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Editorial

Shape Modeling International (SMI) 2022 Awards: Interviews with SMI'2022 Award Winners☆

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ABSTRACT

The Shape Modeling International (SMI) Awards were established to commemorate the passing of the SMI founder, Professor Tosiyasu Kunii. Since 2021, the SMI Awards have recognized exceptional contributors to the field of shape modeling. The 2022 Shape Modeling International Tosiyasu Kunii Achievement Award was presented to Dr. Marie-Paule Cani in recognition of her outstanding career achievements in shape modeling research. We are also pleased to honor her valuable service to the research community, particularly her efforts in organizing numerous conferences, including the Implicit Modeling workshop, which later became part of the SMI conference series. The 2022 Shape Modeling International Young Researcher Award was presented to Dr. Teseo Schneider for his significant contributions to shape modeling. These interviews were conducted by Brian Wyvill and took place in October 2022 via Zoom.

1. Introduction

The SMI Awards were introduced in 2021 to commemorate the passing of our founder, Professor Kunii. The Achievement Award includes a publication by the award recipient to be included in the conference proceedings. The SMI Steering Committee decided that this publication should take the form of an interview, allowing for a more informal discussion of the award winner's research areas, insights, and contributions.

What follows is an edited transcript of two conversations between Brian Wyvill (University of Victoria, Canada Research Chair), a long-time member of the SMI Steering Committee and contributor to shape modeling research, and the two recipients of the SMI 2022 Awards: Marie-Paule Cani and Teseo Schneider. The interviews took place in October 2022 via Zoom (see Fig. 1).

1.1. History of SMI and SMI awards

Shape Modeling International (SMI) is a global community dedicated to advancing the mathematical and computational foundations of shape modeling. It serves as a premier forum where researchers, developers, educators, and practitioners come together to exchange ideas, present innovations, and explore new methods for modeling, simulating, and processing digital shapes and their properties [1].

Initiated in 1997 by Tosiyasu L. Kunii, the symposium became an annual event in 2001 after its merger with the Eurographics/ACM SIGGRAPH Workshop on Implicit Surfaces. The symposium venue rotates among Asia, Europe, and the United States. Proceedings until 2010 are available at DBLP, computer.org, and IEEE Xplore. Since 2009, SMI proceedings have been published by Elsevier as a special issue of the *Computers & Graphics* journal.

The SMI Council was formed in 2020 and consists of previous SMI conference organizers [2]. The SMI Council's charge is to maintain the quality and visibility of the SMI conference and to promote it actively. The SMI Council established the SMI Awards in 2020 following the passing of Tosiyasu Kunii [3,4].

In honor of Tosiyasu Kunii (1938–2020), the Distinguished Researcher Award was established to recognize shape modeling researchers with distinguished careers. The Young Investigator Award was established to recognize young researchers who are in the first seven years of their careers and have made significant contributions to shape modeling. The Tosiyasu Kunii Award was established in 2021 to recognize shape modeling researchers with distinguished careers.

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Fig. 1. Marie-Paule Cani (at the left, front) with Brian Wyvill, John Hart, Michela Spagnuolo, and Alexander Pasko (from left to right, front), at SMI 2010 in Aix-en-Provence, France.

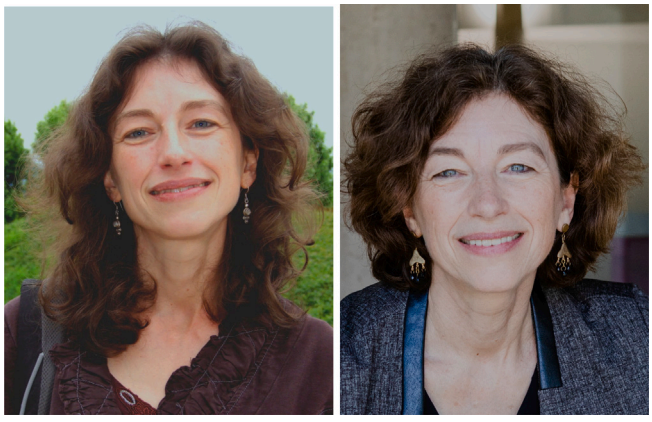

Fig. 2. Marie-Paule Cani in 2008 and 2023.

Fig. 3. Marie-Paule Cani giving a presentation.

Recipients of the awards are selected by the SMI Awards Committee based on proposals from the research community in shape modeling. The Awards Committee is chaired by Brian Wyvill. The members were Ergun Akleman, Loïc Barthe, and Bianca Falcidieno, listed in alphabetical order. This publication provides interviews with Dr. Cani and Dr. Schneider, who are the 2022 recipients of the Tosiyasu Kunii Award and the Young Researcher Award (see Fig. 2).

2. Kunii award winner: Marie-Paule Cani

Marie-Paule Cani is a distinguished French computer scientist renowned for her pioneering contributions to 3D computer graphics, particularly in shape modeling, animation of natural phenomena, and interactive sketch-based modeling. She is currently a professor at École Polytechnique (Institut Polytechnique de Paris), where she led from 2020 to 2023 the "Modeling, Simulation, and Learning" group within the LIX laboratory. Over the course of her career, she has also held major research roles at Inria and joined the French Academy of Sciences in 2020.

2.1. Bio: Marie-Paule Cani

Cani graduated from the École Normale Supérieure and received her PhD in Computer Science from the University of Paris-Sud in 1990, followed by her habilitation from the Institut National Polytechnique de Grenoble in 1995. After early academic appointments at ENS and Grenoble INP, she became a full professor in Grenoble, where she founded and led the INRIA research teams EVASION and later IMAGINE before moving to École Polytechnique in 2017. She also held the Chair of Computer Science at the Collège de France in 2014–2015 (see Fig. 3).

