



From High-Tech Dentistry to Everyday Tools: Making the Invisible Visible

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The Dental College of Georgia at Augusta University
Associate Dean of Digital Technologies and Associate Professor
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Background

Machining technician degree, 2001-2003
Computer technician degree, 2002-2005
IBM (systems' monitor and graphic designer), 2006-2007



Doctor of Dental Surgery, 2007-2010

State University of Campinas



MSc in Dental Materials, 2011-2012

State University of Campinas



PhD in Dental Materials, 2013-2016

State University of Campinas



Visiting Scholar, 2014

AUGUSTA
UNIVERSITY

Augusta University (Dr. Frederick Rueggeberg)



Assistant Professor, 2015-2020

UNIVERSITY OF
DETROIT
MERCY

University of Detroit Mercy



Associate Professor with Tenure and Department Chair, 2020-2022

UNIVERSITY OF
DETROIT
MERCY

University of Detroit Mercy



Associate Professor and Section Director, 2022-present

AUGUSTA
UNIVERSITY

Augusta University



Vice Chair, Department of Restorative Sciences, 2023-2025

AUGUSTA
UNIVERSITY

Augusta University



Associate Dean of Digital Technologies, 2025-present 

AUGUSTA
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Augusta University



AUGUSTA UNIVERSITY

**DENTAL COLLEGE
OF GEORGIA**



Our Mission: To provide leadership and excellence in oral health education, research, clinical care and service.

Our Vision: To be a globally recognized leader in the prevention of oral disease and the preservation of oral and systemic health.

Our Values: Collegiality · Compassion · Excellence · Inclusivity · Integrity · Leadership · Service



AUGUSTA UNIVERSITY
**DENTAL COLLEGE
OF GEORGIA**

01 Primary outcome **Dentists**

Education of dental professionals to meet Georgia's oral healthcare workforce demands.

- **Practice-ready graduates for Georgia communities**
- **Advanced specialty training programs**
- **Pipeline for rural and underserved areas**

02 Primary outcome **Patient Care**

Comprehensive dental services to Georgia's population, including patients who face barriers to accessing care.

- **Quality patient outcomes and safety**
- **Access for underserved populations**
- **Comprehensive and specialty care services**



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Research & Scholarship

Advancing knowledge, improving techniques, and shaping the future of dentistry

Service & Leadership

Professional engagement, community outreach, and advocacy for oral health

Digital Technologies

Infrastructure and innovation that elevates education, care, and discovery



Digital Dentistry



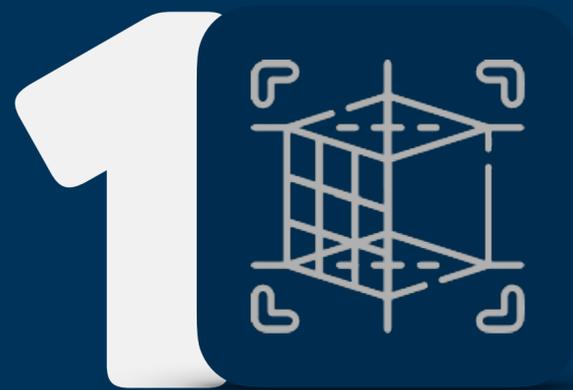
Dentistry



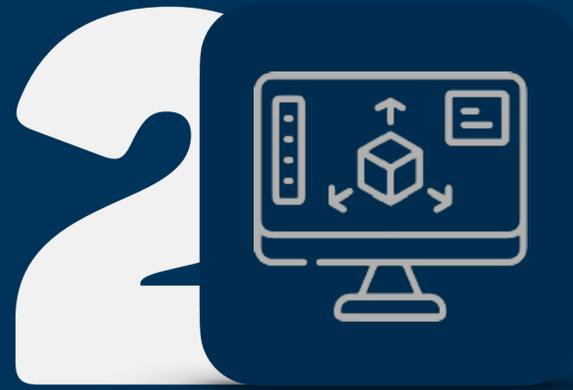
Digital



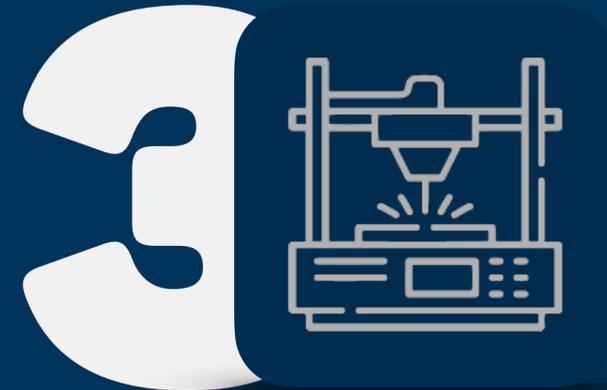
Digital Dentistry is not a substitute for foundational knowledge. Without understanding of anatomy, occlusion, or materials science, the technology is just data.



