

A world of opportunity in dental research

The National Institute of Dental and Craniofacial Research,
National Institutes of Health (NIDCR/NIH)



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**Dr Jennifer
Webster-Cyriaque**

Meet Jennifer

Acting Director, National Institute of Dental and Craniofacial Research, National Institutes of Health, Maryland, USA

Fields of research

Oral Health, Microbiology, Immunology, Virology

Jennifer explains the opportunities available for the next generation of dental researchers...



Dentistry is about more than a bright smile...

“Oral health is important because without it, we cannot be truly healthy.” - Jennifer

Oral diseases are highly prevalent. 90% of people in the world are affected by oral disease, including caries (cavities), gum disease, cancers, genetic disorders (including cleft lip and palate), and autoimmune diseases.

“Dental research focused on understanding how best to prevent oral disease and on understanding the relationship between oral disease and systemic disorders will lead to significant improvement.”



The future of dental research

There are challenges to overcome but also many advancements to build upon.

“For example, artificial intelligence is being used to diagnose oral cancers, while microbots made of nanoparticles are being used to brush and floss teeth.” - Jennifer

It is a fascinating time to be entering the world of dental research, where data science and computational tools are being used to look at ‘big data’, answering important questions in oral health.

“New technologies are supporting dental researchers in their work. More people will keep their teeth, have viable replacement teeth and benefit from a healthy oral environment. Working in dental research is incredibly rewarding, and we look forward to you joining us!”



Talking points

1. How prevalent (common) are oral diseases around the world?
2. What impact could new technologies have on oral health?
3. What do you think are the rewards of a career in dental research?
4. How likely are you to consider a career in dental research, and why?

Researchers investigating risks and causes of oral health problems...





**Dr Margherita
R. Fontana**

Meet Margherita



Clifford Nelson Endowed Professor and Professor of Dentistry Director, Global Initiatives Program in Oral and Craniofacial Health, Department of Cariology, Restorative Sciences & Endodontics, University of Michigan School of Dentistry, USA

Field of research
Cariology

As a cariologist, Margherita researches tooth decay. Currently, she is conducting clinical studies to investigate caries risk in young children.

Learn more about Margherita's work...

Margherita's research

“We have developed **caries risk tools** for early childhood and are now focusing on the school age years into early adolescence.

“We are conducting *in vitro* studies of **biofilms**. Chemical and biofilms caries models are important to understand how biofilms react with tooth surfaces and how cavities develop in response to different conditions.

“A career in **cariology** relies on many years of study, but it is very **rewarding**. I have been able to **collaborate** with wonderful communities of people in different parts of the world, all committed to improving the health of children **worldwide..**”



Dr Margherita R. Fontana (center) and colleagues.



**Dr Margherita
R. Fontana**

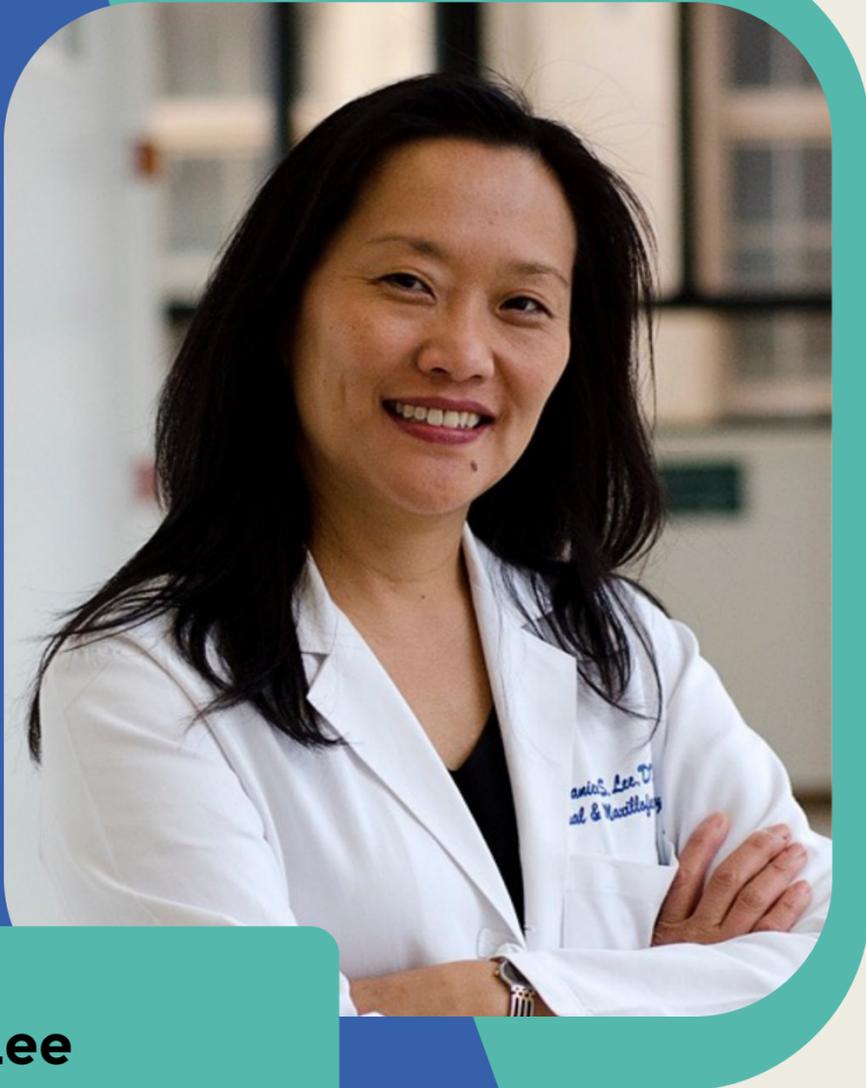
Margherita says...