Cani's research aims to make the creation and animation of 3D content more intuitive and accessible, replacing complex manual workflows with natural, user-friendly interaction techniques. Her work spans physically based animation, implicit surfaces, and sketch-based modeling, with notable contributions to the simulation of natural phenomena

Fig. 4. Marie-Paule with IMAGINE-Inria team in 2012, when she was the head of the team.

such as lava flows, oceans, vegetation, and human hair. More recently, she has combined procedural modeling with artificial intelligence and machine learning to develop interactive systems for sketching 3D landscapes and virtual sculpting, helping bridge artistic creativity and computational modeling.

Her achievements have been widely recognized within the computer graphics community. She received the Outstanding Technical Contributions Award (2011), the Distinguished Career Award (2022), and the Eurographics Medal (2025) from Eurographics. She was awarded the CNRS Silver Medal in 2012 and has been elected to Academia Europaea (2013), the ACM SIGGRAPH Academy (2019), and the French Academy of Sciences (2020). She was also named Chevalier of the Légion d'Honneur in 2012 and Commander of the National Order of Merit in 2021. In addition to her research, Cani has provided extensive professional service, serving as President of the Eurographics Association (2017–2018), Director-at-Large for ACM SIGGRAPH (2007–2011), and Technical Papers Chair for ACM SIGGRAPH 2017. She is also deeply committed to mentorship and the promotion of women in science, receiving the Irène Joliot-Curie Prize in 2007 for her efforts in supporting women in computer science. She also received the SIGGRAPH Steven Anson Coons Award in 2023 (see https://history.siggraph.org/award/siggraph-2023-steven-anson-coons-award-cani/) (see Fig. 4).

2.2. *The interview with Marie-Paule Cani by Brian Wyvill*

Question: Congratulations, Marie-Paule, on receiving the second year of our new Shape Modeling International Kunii award. The award is given to someone who has not only made significant advances in their research and many high-quality contributions, but has also made significant contributions to the research community. You have organized many conferences, done much reviewing, and, of course, have a large number of Ph.D. students who graduated under your direction. Let me start by asking you to tell me about your career in computer graphics.

Answer: Firstly, I'm really grateful to receive this award. As to my main contributions, let me go back to when I started in computer graphics. My work has always been devoted to trying to create things, and since I was a child, I used pencils and modeling clay. I was using literal wires, and I was always creating something.

Later, when I discovered computer graphics, I wanted to make these creations possible in virtual form. After my PhD. I discovered the world of implicit surfaces. I thought it was a really great modeling methodology to be able to assemble pieces of material like they were puzzles, using a skeletal base and an implicit interface. This made the process of creation much easier than using spline surfaces, which I had used during my PhD. With implicit modeling, it was possible to paste together parts that could be connected with different blending modes.

I also discovered that with computer graphics, you can not only create static objects, but also create animation and entire animated visual worlds. This was really like a dream come true, because what I created as a child was always static, even if it represented an animated object. With computer graphics, it was possible to create animations. Such creative tools became a theme for my entire work (see Fig. 5).

Question: I think being able to realize your dreams with computer graphics is a wonderful motivation for your work. You said you were using parametric models for your PhD research. What year was that? What was important about it?

Answer: I defended my PhD in 1990. The subject was about modeling and animation of organic shapes. I called them complex or deformable shapes. A kind of soft object. My dream was to do soft objects of dynamic shapes. One of the contributions involved welding spline surfaces together to create objects, such as a human hand, for instance, by pasting smaller pieces together so that the parts could be animated. The animation of soft bodies made from tensor product surfaces defined by a skeleton set, and then connected the skeleton by springs to the control points. It was not until the end of my PhD that I discovered implicit surfaces.

I replaced the splines with an iso-surface around my skeleton, and I could make soft objects with an interface, which was much more natural. All these inspirations were already there in the PhD. For example, soft objects bouncing over each other are made from splines [5] (see Fig. 6).

Question: How did you come by the idea of using implicit modeling?

Answer: One of my friends in the lab said, Oh, look! There is already something called Soft Objects [6,7] right here! And so I discovered this, and then I came up with Precise, Contact Modeling between implicit surfaces [8]. I was trying to solve for contact surfaces, and I was always dissatisfied because it was always a return penetration, but with the implicit formulation, I could formulate a deformation that made the contact really exact, so you could cut a take a cross section of the object, and it was an exact contact surface.

My first Ph.D. student was Mathieu Desbrun. We started using these surfaces for even more soft substances. We were using particles to animate viscous liquids, and we had this idea of using this implicit surfaces. It was the first coating of a liquid with an implicit iso-surface or level set.

Question: In 1986, I showed the soft movie at SIGGRAPH. We also used an implicit technique to show a liquid surface, although we were not trying to make an accurate liquid behaviour as you did.

Answer: Mathieu and I were working on Animating Soft Substances with Implicit Surfaces in 1995, published in SIGGRAPH '95 [9].

Question: I do remember coming across your work on contact modeling published in a SIGGRAPH 1993 paper. I was also working in something similar. When I looked at your work, I realized you had solved all the problems I was working toward. I was very impressed. I had made some pictures, but I was doing it in a very crude way compared to your very nice formulation in precise contact modeling. Did you think you were doing significant work back then?