*Imaging
Scanning
Acquisition*



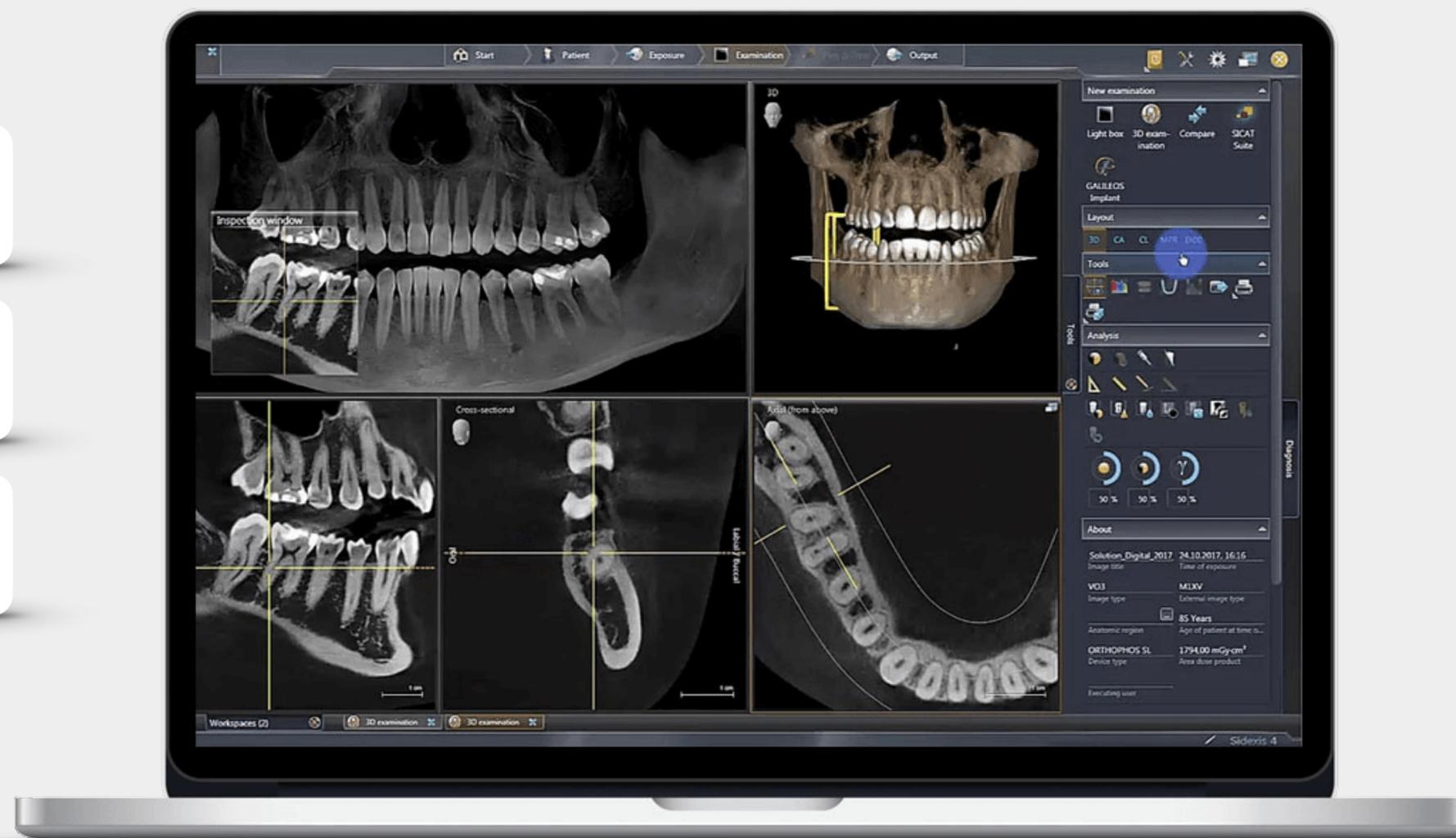
*Designing
Processing
Manipulation
CAD*



*Manufacturing
Milling
Printing
CAM*



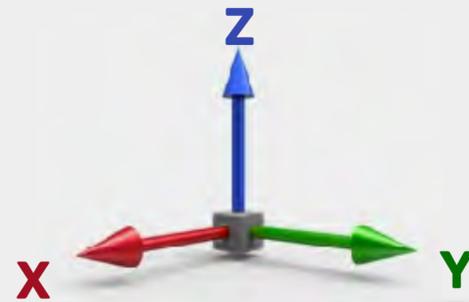
- 1
- 2
- 3







HOW
does it work?



Coordinates

Each point in space will have a value for x , y , and z .