“What one word sums up a career in
cariology? **Impactful**

My top tip:

**Follow your dreams and take advantage of
opportunities as they happen in life.”**





Dr Janice Lee

Meet Janice

Clinical Director, Craniofacial Anomalies and Regeneration Section, NIH National Institute of Dental and Craniofacial Research, Maryland, USA

Field of research

Craniofacial Anomalies and Regeneration

Janice is a surgeon scientist. She leads the Lee lab, focusing on craniofacial research.

Learn more about Janice's work...

Janice's research

“Currently, my lab is studying **skeletal malocclusions** (severe underbite and overbites) to understand the genetics and shape changes, so we can predict who will develop the condition.

“Using **3D computational analysis**, we examine craniofacial development and compare the differences in healthy groups and individuals with specific diseases.

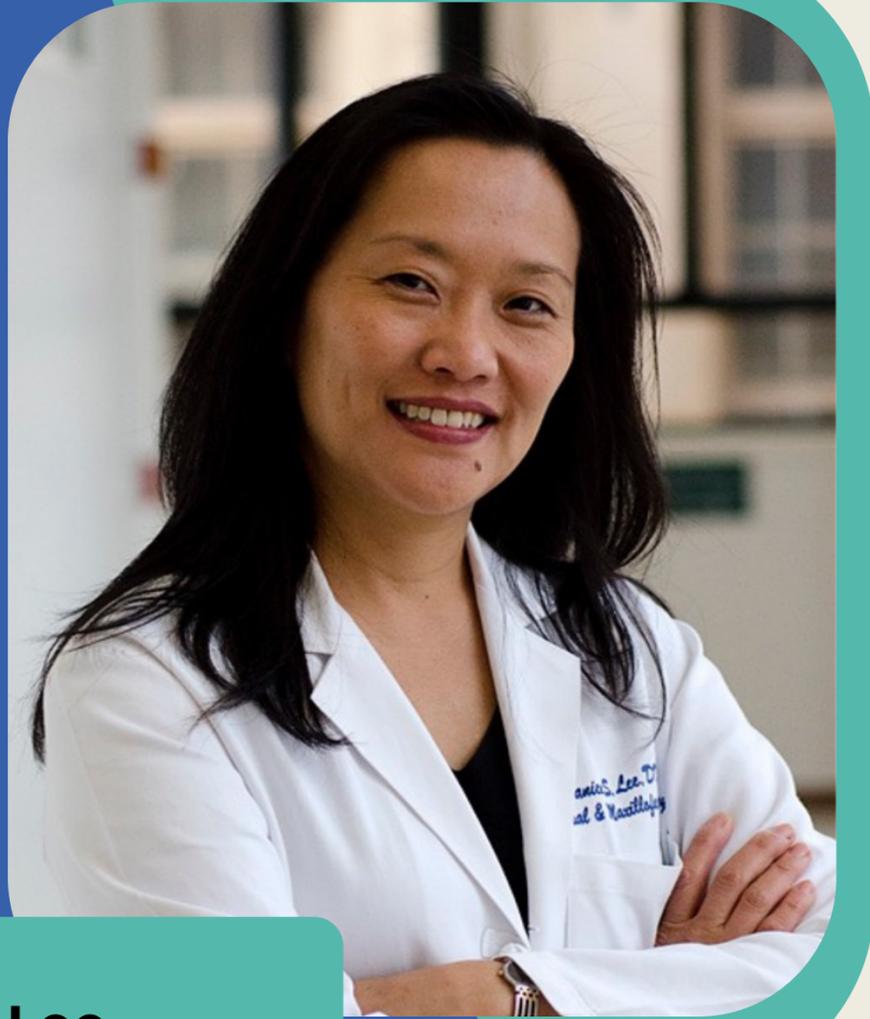
“My research enables me to understand the condition in more detail, informs earlier **diagnosis** and predicts craniofacial development. To do this, my research relies on a strong **partnership** with patients who contribute their time, data and experience to help me find answers.”