Answer: What was nice also was the fact that I discovered the power of implicit surfaces. It was the beginning of many people showing interest in that area in the mid-late 1990s. It was at that time that you and I created the implicit surfaces workshop, which later became part of Shape Modeling International.

Question: Maybe you could describe the events that led to the creation of those conferences?

Answer: Yes I remember I contacted Jules Bloomenthal, who introduced you and me at SIGGRAPH '93 and you proposed that we hold the first Implicit Surfaces in Grenoble — no doubt the presence of the French Alps was an incentive!

Fig. 5. Marie-Paule Cani in Guillaume Cordonnier's PhD defense. (from left to right, Guillaume Cordonnier, Pierre Poulin, Marie-Paule Cani, François Sillion, Eric Galin, Jean Braun, and Jean-Michel Dischler.)

Fig. 6. Marie-Paule Cani working with one of her Ph.D. students, Adeline Pihuit, in 2008.

Question: Yes, you are right, climbing is important to me. Jules Bloomenthal was a Ph.D. student of mine at the time, who also made some very good contributions to implicit modeling. There were very few people in the world who were actually interested in that area. Did you feel isolated at all moving into a field like that?

Answer: Not at all, because it was the beginning of my career I didn't know anybody, and having a very small community of really nice people who are eager to work together, was really extremely good for me, because I made friends, including at this first implicit surfaces conference, such as Cindy Grimm for instance, and John Hart, people who I still know, and others in the following Implicit conferences. It was really extremely important to build this community, and having a small conference was a good idea for a young researcher (see Fig. 7).

Question: It turned out that building a conference series around a subject area rather than a problem was not such a forward-looking idea. I'll take the blame for that. As you say, it did bring like-minded people together.

Answer: There was also a conference on point-based graphics at that time. I think it was good for the first few years, discovering the community, finding that there are other colleagues in the area, and getting to know each other. It was a really positive move to merge with a larger conference. That way, we could compare the solutions, using implicit with other models to solve the same problems.

Question: I agree. You had a lot of students through the late nineties and early 2000s who went on to terrific careers like Mathieu. Also, please mention some of the highlights in terms of the people that you inspired, the young people.

Answer: My first full Ph.D. student was Mathieu Desbrun. I don't know if I inspired him, but he continued, and he's still doing some work on simulation, less on implicit surfaces, but recently he contributed to the animation of liquids, for instance. There is a tool that he likes that I don't like, which is meshes. He's doing a lot of work with meshes, while I remain mostly willing to do work that is mesh-less. Mathieu's work is more mainstream. I prefer to stick to what we do with these implicit surface models that don't depend on the way you build the mesh. I really like it. After Mathieu, I had some students doing work with real-time, multi-resolution, physically based models [10–12]. My whole team worked on the creation of natural scenes and phenomena at that time.

Among those students who have made a very good career is Florence Bertails, who worked on hair animation [13]. This was based on layered physically based models and the notion of a wisp of hair, with a skeleton and an embedding around, effectively an implicit volume. It's a very good example of a real-time, physically based animation, using a layered model where you use some geometry and some mechanics, mixed in a smart way in order to have something which is efficient and fulfills the physical properties.

Question: I remember also, Eric Ferley was one of your students who did some nice work.

Answer: His work on virtual sculpture was really good and inspired software such as Z-Brush [14]. We had much of what is now in that product in the late 90s and early 2000s. We had a virtual reality system where you could deposit matter into space, and erase it, embedded in a virtually infinite grid, infinite in space, and resolution. We used the Phantom Arm to provide force feedback when we were sculpting, which was inspiring and launched a series of PhD theses on virtual clay.

Another of my Ph.D. students, Guillaume Dewaele was from mechanics. He designed a real-time, physically based model for virtual clay that was also able to deform at constant volume [15], an important property to make it realistic. A last one, Alexis Angelidis, also made virtual clay but with space deformation [16]. I thus contributed to three different successive models, using implicit surfaces, with a layered physically based model, and then with space deformation. I the three cases we studied deformations that maintain constant volume. It's very interesting to use such metaphor inspired from real life, while not necessarily mimicking reality. For instance, our virtual clay with the space deformation would not collapse under gravity. It also enabled to sculpt with tools that can penetrate within the clay, and then move the clay with them, making modeling much easier than with virtual fingers interacting with the clay material, which we also achieved [17] (see Fig. 8).

Question: It was very nice work. I seem to remember that the Clay sculpture metaphor led you to a lot of work on human–computer interfaces. Many of your students had some very innovative ways of interacting with implicit models.

Question: Yes, we started with sculpting that looked natural, but you really needed to be a good artist to use it. The next step was to try sketching, which is much easier than sculpting for many people. We developed the MATISSE painting system [18], which used an implicit surface system to deposit material, with a brush in 2D, and it could create shapes in 3D but of arbitrary topology, and you can add pieces from another viewpoint, and for this, we needed to add a new technique to implicit surfaces.

Newly added chuck of material could only blend when they touch another part of the model. Imagine you want to draw a cup, for instance, the handle is open with a hole for the hand. You don't want to close it, but if you go too close to the cup body, then it will close within with the standard implicit model.