Coordinates

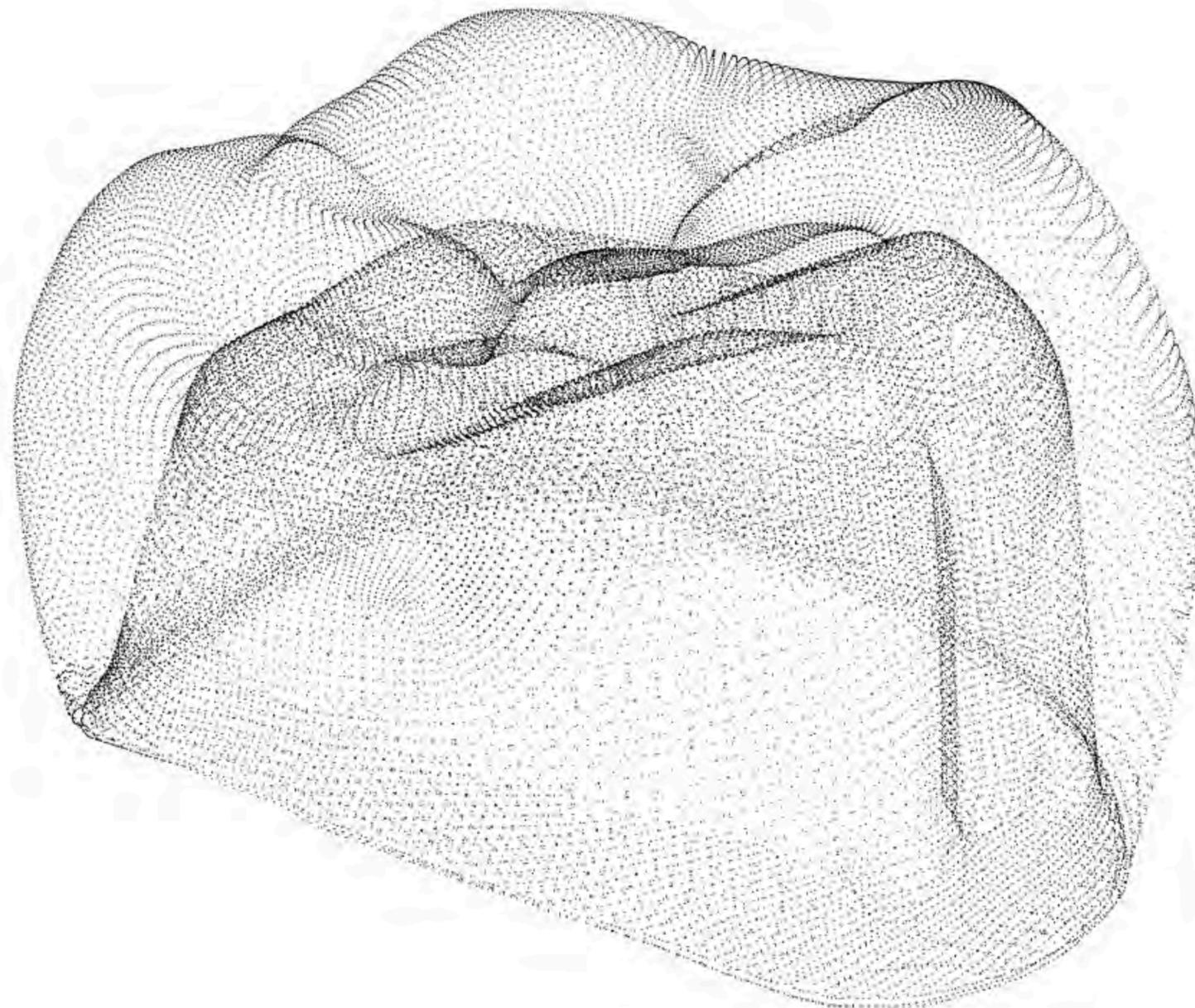


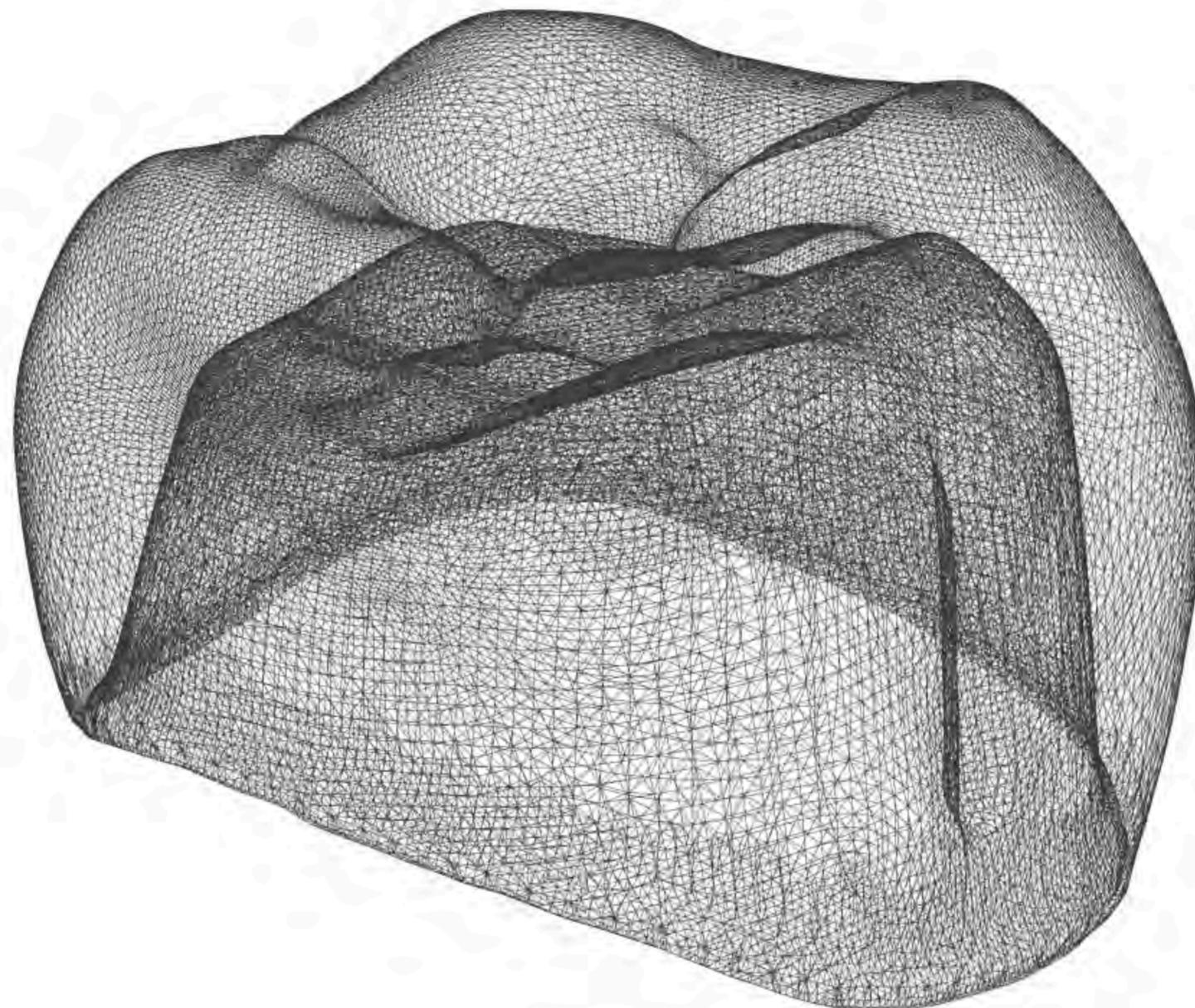
Dental College of Georgia
Latitude: 33.4667865
Longitude: -81.9909944
Elevation: 44 m