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Janice says...



Dr Janice Lee

“What one word sums up a career in craniofacial research? **Fulfilling**”

My top tips:

It’s never too early to **talk** to clinician-scientists who are doing what you find interesting.

Explore and find what **excites** you the most... then work doesn’t feel like work.”



Dr Azeez Butali

Meet Azeez

Gilbert Lilly Endowed Professor of Diagnostic Sciences, College of Dentistry, University of Iowa Health Care, USA

Fields of research

Genetics, Genomics and Ethical, Legal and Social Issues (ELSI)

A researcher in dental and craniofacial genetics, Azeez also directs the African Craniofacial Anomalies Network.

Learn more about Azeez's work...

Azeez's research

“My research has included looking at **non-syndromic clefts** – a birth defect where the nasal and oral cavities have not divided completely – in populations of **African descent**.

“The **African Craniofacial Anomalies Network** is a collaboration between scientists in Ghana, Ethiopia, Kenya, Nigeria and Rwanda. We aim to train and build capacity in Africa for research into dental and craniofacial diseases, to investigate the **genetics** and **environmental** causes of dental and craniofacial diseases, and to create opportunities for **transdisciplinary** and **global** research.

“Genetics is a rapidly **evolving** field, and there is need for constant training and retraining to keep abreast with the **dynamic research** environment.”





Dr Azeez Butali

Azeez says...

“What phrase sums up a career in dental and craniofacial genetics? **Be intentional**

My top tips:

Trust the journey, focus on the clinical skills, and aspire to become the best dental scientist that you can be.

Open yourself up for learning and mentoring.”



**Dr Niki
Moutsopoulos**

Meet Niki

Associate Scientific Director, Tenure Track/Assistant Clinical Investigator (TT/ACI) Faculty Development, Chief Oral Immunity and Infection Section, National Institute of Dental and Craniofacial Research, National Institutes of Health (NIDCR/NIH), Maryland, USA

Fields of research

Immunology, Inflammation, Microbiology

Niki leads the Moutsopoulos Lab, which studies oral mucosal immunity in health and disease.

Learn more about Niki's work...



Niki's research

“We take a **bedside-to-bench** approach to studying **oral mucosal immunity**, aiming to understand oral diseases in people and help treat them.

“Research in our lab combines many types of work, ranging from seeing **patients** in the clinic to performing wet lab experiments, analyzing **data** and applying **computational approaches**.

“We are thrilled that our lab has been able to partner with scientists and clinicians from many fields with the idea that **diverse perspectives** can help tackle complex questions in biology and medicine.”





**Dr Niki
Moutsopoulos**

Niki says...

“My top tips:

Challenge yourself and try to ask important questions.

Find mentors willing to support and push you forward.”

Talking points: Margherita, Janice, Azeez, Niki

1. Why do you think Margherita finds collaborating with other researchers so rewarding? How rewarding would you find it, and why?
2. Why is 3D computational analysis so useful for Janice's research?
3. Why do you think it is important for Azeez to look at environmental factors, as well as genetics?
4. Niki's bedside-to-bench approach involves treating patients (at the bedside) and then conducting research in the lab (at the bench). What do you think are the advantages of this approach?

Researchers investigating ways to correct oral health problems...





Professor Ophir Klein

Meet Ophir

Professor of Pediatrics, Cedars Sinai, California, USA

Fields of research
Pediatrics, Medical Genetics

Ophir is a pediatrician and medical geneticist. His research focuses on craniofacial development.

Learn more about Ophir's work...



Ophir's research

“Our lab is studying how **teeth** form and how the **lining** of the mouth (the oral mucosa) can heal so quickly and without scarring.

“To study craniofacial and dental **birth defects**, we perform a variety of studies, including using mouse and zebrafish animal **models**, experiments with **cells** derived from patients, and **genetic** and **phenotypic** analyses of the patients themselves.

“By learning how **stem cells** fuel both normal turnover of tissues as well as repair of injuries and other types of damage, we are laying a foundation for harnessing the **regenerative** power of these amazing cells and thinking about how to use them **therapeutically**.”