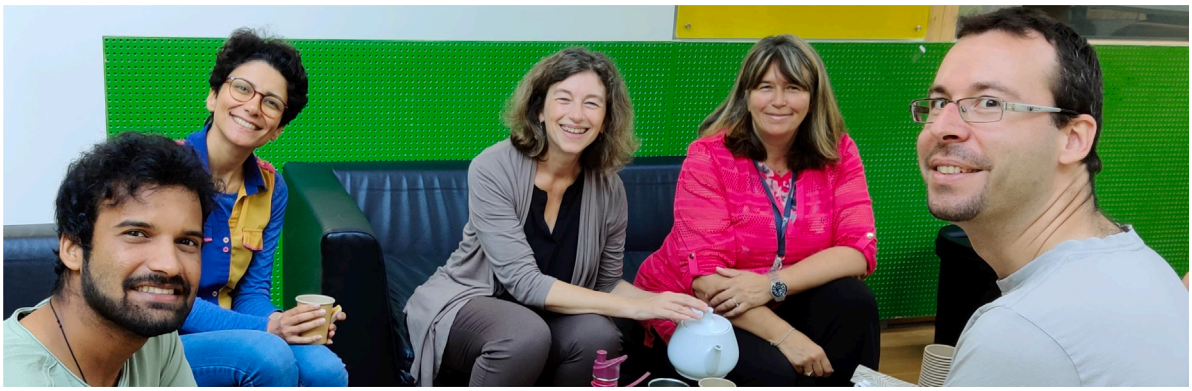

Fig. 7. Marie-Paule Cani with her research team at Ecole Polytechnique.

Fig. 8. Marie-Paule Cani with Amal Dev Parakkat. She served as his postdoc advisor.

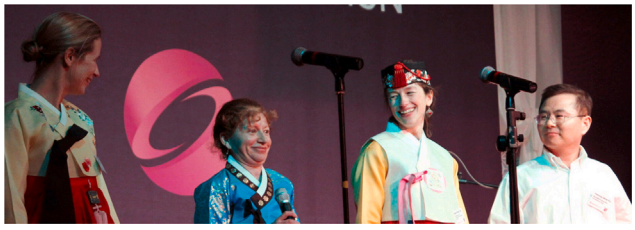

Fig. 9. Siggraph Asia 2010 chairs, Alla Sheffer and Marie-Paule Cani in Korean dress.

Here, Adrien Bernhardt invented a way to have implicit surfaces that blend only where they intersect. We had three successive solutions to this problem, First with Adrien in the original MATISSE paper, then collaborating with Loic Barthe and with you, Brian (see Fig. 9).

Question: Yes, I remember, we had a paper in Eurographics [19], followed by the emergence of the gradient blend.

Answer: Yes, exactly, the gradient blend [20] was a SIGGRAPH paper in 2013 from which we could build some very nice surfaces and it led to a lot of new work.

Question: You also helped create a couple more conference series, one was Sketch Based Modeling (SBIM), which you were heavily involved with, which was then renamed Expressive. These were jointly run by Eurographics and ACM SIGGRAPH.

Answer: Yes, I contributed to these conferences very regularly. It was a great series. We hosted them several times, and discovered that three conferences were linked, so we decided to merge them into the Expressive symposium. They were Computational Aesthetics, Sketch-Based Interfaces and Modeling (SBIM), and Non-Photo Realistic Rendering (NPAR). I was very sad when Expressive was stopped after a few years. Maybe this domain became too attractive for the SIGGRAPH community, and most papers were published at a larger venues. With both SIGGRAPH and SIGGRAPH Asia, people were less interested in keeping these small conferences. I really enjoyed meeting people at Expressive. It was especially good as the objective was a goal — offering expressive, creative tools, rather than being restricted to a single method. This conference series fortunately re-started in 2025 (see https://expressive.graphics/2025).

Question: Your influence has been felt around Europe. One of the advantages of living in France is a being member of this huge community, and having access to the big European grants. How has this helped your work?

Answer: I was really lucky to get this ERC Advanced grant. It is a huge amount of money for five years and is a dream of every researcher, because for five years I don't have to think any more about looking for funding. I could fund five Ph.D. students and a full-time engineer for five years, plus a computer artist for five years. I also had a lot of invited professors visiting me during this period, and we could have a monthly seminar, where people coming from different countries would give talks. At that time, I was in Grenoble with a group of maybe 30 people total, and I was able to help my colleagues as well. The name of this project was EXPRESSIVE (EXPloring REsponsive Shapes for Seamless desIgn of Virtual Environments). We extended expressive modeling from complex shapes [21,22] to motion [23] and to the design of full virtual worlds [24,25]. The Expressive symposium was created after the name of my project (see Fig. 10).

Question: Expressive was a great name to use for those conferences! Perhaps you could say something as well about your career path. You were in Grenoble for a long time, and now you're in Paris. What were the steps along the way?

Answer: My career actually began in Paris, where I completed my PhD. My first Assistant Professor Position was at the Ecole Normale Supérieure in Paris. After two years, the team led by my ex PhD advisor Claude Puech moved to Grenoble, and I decided to go. We created the first computer graphics group there. We also joined INRIA in Grenoble, and I remained there for 24 years. First as an assistant professor, then as a full Professor. I also raised three children. When they left home, I decided to accept an offer from Ecole Polytechnique near Paris, which is one of the most famous French universities. Also, there was no Computer Graphics there yet, so after 30 years in the field, it was really a great opportunity to start again with a new team, and think about new research directions. I chose to work on the application of expressive modeling to the design of animated, natural scenes and phenomena, in collaboration with scientists of other disciplines [26,27]. In addition to gathering a great team, I created a new Master of Science and Technology, which I called "Artificial Intelligence and Advanced Visual Computing". Creating such a program was something I could no longer do in Grenoble because of existing degrees in related fields. It was really refreshing to change universities and create something from scratch there (see Fig. 11).