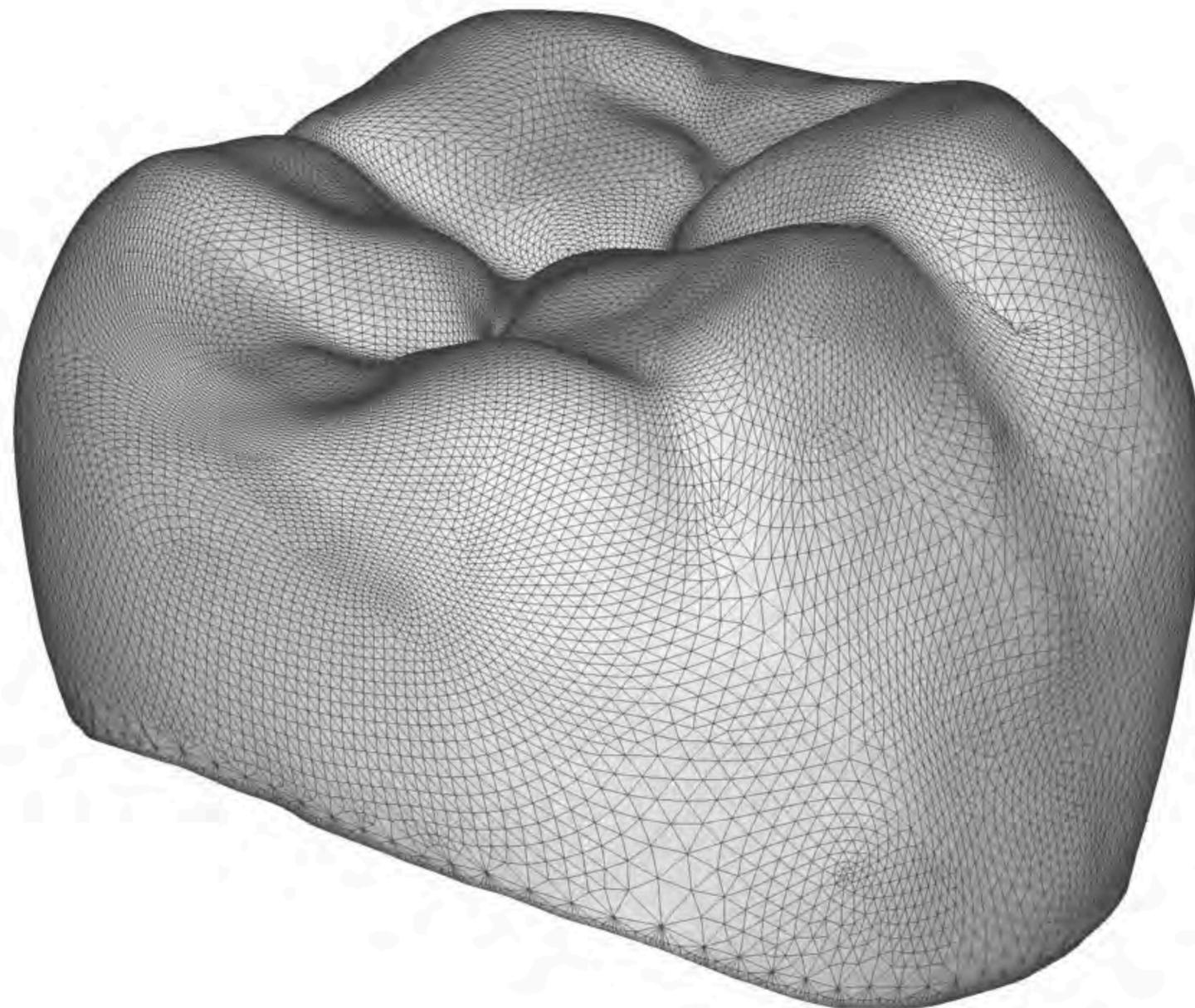


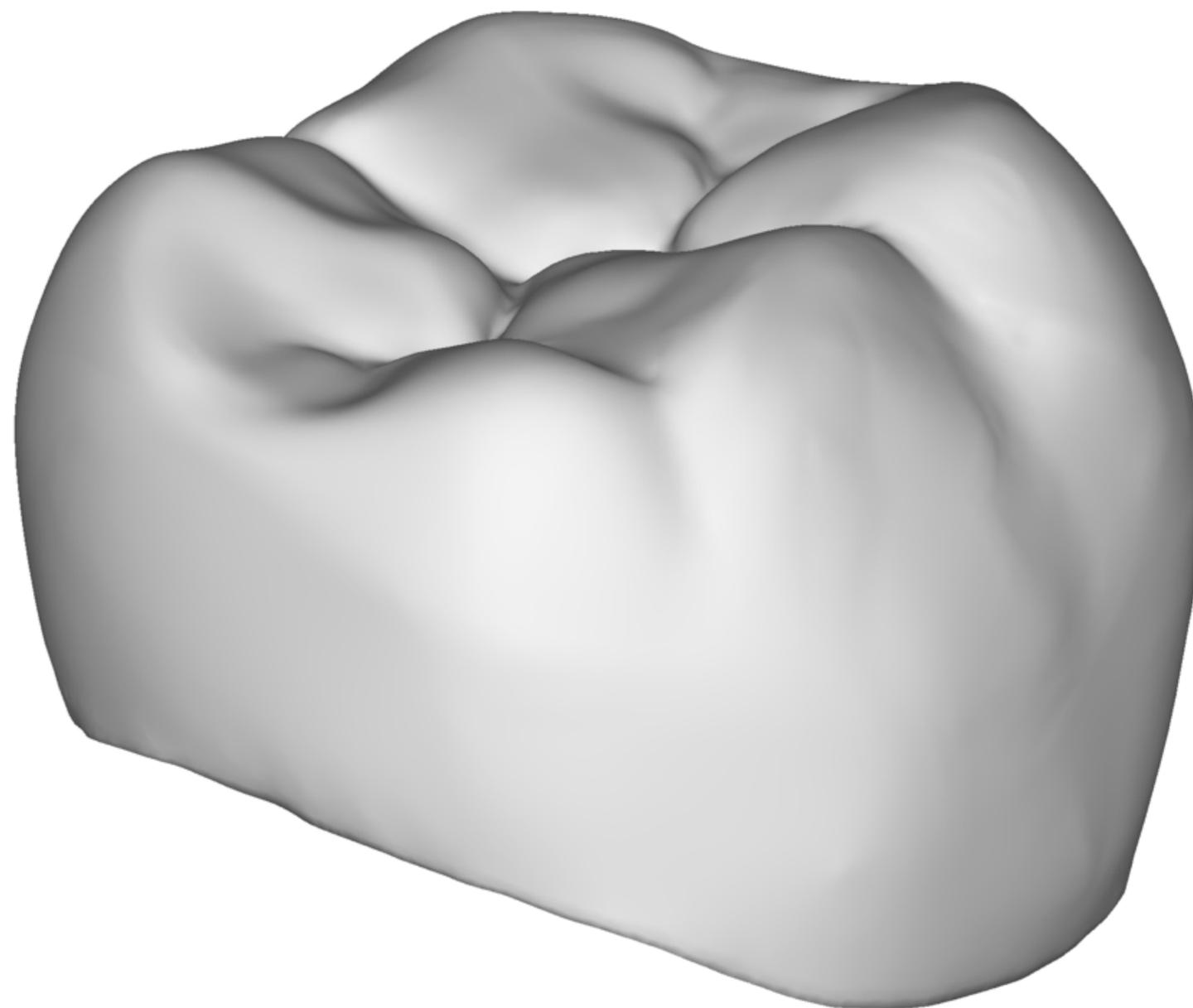
Where Dr. Pacheco was born
Latitude: -23.5570003
Longitude: -46.6612482
Elevation: 836 m







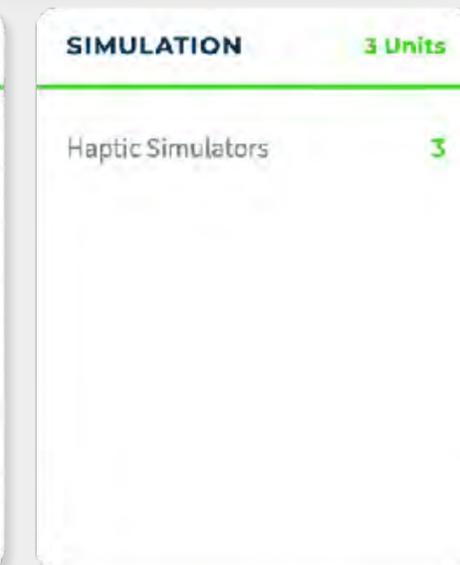
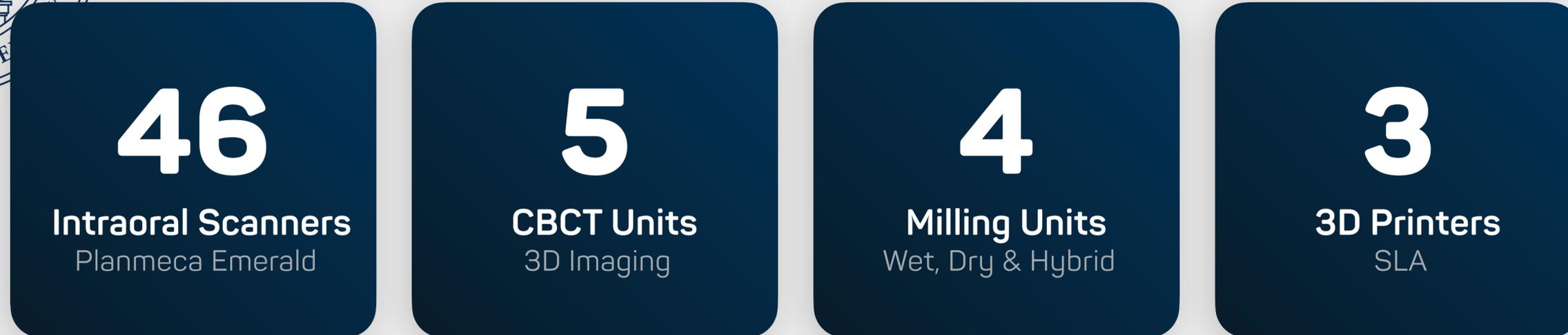






