homotopy?

**Bianca:** Yes, we studied these fields. Thanks to this collaboration, I was able to attract a group of excellent Italian topologists to our team, with whom we studied problems related to Kunii's research [12,13].

**Brian:** Talking of our community, you mentioned Michela Spagnuolo, who has become a very well known researcher since those early days. You have had a huge influence on a lot of young people coming into not just mathematics, but computer graphics via mathematics, particularly women. It's interesting that as far as I can see, Italy leads the world in the status of women in mathematics. I wonder how this worked into your plans?

**Bianca:** This is a question I was asked, especially when I started my career. In the beginning we were mostly women, because mathematics is a type of specialization that women appreciated, because, in addition to other professional opportunities, you can become a teacher. Teaching in a school was considered a good job for a woman because it allows you to care for your family. The other reason I mainly supervised women researchers is that it was easy for me to understand their needs. Also I could serve as a role model because not only was I successful in my job, but I also had a family, and I was able to manage my personal and professional life quite well. So I think these two aspects have attracted women. It was different then. Not everyone accepted a woman as a leader. However, now the IMATI team has a balanced composition, which I believe it is best for a research group.

**Brian:** Yes, I think the rest of the world is still catching up. Your work at CNR, and particularly your guidance of the group in Genova, has had a great effect on the lives of those researchers. Are there other researchers you'd like to mention, whose work you are proud of, whom you've nurtured and mentored?

**Bianca:** I think I have grown many researchers. I am proud of it, but I was also very lucky. I had excellent students. I was also fortunate enough to have collaborators such as Michela Spagnuolo or Franca Giannini with whom I co-directed many students [10,14–24]. As for the research with Kunii, I like to mention Silvia Biasotti, who started her doctorate with me on these topics at the beginning of 2000, and became a top-level researcher at IMATI [12,13,22,25].

**Brian:** Indeed yes! Another huge contribution you've made is in terms of the number of European research projects that emerged from your group, initiated by you. I just wondered if you wanted to mention one or two of them?

**Bianca:** Yes, the European projects were the means for doing research and receiving the finance that I used for paying students and postdoc researchers. This was the important thing for me. But I'm also proud that many of them were my research projects. So I was paid for doing what I wanted to do.

One project, in particular, is the most important. It originated from the research I did with Professor Kunii, but was developed later, in 2004, when we no longer worked together. This is the AIM@SHAPE project [26]. Thanks to it, I was able to bring together the best groups in Europe to work on shapes and semantics. I put together the community working in shape modelling and reasoning with experts in knowledge technologies, to develop new approaches to associate semantics with shapes, to increase the number of applications that would use computer graphics. This project was very successful.

After AIM@SHAPE, the term "semantics" entered the Computer Graphics field. It is now used in many recent works that address the challenging problem of understanding and characterizing the meaning of 3D models beyond their pure shape [27–29]. AIM@SHAPE shape repository and digital shape workbench were among the very first examples of infrastructure aimed at promoting the principles of benchmarking and data quality documentation.

After this, I coordinated another European project, FOCUS K3D, in which we used the results obtained from AIM@SHAPE to reach out to different communities. There was a risk that the excellent results we obtained were confined to our community of researchers, so we involved various fields of application: medicine, bioinformatics, archaeology, cultural heritage, to foster the understanding, adoption and use of knowledge-intensive technologies for the encoding and sharing of 3D multimedia content. Thanks to the results obtained in these two projects, IMATI was able to participate in many other European projects. So I think that AIM@SHAPE has been the most important in my career.

**Brian:** And obviously benefiting these application fields considerably by having this kernel of shape modelling there, and understanding of shapes. How's this translated into industry? Is industry picking up on this work now?

**Bianca:** I think yes. For example, in the 1980s, I developed a geometric modeller based on topological concepts. It was adopted by a company that developed software for designing and manufacturing 3D products. More recently the results of our research have not been used so explicitly but less directly, because industrial partners have been part of our projects, and some of their results have been incorporated into industrial products.

**Brian:** I think you'd be surprised how much influence there has been. I recently came across some industries, who were using implicit modelling, for example. You don't know when it starts, this is the problem. Your work probably had more effect than you think.

**Bianca:** Probably you're right.

**Brian:** Your work on the service to the community. You mentioned the SMI conferences, which are still going today, and it's an influential conference, I would say in the community, beyond the more general conferences. What is your impression of the future of conferences? We've had two years of COVID where all the conferences have gone online? Do you see this as something that will be a trend in the future that will we just meet each other online and never see each other face to face?

**Bianca:** So you're asking me what I thinking about the online conferences?

**Brian:** Whether this is going to be the trend for the future?

**Bianca:** I think yes. We can accept that some well-known researchers present their research online. Too bad for young people, I think that the advantage of attending a conference is not just the official part, but what happens in social moments, when people can be approached to start discussions, debate ideas, start collaborations. In this way, many possibilities have opened up for me. So I think online conferencing is not good for young people. It's not such a friendly format, where people are also afraid to ask questions. When you write a question it's not the same as having an informal discussion.

**Brian:** Yes, I agree. It's what we call the *corridor conversations*, which happen by chance and are so important to conferences.

**Bianca:** Perhaps in the future we will have conferences, some live and some in presence or hybrid.

**Brian:** Yes I expect that is our future. In my experience, the conferences have been the absolute driver of research in computer graphics.

**Bianca:** For me, when we had no Internet, no Skype, or anything else, you had to travel to meet people, to invite them to projects. Personal contacts were the only way to build possible collaborations with many people, inside and outside Europe. For example, I remember a project started with George Nagy of the University of Nebraska and then of the Rensselaer Polytechnic Institute on the study of triangular meshes [30]. In this way, I also initiated projects for computer-aided design with the Fraunhofer Institute for Computer Graphics Research IGD in Darmstadt [9]. I remember having participated in a lot of interesting conferences and workshops, where I was able to interact with the best researchers in the world. And these contacts have been essential for my professional growth.

**Brian:** And you're now retired from the institute. I wondered if you're enjoying retired life and whether you're really retired, you still seem to be appearing at the SMI conferences anyway. What are your projects during retirement?

**Bianca:** Yes, I retired, but I'm still doing some research because I still enjoy it. I'm also a grandmother. I have three grandchildren, who fill my life. I think the drawback of retirement is that you get older, that's the problem. For the rest, it is a good life.

**Brian:** Thank you for an excellent overview of what you've been doing in the last how many years it is now since you started with CNR?

**Bianca:** I started in 1974. This year is 47 years since I started.

**Brian:** And congratulations again on the award.

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