Question: You talked a little bit about your students and some of your papers, but I notice that your influence in France, especially

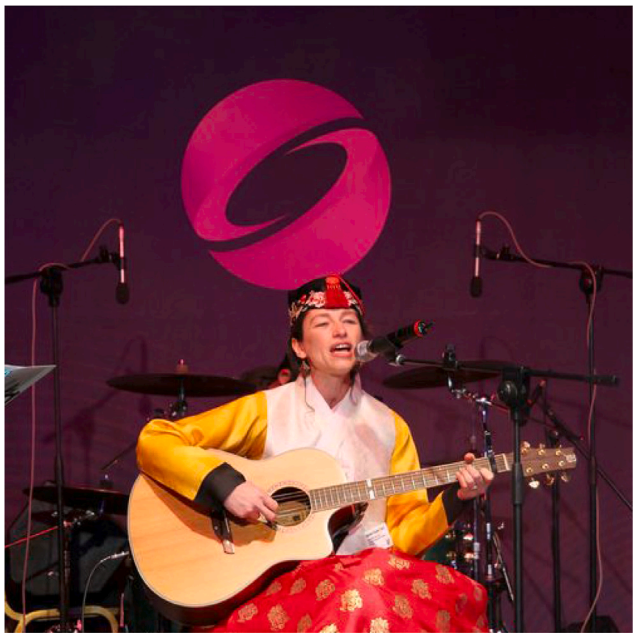

Fig. 10. Marie-Paule Cani was unexpectedly handed a guitar during the official reception at SIGGRAPH Asia 2010.

with implicit modeling, has been very great, because there are a large number of French researchers in this field. You mentioned Loic Barthe, but also Eric Galin, Christophe Schlick and others in France have contributed to this topic. Did your work influence these researchers?

Answer: Yes, may-be, and I worked with many of them. In fact, I have had a great circle of long-term collaborators for many years. Several international researchers also belong to this circle. When I received the Career Award at Eurographics, I had a slide with my main collaborators. By the way, Brian, you may not be aware, but you were on that slide!

Among those that did not work on implicit surfaces, I really enjoyed working with Alla Sheffer from UBC in Canada, on garment modeling [28]. I also worked a lot on the modeling and animation of natural phenomena, as being able to go into nature, at least virtually, is really important for me. One of my major collaborators on that [29,30] is Bedrick Benes, from Purdue University in the US. Another long term collaborator is James Gain, from Cape Town University South Africa [31,32].

Question: What about your mentors? Who have been your mentors in your career?

Answer: Indeed my PhD advisor Claude Puech was one of my mentors. He was confident that I would succeed in Computer Graphics. I was his first Ph.D. student in modeling and animation. There are also many people, and especially women, whom I admired and were like mentors or models along my path. I had a few colleagues who filled this role in my University in Grenoble, but nobody from Computer Graphics. At the time there were very few women in our field. In Computer Graphics, I would say you, Brian! I would cite you as a mentor for sure.

Thanks to the SIGGRAPH co-mentorship program for women, I have also been regularly discussing with a colleague in the US called Eakta Jain. I met her in 2017 when she served in the SIGGRAPH paper's committee that I was chairing. We decided to start a co-mentorship activity. This has been really useful for me, and I hope for her, especially as we are from different cultures, different countries, and completely different environments, making our discussions really interesting.

Question: That is good to find solutions to this problem. When you started, the only women I knew in Computer Graphics was yourself and Cindy Grimm. So do you think you've inspired other women in France and around the world? There were very few women, certainly in the eighties and nineties, in the field.

Answer: That's possible. but it's not me who should say that. I was maybe influential, being one of the few women who made a career in this field. Perhaps people would remember me because my French accent made me somehow more visible. I don't really think of myself as a role model.

Question: You have worked in modeling and animation, and there has always been an artistic flair to your work. How did moving to Paris influence the direction of your research?

Question: Ecole Polytechnique is a small, very high-level university (called a "Grande Ecole" in the French system). What I like there is that there are many different disciplines at the same place. So instead of focusing on tools that can be used by the general public or by artists, I could recently work on novel tools targeting scientists of other disciplines, enabling them to quickly draft and play with their models. More precisely, the goal is that they can visualize their mental abstract images of their object of study, and interact with them to test hypotheses. I wanted that scientists, for example, have tools to sketch not only static but also animated shapes and scenarios, as we did with biologists [33]; or to sculpt their mountains if they work in geology [34]; or to paint their forests and see them grow in ecology. So we worked on painting distributions of trees and bushes [35], and so on. A recent example of such creation tool developed with scientists of other disciplines is a sketch-based authoring system for the design and control of plausible, virtual tornadoes [36].

Being in Paris since 2017, I was elected to the French Academy of Sciences a couple of years later, where I joined the inter-section of the Applications of Sciences. This is curious, because there are disciplinary sections in math, in computer science and mechanics, in physics, biology, and so forth, but my name was proposed by the inter-section. I am really very happy about this. I work there among scientists from different disciplines, who are really open-minded and want to understand how diverse knowledge can be combined toward a variety of applications.

Question: Congratulations on your election. Helping scientists to express themselves and visualize their work is a worthy goal. How many years are you going to continue researching before you think about retirement? Or is that still in the far future for you?

Answer: Oh, it's not a very far future, because if the French Government doesn't change things, I should be retiring in 5 years. There are so many different things that I love in life. I think I could be happy to retire, perhaps remaining as Emeritus and focusing only on enjoyable projects... I no longer get much pleasure from recruitment, fundraising, or reviewing papers. Maybe I should not say that in an interview!

Question: I've been retired for a few years now, and I'm still doing things like this, which, of course, is a great pleasure with you, Marie-Paule.