Digital Infrastructure at DCG

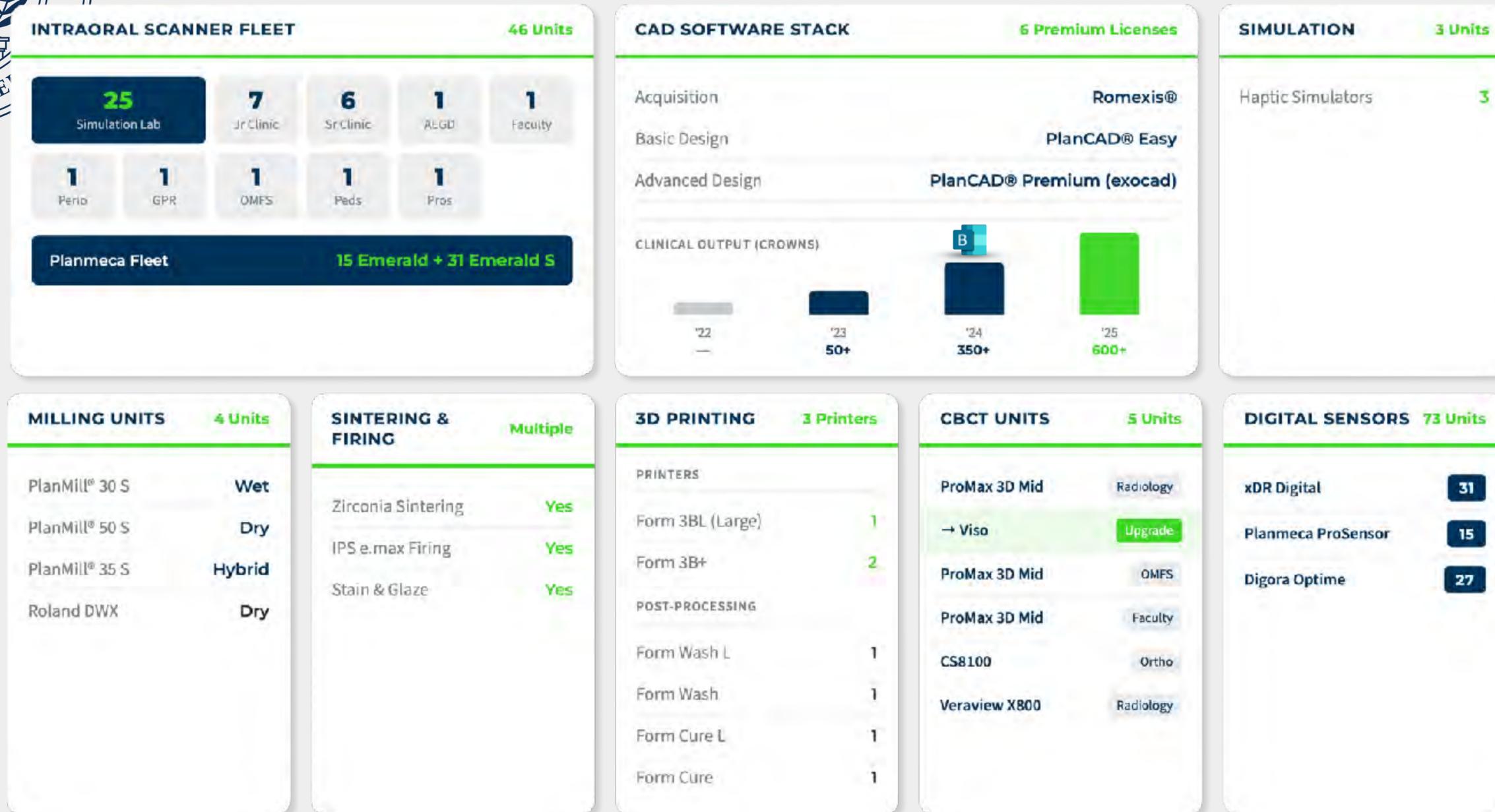
"The Dental College of Georgia's Digital Ecosystem" **PLANMECA**





Digital Infrastructure at DCG

"The Dental College of Georgia's Digital Ecosystem" **PLANMECA**





Digital Council

AUGUSTA UNIVERSITY
DENTAL COLLEGE
OF GEORGIA



What is the best system?



What is the best car?





EMERGING TECHNOLOGIES AND TECHNIQUES CLUB

AUGUSTA UNIVERSITY

DENTAL COLLEGE OF GEORGIA



ScAnaPalooza

PLANMEGA Dentsply Sirona 3shape MEDIT DEXIS iTero

NO BORING LECTURES. JUST SCANNERS AND SANDWICHES.



SATURDAY, MAY 3, 2025

10:00 AM to 4:00 PM (Lunch provided at noon)
 GC Commons Building

SPOTS ARE LIMITED
 REGISTER NOW!