Professor Ophir Klein presenting at a conference



Professor Ophir Klein

Ophir says...

“What one word sums up a career in medical genetics? **Captivating**”

My top tip:

Medical and scientific training will be difficult and challenging at times, and they’ll require some **sacrifices**, but if you love what you’re doing, it is definitely **worth it**. If you can, try not to worry too much about what is going to happen in the distant future, and **focus** on the journey.”





Meet Darnell



Dr Darnell Kaigler

Director of Kaigler Lab, Major M. Ash Collegiate Professor of Dentistry, Department of Periodontics & Oral Medicine, Department of Biomedical Engineering, University of Michigan School of Dentistry, USA

Fields of research

Regenerative Medicine, Stem Cell Biology and Therapy

Darnell leads the Kaigler Research Group, which is focused on the development of methods to regenerate tissue.

Learn more about Darnell's work...

Darnell's research

“My lab conducts research on **stem cell-based therapies** for the regeneration of **oral tissues**. We are currently trying to determine how stem cells from the body can be procured, cultivated and re-introduced to the body to **repair, regenerate and reconstruct** diseased and damaged tissues.

“This stem cell therapy could have great **impact** on people and their everyday lives by enabling treatment of debilitating conditions for which there are currently **limited** treatment options.

“Using stem cell therapies to successfully treat patients in our **clinical trials** and seeing the impact it has had on patients are **highlights** of my career.”



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Dr Darnell Kaigler

Darnell says...

“What one word sums up a career in periodontics? **Awesome**”

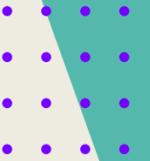
My top tip:

Pick something to study that you are **genuinely interested and excited** to learn about.”

Talking points: Ophir, Darnell

1. What is it about stem cells that interests Ophir?
2. What do you think are some of the challenges of medical and scientific training that Ophir mentions?
3. What does Darnell think reintroduced stem cells could do to damaged tissues?
4. What do you think are the challenges and rewards of running clinical trials like Darnell does?

Researchers investigating wider impacts of oral health...



Dr Donald L. Chi

Meet Donald

Professor and Associate Dean for Research, Lloyd and Kay Champan Endowed Chair for Oral Health, School of Dentistry, University of Washington, USA

Fields of research:

Pediatric Dentistry, Health Services

Donald is a pediatric dentist whose research addresses health disparities. He works with vulnerable and marginalized communities, targeting health inequality.

Learn more about Donald's work...

Donald's research

“Many individuals from **vulnerable** communities have similar experiences. These include difficulties accessing dental care, high sugar diets, and inadequate fluoride exposure – all of which pose **risks** for their oral health.

“**Oral health inequities** in childhood can lead to pain, missing teeth, hospitalizations, systemic diseases and missed school days. These factors have **lifelong consequences**, many of which are irreversible.

“It’s an absolute **joy** working with children though **pediatric dentistry**. My research is aimed at **breaking the disease cycle**. Conducting research that has a positive impact on vulnerable families is something I am very proud of.”



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Dr Donald L. Chi

Donald says...

“A career in pediatric dentistry summed up in one word? **Opportunities**

My top tip:

Hone your **thinking** and **writing** skills, **read** broadly, and when communicating with others, **practice** conveying the **big picture** first.”



Dr Caroline Shiboski

Meet Caroline

School of Dentistry, University of California San Francisco, USA

Fields of research

Orofacial Science, Oral Medicine, Epidemiology

Caroline studies how immune dysfunction can manifest in oral health problems.

Learn more about Caroline's work...

Caroline's research

“If a person's **immune system** is weak, they may develop more infections (from either bacteria, viruses or fungi), and some of these infections can happen in the mouth.

“The immune system can also be overactive, when a person has an **autoimmune disease**. There are many different autoimmune diseases, with each one affecting a different part of the body that is being attacked by **overreactive** immune cells.

“My career highlights include having the opportunity to work with **multidisciplinary** teams for my work in **HIV** (a condition where the body's immune system is unable to fight off infection or disease), and for my work in **Sjögren's disease** (a condition where the body attacks glands that secrete fluid).”



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Dr Caroline Shiboski

Caroline says...

“What one word sums up a career in orofacial science? **Multidisciplinary**”

My top tip:

Don't get into a lot of school debt to go to graduate school too early. Explore options for **scholarships, training grants, etc.**”

Talking points: Donald, Caroline

1. What do you think are some of the lifelong consequences for people who experience oral health inequities in childhood?
2. How do you think Donald aims to break the 'disease cycle'?
3. How might a weakened immune system be evident in someone's mouth?
4. What type of research has working in multidisciplinary teams allowed Caroline to conduct? Why do you think Caroline considers this work a career highlight?