Answer: Sure, but if I could choose, I'd prefer to get paid for inventing new things!

Question: I'm sure you will not stop being creative.

Answer: I intend to do so, yes, including by creating things through singing, drawing, painting, or sculpting. I love creation in real life. I'll never get tired of it, I think!

Question: Anything else you would like to add?

Answer: The lack of women in our field, at least in France, has tended to increase recently. Computers and coding may look more attractive for boys than for girls, and maybe teenagers don't really understand their goals. People don't know about the collaborative nature of working in Computer Science and the excitement of doing research. They see it as interacting all day long with a machine. In fact, it's mostly interaction with other humans, even if we study what can be created by a machine! Yes, this is something that I regret, and if I could have a role in influencing more young girls to work in computer science, with the example of Computer Graphics, I think it would be a very nice contribution.

Fig. 11. Marie-Paule Cani, then President of Eurographics, pictured with Marcus Gross and Hans-Peter Seidel at the Eurographics 2017 Conference.

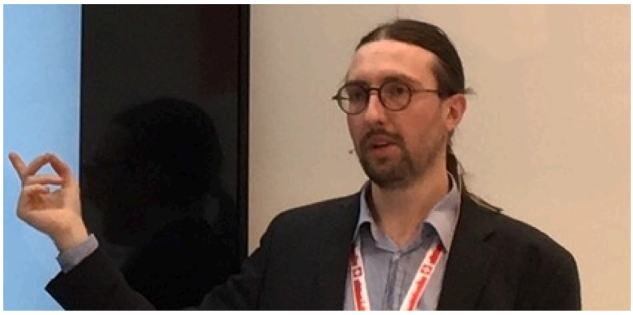

Fig. 12. Teseo Schneider giving a presentation.

Question: Thanks so much for the interview, and congratulations again on the Kunii award, in the same year as the Eurographics award; a great year for you.

Answer: Thank you and the SMI award committee! (see Fig. 12)

Young researcher award winner: Teseo Schneider

Teseo Schneider is an Assistant Professor in Computer Science at the University of Victoria, Canada.

2.3. Bio: Teseo Schneider

Teseo earned his Ph.D. in Computer Science from the Universita della Svizzera italiana (2017) with the thesis entitled "Theory and Applications of Bijective Barycentric Mappings." He earned a Post-docMobility fellowship from the Swiss National Science Foundation (SNSF) to pursue his research at the Courant Institute of Mathematical Science at New York University, aiming to bridge physical simulations and geometry. His research interests are finite element simulations, mathematics, discrete differential geometry, and geometry processing. Teseo is the leading developer of Polyfem, a flexible and easy-to-use Finite Element Library. He is one of the maintainers of libigl and a contributor to wild meshing, a 2D and 3D robust meshing library.

2.4. The interview with Teseo Schneider by Brian Wyvill

Question: Congratulations, Teseo, on being recognized as a shape modeling international young researcher and winning this award. I'm going to ask you a series of difficult questions, and what we'd like to explore is a number of aspects of how you came to be the award winner this year.

Answer: Thank you, Brian, and all those involved in awarding me this honour. It was most unexpected, and I am really happy (see Fig. 13).

Fig. 13. Teseo Schneider with his PhD advisor Kai Hormann.

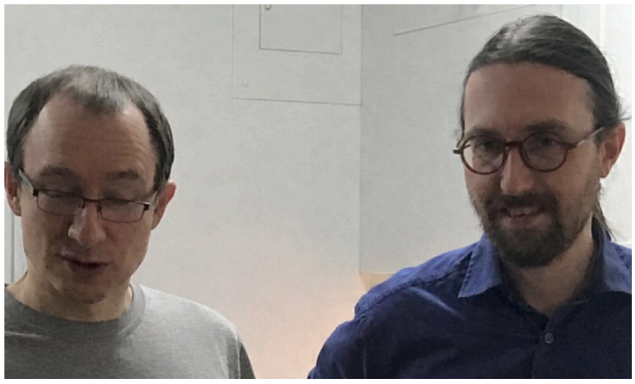

Fig. 14. Teseo Schneider with his Posdoc advisor Daniele Panozzo.

Question: It is well deserved. In the beginning, how did you come to computer graphics as your research area?

Answer: I started my studies as a math major with a minor in Computer Science. My minor soon became more interesting than my major, so I switched to CS, but I still kept this love of doing math for my Master's. Computer Graphics is one of the fields in which you can do CS with Math. There are not many. And I think this is why I got attracted to it. Also, you can make cool, fancy images. I was lucky to have the right professor when I was an undergraduate. After that, Prof. Kai Hormann became my PhD advisor (see Fig. 14).

Question: What was your PhD project?

Answer: I was working on computer graphics and numerical simulation. I hated finite elements and tried as hard as I could to stay away from them, but that is the thing that stuck on me. My thesis project

Fig. 15. Teseo Schneider with Denis Zorin and his Research Group.

was to use bijective barycentric mapping to construct a finite element mesh. Thus, combining Math, simulation, and computer graphics.

Question: Were you visualizing the finite element cell simulation in real time?

Answer: No. In general, none of my research is real-time. The idea was to generate meshes for the finite element method, using bijective Barycentric mappings as a way to transfer between different planar element spaces. The geometry part was fun, the math and final part was less fun, but yeah, it's stuck with me, and now it's part of my research.

Question: Where did you move on to after your PhD?