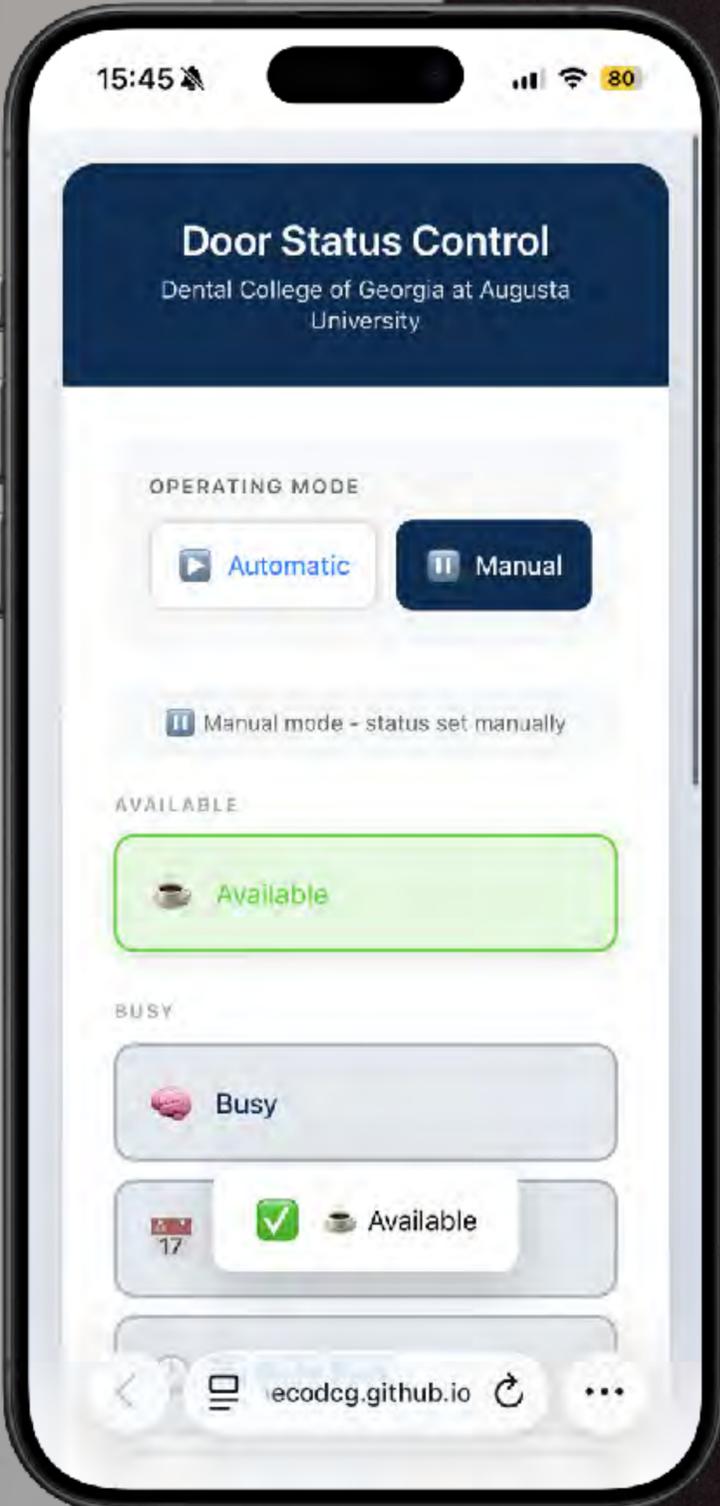
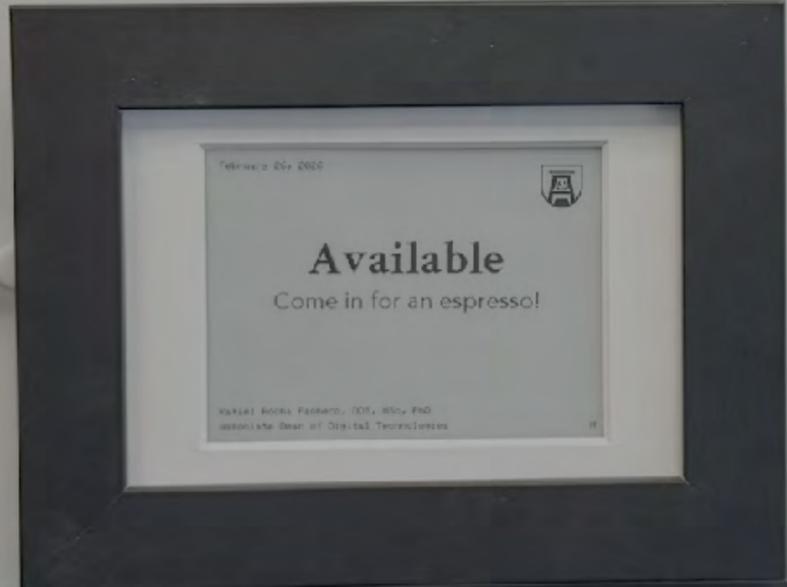
STUDENTS
 RESIDENTS
 FACULTY

