

**Further information:**

**Video**

<https://youtu.be/4nbXd3jKkZ0>

**Uni News**

<https://www.unibas.ch/en/News-Events/News/Uni-Info/New-assistant-professor-of-oral-implantology.html>

**UZB**

<https://www.uzb.ch/forschung/mitarbeitende-forschung/>

## Back to her roots

### Former nanoscience student Anne Géraldine Guex is returning to Basel as a professor

From 2024, the Straumann Assistant Professor Anne Géraldine Guex will become a member of the SNI network. The unusual thing about this appointment is that Guex was part of the SNI at the time of its founding, when she was a student of the nanosciences. Now, she will be supervising nanoscience students herself and will play an active role in SNI-supported research projects, focusing on research into oral implantology. Thanks to her previous work in areas such as tissue engineering and biomaterials, she is ideally equipped to develop new materials for subsequent use in clinical practice for the benefit of patients.



Since April 2023, Géraldine Guex has been Assistant Professor of Oral Implantology at the University Center of Dental Medicine Basel (UZB).

After completing school in Fribourg, Anne Géraldine Guex initially wanted to study medicine and attended the Bachelor's information day at the University of Basel to find out more about medical studies there. She then realized that medicine lacked a research component and that her gut instinct to study medicine was not exactly correct. With that in mind, she also sought out information about the nanosciences degree program, which was completely new at the time. "The nanoscience stand appealed to me immediately. The people were really nice,

and I felt like I was in the right place, because I'd always enjoyed tinkering with things and doing my own research," she recalls.

#### **A good start in the nanosciences**

Géraldine therefore enrolled on the nanosciences program in 2003, becoming part of the second-year group of students on this demanding, interdisciplinary course of studies. The program had only been founded in 2002 within what was then the National Center of Competence in Research (NCCR) Nanoscale Science. Looking back, she particularly valued

the sense of team spirit and mutual support. “We used to meet for a ‘constructive cake session,’” she says. “This was a way of combining exercises relating to the lectures with something fun.” The relatively relaxed relationship with the professors is also something that she still remembers fondly. “Although everything was new, and a bit chaotic at times, we were accepted and integrated wherever we went and also enjoyed a great deal of freedom.”

### A focus on chemistry and biology

From the outset, she was primarily interested in questions relating to chemistry and biology. With that in mind, she completed her master’s thesis on tissue engineering in the group led by Professor Ivan Martin, head of the Department of Biomedicine at the University of Basel. Since then, she hasn’t lost her interest in – or fascination with – the production of artificial tissue.

Whereas her master’s thesis explored methods for culturing cartilage in the laboratory, her subsequent doctoral dissertation at the University of Bern focused on muscle cells. “We developed a matrix that was suitable for using mesenchymal stem cells originating from the bone marrow as an implant following a heart attack,” says Géraldine. She continued this research for another year as a postdoc at the Swiss Federal Laboratories for Materials Science and Technology (Empa) and then spent two years studying conductive polymers for bone tissue engineering at Imperial College London as part of an SNSF Swiss Postdoctoral Fellowship.

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**Prof. Géraldine Guex**  
**University Center of Dental Medicine Basel (UZB)**

### Various methods for better healing

After two years in London, Géraldine returned to Empa to research antibacterial wound dressings. There, her investigations focused on various peptides and gallium complexes as potential active substances for tackling bacterial infections. In collaboration with the Laboratory of Organic Electronics at Linköping University, she also evaluated a controlled proton pump that can be used to precisely regulate the pH value in wounds and thus to achieve an ideal, slightly acidic environment for wound healing.

For Géraldine, this was followed by three years as a research scientist at the AO Research Institute in Davos, where she worked with the start-up mimiX and investigated how acoustic waves influence the three-dimensional



Supervising students from different disciplines is one of Géraldine Guex’s core tasks.

orientation of cells within a hydrogel. In another area of research, Géraldine looked at the mechanical simulation of certain cells in the immune system (macrophages) and stem cells from the bone marrow. This work primarily entailed using *in vitro* models to examine how exercise affects the healing process following a bone fracture, for example.

### Returning to Basel as an endowed professor

Despite choosing to study the nanosciences instead of medicine, Géraldine has subsequently turned her attention to medical topics over the course of her career. Accordingly, the obvious next step was to continue in this vein. In 2022, she therefore applied to the University of Basel for an assistant professorship in oral implantology sponsored by the Basel entrepreneur and honorary doctor Thomas Straumann. She ultimately prevailed over her competitors and took up the professorship at the University Center for Dental Medicine Basel (UZB) in April 2023.

“Basel is, of course, very attractive as a city – and biomaterials and tissue engineering are subject areas that I’ve been working on for years. Although I had no previous links with dental medicine, I’m very familiar with organic and inorganic materials and the biological principles needed for the projects,” says Géraldine Guex.

### Setting up a group

Géraldine is currently supervising a master’s student and two doctoral students from the field of dental medicine, but the group will continue to grow. For example, she is now in a position to take on a doctoral student, a biology lab technician and a postdoc. With this team, Géraldine hopes to develop complex, three-dimensional *in vitro*

models consisting of bone tissue in the lower section and soft tissue in the upper section, for example. Models of this kind would allow researchers to investigate how a dental, bone or tissue implant interacts with the body and help to improve our understanding of wound healing processes. They would also make it easier to optimize the surface properties of dental implants using micro and nanofabrication.

With the help of her group, Géraldine is also planning to investigate personalized treatment methods in relation to oral implants. “The methods used in oral implantology today are primarily optimized for healthy patients,” she explains. “If someone with diabetes and impaired wound healing receives an implant, however, standard measures often fail to deliver the desired results.” In this regard, tissue cultured from the patient’s own stem cells, for example, could potentially compensate for the deficits in the body’s own wound healing processes and significantly improve the implant’s chances of long-term success.

Together with Professor Michael Nash of the Department of Chemistry, Géraldine will be supervising a doctoral dissertation at the SNI PhD School from 2024 onward. This research aims to investigate how the formation of bone cells is affected by synergistic effects of nanosurfaces and peptides immobilized on polymer substrates. “We want to understand the influence of surface structure on protein or peptide absorption and how a specific interface affects the differentiation of bone-forming stem cells. The project is also primarily about exploring the interactions between materials and cells using new methods, and about understanding these interactions on the molecular level,” explains Géraldine.

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**University Center of Dental Medicine Basel (UZB).**

Together with UZB colleague PD Dr. Nadja Rohr, Géraldine is also participating in a Nano-Argovia project from 2024 onward. Working with project partners from the FHNW School of Life Sciences and the Straumann Institute, the scientists are investigating how to create the optimum surface of zirconia dental implants for effective healing.

#### **Interdisciplinary education pays off**

Géraldine is looking forward to the work that lies ahead and to collaborating with researchers from wide-ranging disciplines. It helps that she has already been “immersed in an interdisciplinary environment” during her degree. “I learned to communicate with experts from very different disciplines and to respect and benefit from different ideas,” she explains.

Géraldine left Basel with a master’s degree in nanosciences in 2008 and has now returned as a professor. She says she would choose to study “nano” again today, as it has allowed her to realize her childhood dream: carrying out research into medical issues.

“We’re delighted to welcome her to our network as a project leader, and we look forward to her participation in exciting SNI projects.”



Géraldine Guex is looking forward to the two SNI-funded projects that she will participate in starting in 2024.