Answer: I am lucky to be born in Switzerland. At the end of your PhD, you can write a research proposal, and if you get awarded, you can go to literally anywhere in the world, completely paid by the Swiss National Science Foundation, so the host organization doesn't have to pay you. I landed in New York, working with Daniele Panozzo. Maybe it's typical, but I always plan to do something, and when it doesn't work, I do something else. I wanted to continue my work on parametric, finite elements, and develop a framework for doing a simulation with complicated finite elements such as splines, polygons, and polyhedra. It was promising, but it did not work any better than other methods. So we changed direction until we found something that worked better.

Question: Where did you go from there after you decided finite elements was not your main interest?

Answer: Actually, I remained interested in finite elements. The idea was to do complicated finite elements with polygons and polyhedra, such as cubes and also splines, and then write a paper with yet another comparison. Let's say that a complex element is better than using something simple, like tetrahedra. We were kind of surprised that this is actually, indeed, better. So this is where I took a step back to verify any assumptions that we had made. My research philosophy is not to have any assumptions. At least, no strong assumptions about anything, and to verify everything. I think in CS we are really lucky, because implementation and verification don't require setting up a complex lab or building any machinery. You write the code, run it, and see for yourself. This is where the research took a turn. Instead of doing something complicated, we end up publishing a paper about, for example, comparing different kinds of elements or shapes. And the conclusion was that using tetrahedra kind of gives you similar advantages to anything else, and to try it on a mesh. It's a problem to trade it for a finite element that is easier. This is where you know things kind of took a turn, and now you're working with those, so still finite element (see Fig. 15).

Question: In New York, Daniele Panozzo was your main supervisor. Were there any other influential mentors who helped you with your work?

Answer: Yes, Denis Zorin, who is a senior researcher. It's really fun to work with him because, despite being a senior researcher, he is really involved in the day-to-day research. Denis is more on the math side, so I think this is a great team because Daniele is more applied, and the two fit together. It was difficult to leave New York in the end.

Question: I see that you published quite a few papers during that period. Where did you publish?

Answer: So, doing graphics, I mostly publish at SIGGRAPH the engineering journals were so interested in our work. I don't know exactly why. Graphics people are more open to data sets and comparative studies. Maybe I was just not good enough.

Question: And what was your favorite project from that period?

Answer: There, this is something I am super happy to have done in my career. I was in a talk a couple of years ago with Tom Sederberg. It was really a cool keynote, because it was about life. He said that he had a project in which he had this *aha* moment, in which things fell into place. The thing I'm happy about is such a moment, and it's likely not going happen again in my life. One of our papers is about decoupling geometry from simulation and accuracy. The basic idea is that your meshing is hard, and if you read finite element theory, there is an underlying assumption that the mesh is high quality or regular, which is usually not the case.

But what we did was, we revisited the convergence proof and kept the shape of the element explicit. The beautiful thing is that when you rework the proof, you end up with a solution to a simple equation, where you can get an explicit way to control the accuracy by changing the degree of the element.

I think it was really the *aha* moment, because the whole thing started with something complicated and end up with a formula which can be written on a piece of paper that you just compute. Usually, my experience in research is that you try something and then it doesn't work, and then slowly it's an alternative process instead. For that thing, it just worked, and it was really beautiful. I hope I'm going get another moment like that, but I'm not optimistic (see Fig. 16).

Question: Oh, I'm sure you will. Occam's razor plays a big role in any research. So after you left New York, what happened then?

Answer: It was a stressful time, because my postdoc was running out during the pandemic, so all the universities panicked over budgets. I had to find a position. Luckily, I managed to land at the University of Victoria, where they were actually looking for someone doing graphics. Because you, Brian, retired! I am extremely happy being here. I have a family, and I'm not looking to move a million times. Also, they recently hired a lot of new faculty. So there is a population of good, new people with a willingness to change, to make a new start.

Question: So is your research taking new directions now that you're in Victoria?

Answer: Yes, and No. I'm continuing from this initial idea of not making strong assumptions in my research, to rebuilding the whole framework from scratch. I would like to make it robust in the sense that you give any input and you can still get something out.

Moving forward, I want to try to collaborate with people outside of my field, to try out these simulation and finite element methods applied to a strong application in areas such as mechanical or civil engineering, biology, biomechanics, which should be rich in suitable problems. They all need robust algorithms and simulations. I am trying to push a little bit harder on this. For example, we have a Civil Engineering department right here in our building.

Question: Is there anybody you've found to work with in that area?

Answer: I have met potential collaborators in Civil, Mechanical, and Biomechanics. Future interdisciplinary and collaborative research outside my field appeals to me. I have been in graphics, math, and engineering for a while now. So the way to make progress is to try to cross the fields. I can contribute by bringing the pieces together.

Question: I agree, interdisciplinary is a good way to go. Have you started to take on students?

Answer: The hardest part of being a new faculty you are not yet known in the field. The recruitment part is hard, and it's not something you are trained to do. I do have a Ph.D. student. Now she's working on an application in biology, which is something exciting. I have another Ph.D. student joining in September. It's exciting because she has a PhD. in math already. I do have a lot of applications from cs, but people are scared of Math. Maybe this is gonna be the opposite experience. One thing I discovered about Canada, which is great, is that my student needs to have an advisor to do their Masters theses. And so I have three master students now, and more joining in the future (see Fig. 17).