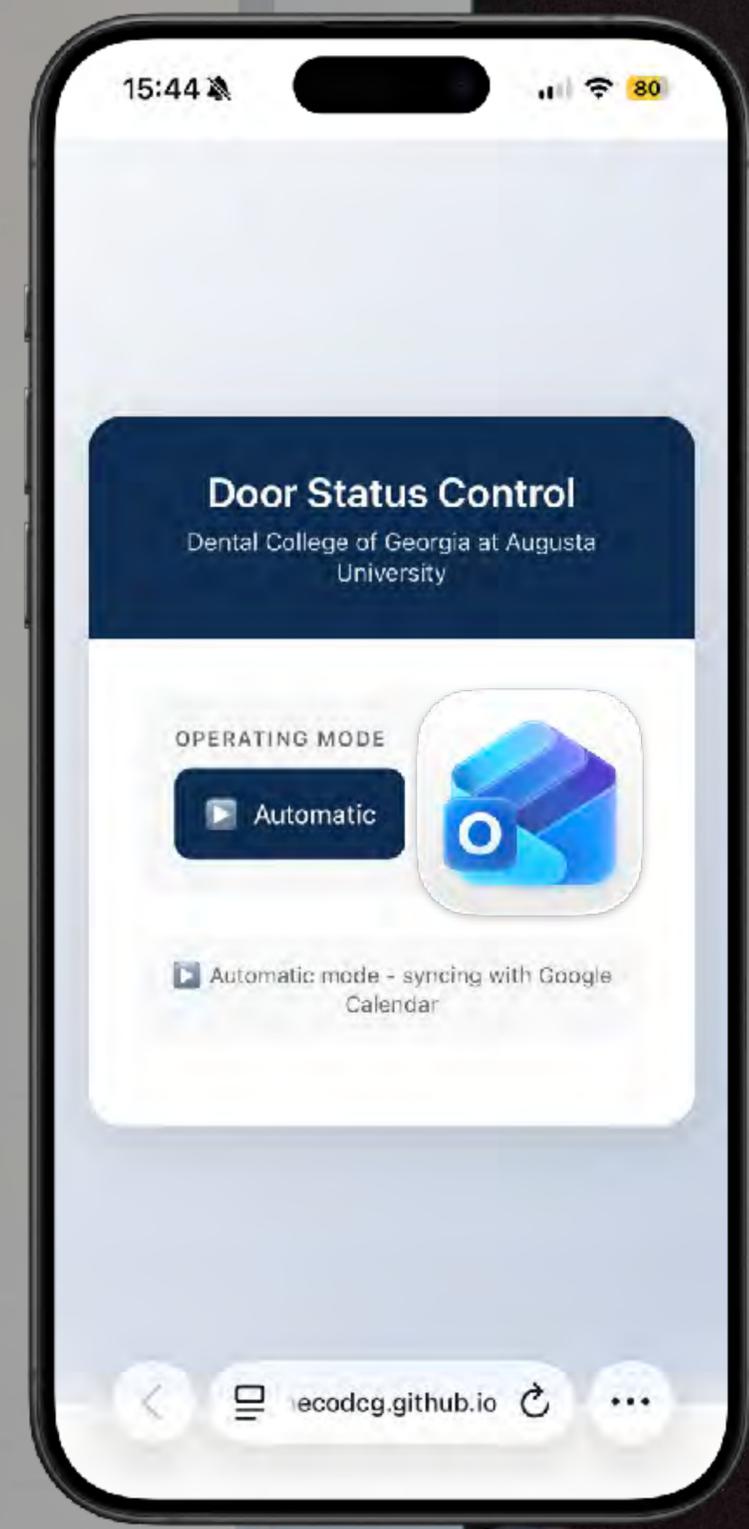
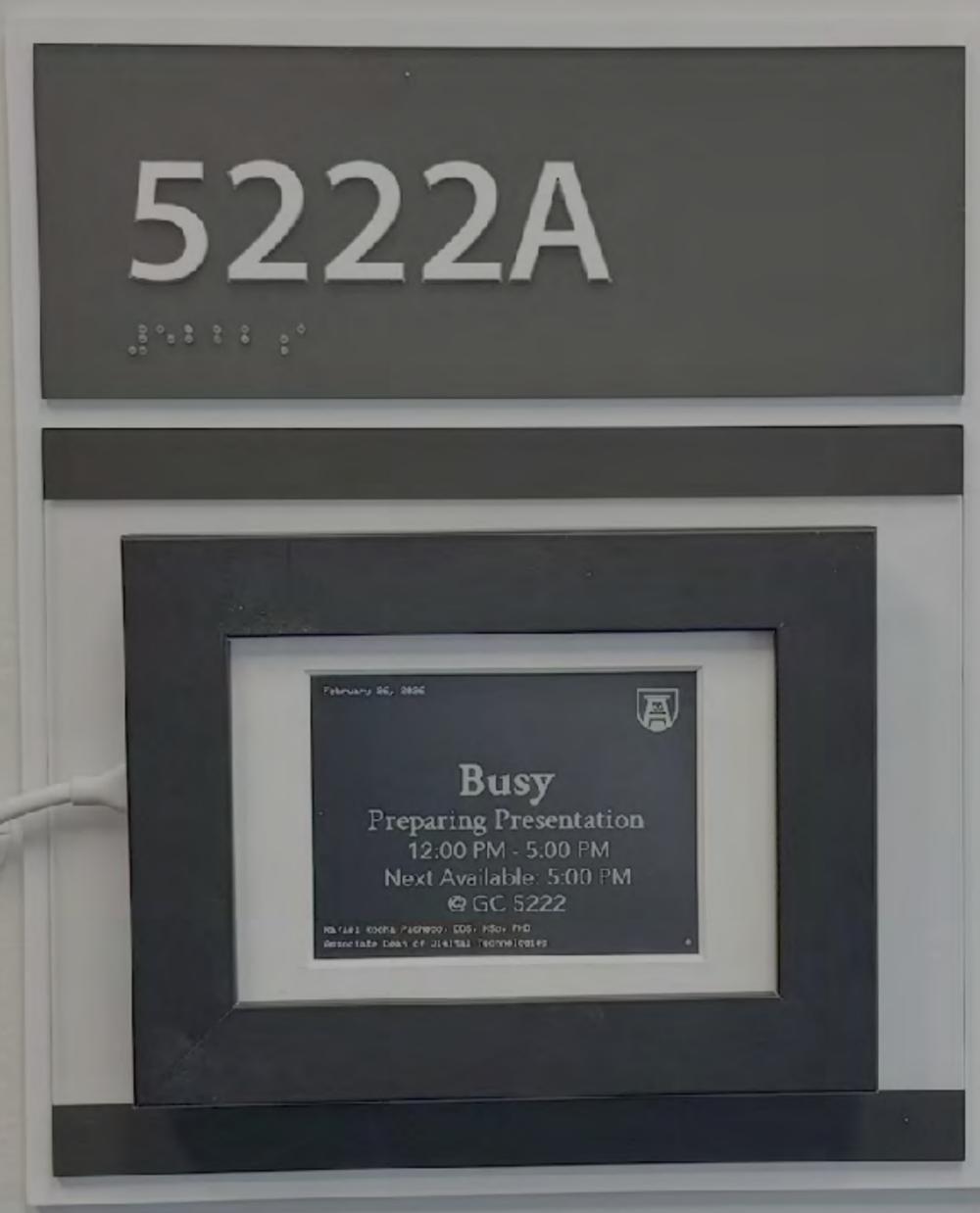
- ✓ Test-Drive the Scanners from All Major Brands
- ✓ Learn Directly from Manufacturer Experts
- ✓ Exclusive Educational Discounts
- ✓ Free Lunch & Giveaways



5222A

Braille characters







Microsoft Outlook
Email and calendar



Microsoft Teams
Team collaboration



Keynote
Slide presentations



Adobe Photoshop
Image editing



Microsoft Planner
Task mgmt.



Microsoft Bookings
Appointments scheduling.





Microsoft Outlook
Email and calendar



Microsoft Teams
Team collaboration



Keynote
Slide presentations



Adobe Photoshop
Image editing



Graphpad Prism
Statistical analysis



Endnote
Reference mgmt.



Claude
AI assistant



Voice Memos
Audio transcription



Microsoft Planner
Task mgmt.



Microsoft Bookings
Appointments scheduling.



Scanning and designing are among the best learning / teaching tools ever created.

They allow us to see what was previously invisible: preparations cut in half, the inside of a crown, and other detailed perspectives.



ADVANCE THROUGH INNOVATION

ADEA | ASSOCIATION OF DENTAL EDUCATORS | WILEY

Enhancing dental education through 3D manuals: A transformative approach

Adrian Oliveira Viana PhD¹ | Frank Yulijans² | Corinne Solorzo PhD³ |
Rafael Rocha Falcão PhD⁴

¹Department of Restorative Dentistry, University of Illinois, School of Dental Medicine, Urbana, IL, USA
²University of Tennessee School of Dentistry, Knoxville, TN, USA
³Department of Restorative Dentistry, University of North Carolina, Chapel Hill, NC, USA
⁴Department of Restorative Dentistry, Federal University of Rio de Janeiro, Rio de Janeiro, Brazil

Correspondence:
Adrian Oliveira Viana, Department of Restorative Dentistry, University of Illinois School of Dental Medicine, 1230 S. Lincoln, Urbana, IL, USA.
Email: aviana@uiuc.edu

PROBLEM (PAIN):
The traditional methods of dental instruction, which have heavily relied on the use of images and lectures, present a significant challenge in adapting to the current educational environment. The new generation of dental students are increasingly interested in using a 3D approach to learn. This paper presents a transformative approach to dental education through 3D manuals. The authors discuss the challenges and opportunities associated with this approach and provide a framework for its implementation.