Pathway from school to *dental research* (1/2)

A focus on biology, chemistry and mathematics in high school and college will provide a good foundation for a dental degree.

There are many opportunities to try dental research with the NIH and at colleges and universities across the US, in low and middle income countries, and elsewhere.

This [website links to NIH training opportunities](#) from high school and beyond.

Pathway from school to *dental research* (2/2)

Azeez and Janice recommend the Office of Intramural Training and Education's [website for summer internships and other programs](#).

Jennifer highlights the huge range of fields of science that dental research involves: “Genetics, oncology, developmental biology, engineering, neuroscience, microbiology, immunology, biochemistry, physiology, public health, data science/computational biology, clinical research, and health disparities just to name a few...,” she says. The discipline that appeals to you will impact the courses you take at the college level and the path you take beyond that.

Explore careers in *dental research*

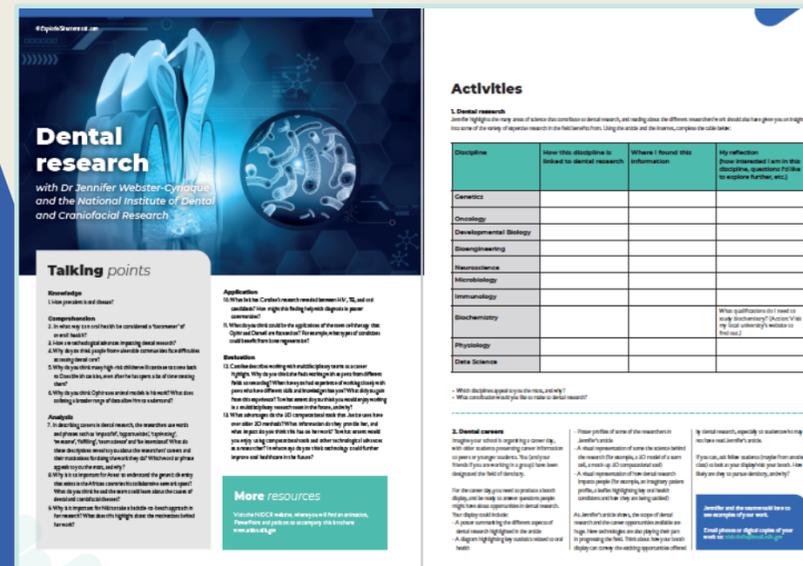
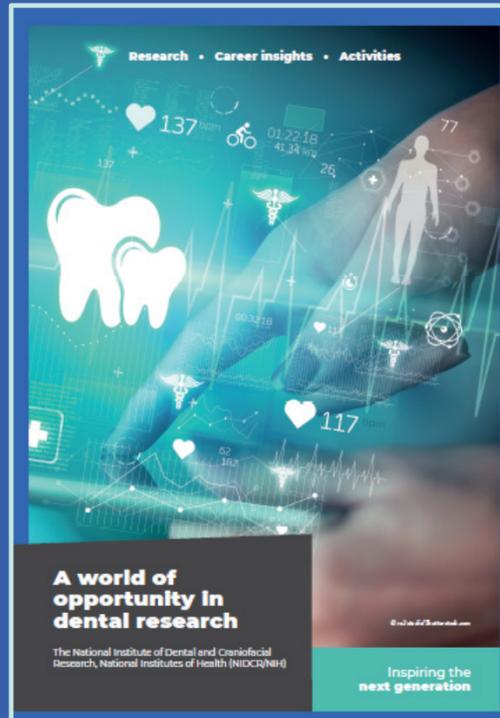
Donald suggests finding a dentist to shadow. This could be a dentist who runs a full-time practice or a dentist in an academic setting. Caroline adds how valuable it is to talk to people in the profession to hear about their work.

Margherita advises finding great mentors and joining scientifically strong groups.

Talking points: Jennifer

1. What do you think are some of the benefits of participating in a dentistry-focused student program? How would taking part in such a program benefit you personally?
2. Of the range of fields Jennifer highlights as being involved in dental research, which interest you the most, and why? Which fields do you know the least about currently, and how could you find out more?
3. How could you go about finding a dentist to shadow or to talk to about their profession? If you are unsure, who could you talk to at your school to help you?
4. Now that you know more about dental research, how likely are you to consider a career in the field, and why?

More resources



01 Download Jennifer's [article](#)

02 Download Jennifer's [activity sheet](#)

03 Download Jennifer's [animation](#)

04 Download Jennifer's [podcast](#)