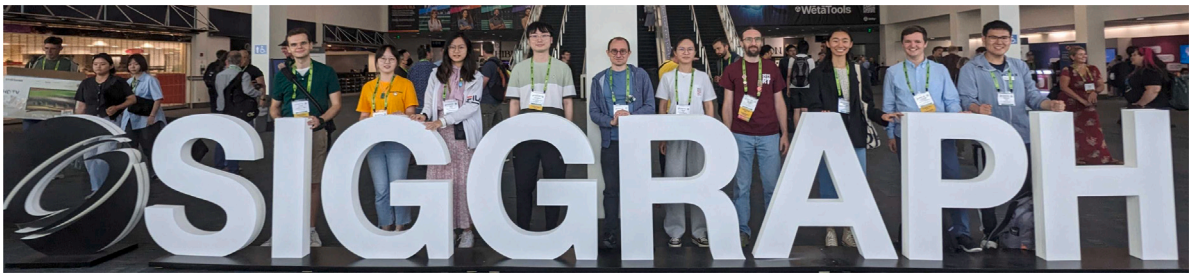

Fig. 16. Teseo Schneider with Daniele Panozzo's research group in Siggraph.

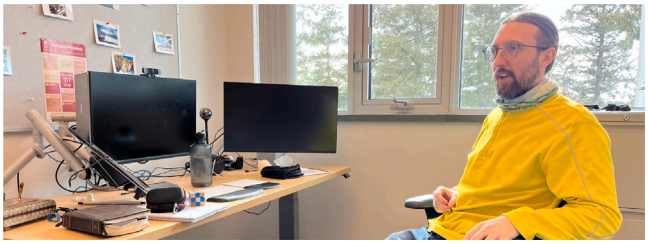

Fig. 17. Teseo Schneider in his office in University of Victoria.

Question: You have a crossover project with biology?

Answer: I have an active collaboration with biologists, and I have a couple of papers in that area. We are trying to estimate how a biological cell is made. We start by assuming the cell is made of two materials.

Question: Often, with interdisciplinary work, the problem is where to publish. Do you think SIGGRAPH will take work in this area?

Answer: The biologists want to publish in Nature. That's not a problem for me, except that getting accepted is not so easy. It's random as for us in graphics (see Fig. 18).

Question: Do you have any words of inspiration for the next generation of researchers coming up?

Answer: My advice is, don't assume anything you think you know. If you read a fancy paper with a fancy name doesn't mean that the thing is correct. Maybe it is, maybe not. Best to implement it. I think in CS, we have this unique opportunity to play around with a method with really low cost. Perhaps a month of experimentation to set up. It's more difficult in biology, or Civil Engineering, you may have to build complex machinery. For us, we just need the code, and you can defend your paper. Once you implement it, you can start poking around by just looking at the code. You can even discover new things. You can even find a new insight about how the process is working. You can apply the method to a problem with sufficient similarities.

Or, you can find out that there are limitations. Some methods may not be as good as those in some papers. Playing around with an implementation is fruitful.

Even if the problem has been solved, you can find out more about it. This has been my experience in the last few years, and it's been exciting.

Question: So critical investigation of other methods important?

Answer: Yes, researchers have a great opportunity that we are not influenced by marketing or other similar. Right, so we can try things.

Don't jump into a research area just because it's new and trendy. We have the opportunity to explore, which is unique in research. I think the most fun is everything.

Question: Great, great words. So are there any other projects you'd like to mention before we sign up?

Answer: One more thing that is changing in our field is being driven by Machine Learning. Don't underestimate the value of a data set, right? So if there is any researcher who has a big chunk of the data that was collected for a project and it is sitting there, publish it. It could be extremely valuable.

Question: Thank you so much, Teseo, and again many congratulations on your Young Researcher Award. I look forward to many more papers and ideas flowing from your office.

Answer: Thank you. Yeah, thank you again for the award.

CRediT authorship contribution statement

Brian Wyvill: Conceptualization, Writing – original draft, Writing – review & editing. **Ergun Akleman:** Conceptualization, Writing – original draft, Writing – review & editing. **Bianca Falcidieno:** Conceptualization, Writing – review & editing. **Loic Barthe:** Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

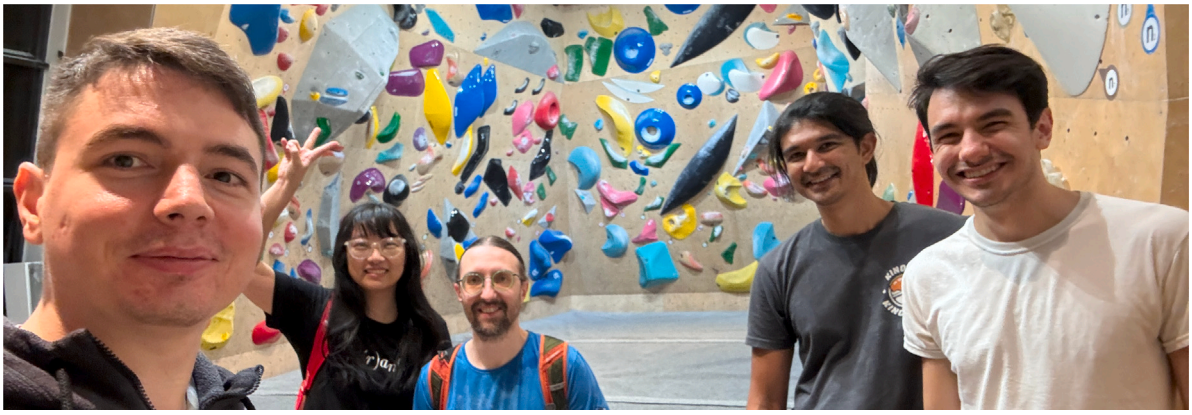

Fig. 18. Teseo Schneider with his research group in Siggraph.

Data availability

No data was used for the research described in the article.

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