ADVANCING THROUGH INNOVATION
DENTAL COLLEGE OF GEORGIA
EMORY UNIVERSITY
DENTAL COLLEGE OF GEORGIA



Full-metal

Current Preparations 2018

#20

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ADVANCING THROUGH INNOVATION
ADEA | ASSOCIATION OF DENTAL EDUCATORS | WILEY

Enhancing dental education through 3D manuals: A transformative approach

Adrian Oliveira Viana PhD¹ | Frank Yulijans² | Corinne Solorio PhD³ | Rafael Rocha Falcão PhD⁴

¹Department of Restorative Dentistry, Universidade Federal do Rio de Janeiro, Instituto de Odontologia, Rio de Janeiro, Brazil
²Department of Restorative Dentistry, Universidade Federal do Rio de Janeiro, Instituto de Odontologia, Rio de Janeiro, Brazil
³Department of Restorative Dentistry, Universidade Federal do Rio de Janeiro, Instituto de Odontologia, Rio de Janeiro, Brazil
⁴Department of Restorative Dentistry, Universidade Federal do Rio de Janeiro, Instituto de Odontologia, Rio de Janeiro, Brazil

PROBLEM (QUESTION)

The traditional methods of dental instruction, which have heavily relied on static 2D images and typodonts, present a significant challenge in adequately preparing students for the modern dental practice. The new generation of dental students are increasingly interested in 3D images and virtual reality. This paper presents a transformative approach to dental education through 3D manuals, which are available through QR codes integrated to the traditional manuals.



Full-metal Crown Preparation on #30

Scan the QR codes with your mobile device or click on the photograph to open the 3D Model of each preparation step



Medium Round

6856.31.016
Grit: Coarse
Head Size (1/10 mm): 016
Cutting Length (mm): 8.0
Shank: 19 mm
Shape: Round-End Taper



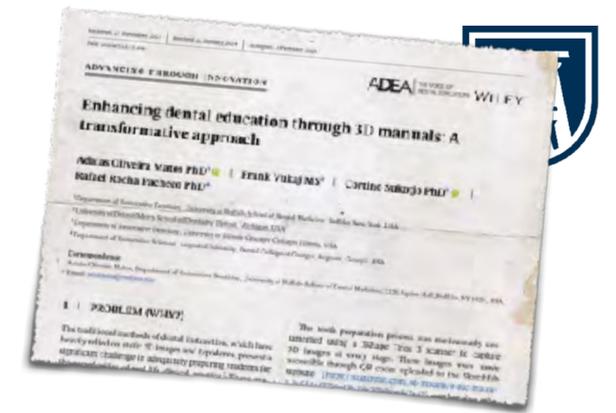
Medium Chamfer

G6878K.33.016
Grit: Coarse
Head Size (1/10 mm): 016
Cutting Length (mm): 8.0
Shank: 16 mm
Shape: Modified Round-End Taper



Small Chamfer

G6878K.33.012
Grit: Coarse
Head Size (1/10 mm): 012
Cutting Length (mm): 8.0
Shank: 16 mm
Shape: Modified Round-End Taper



| | | | | | | |
|--|---|--|---|---|---|--|
| QR Sound tooth | QR Occlusal reduction Central groove reduction guide MR | QR Occlusal reduction Lingual inner inclines reduction guides MR | QR Occlusal reduction Buccal inner inclines reduction guides MR | QR Occlusal reduction Buccal outer inclines reduction guides MR | QR Occlusal reduction Lingual inner inclines reduction MR | QR Occlusal reduction Buccal inner inclines reduction MR |
| QR Occlusal reduction Buccal outer inclines reduction MR | QR Axial reduction Buccal-mesial reduction MC | QR Axial reduction Buccal-distal reduction MC | QR Axial reduction Mesial preservation of adjacent tooth MC | QR Axial reduction Mesial reduction MC | QR Axial reduction Distal reduction MC SC | QR Axial reduction Lingual-distal reduction MC |
| QR Axial reduction Lingual-mesial reduction MC | QR Lingual bevel MR | QR Resistance groove MR | QR Smoothing MC MR | | | |





Occlusal reduction
Buccal outer inclines
reduction guides

M



Smoothing

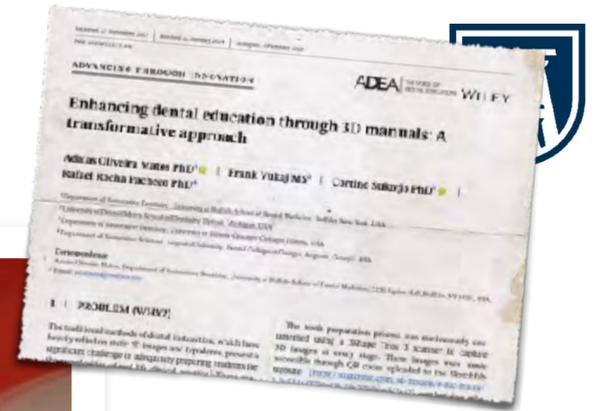
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M



M





Autodesk TinkerCAD
3D Modeling

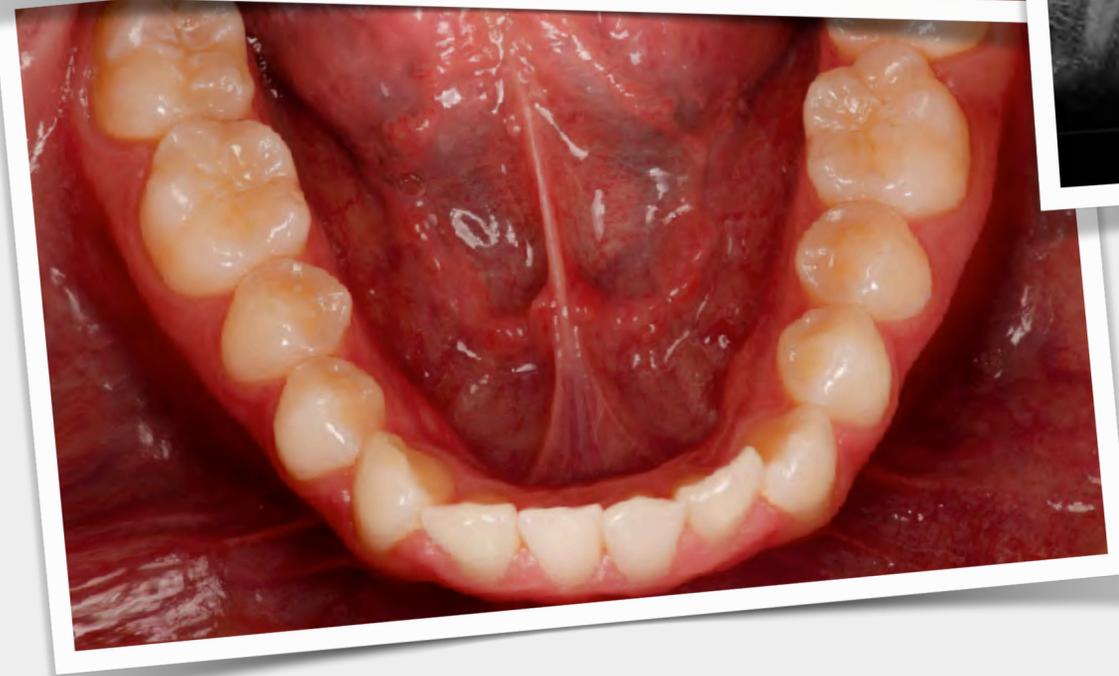
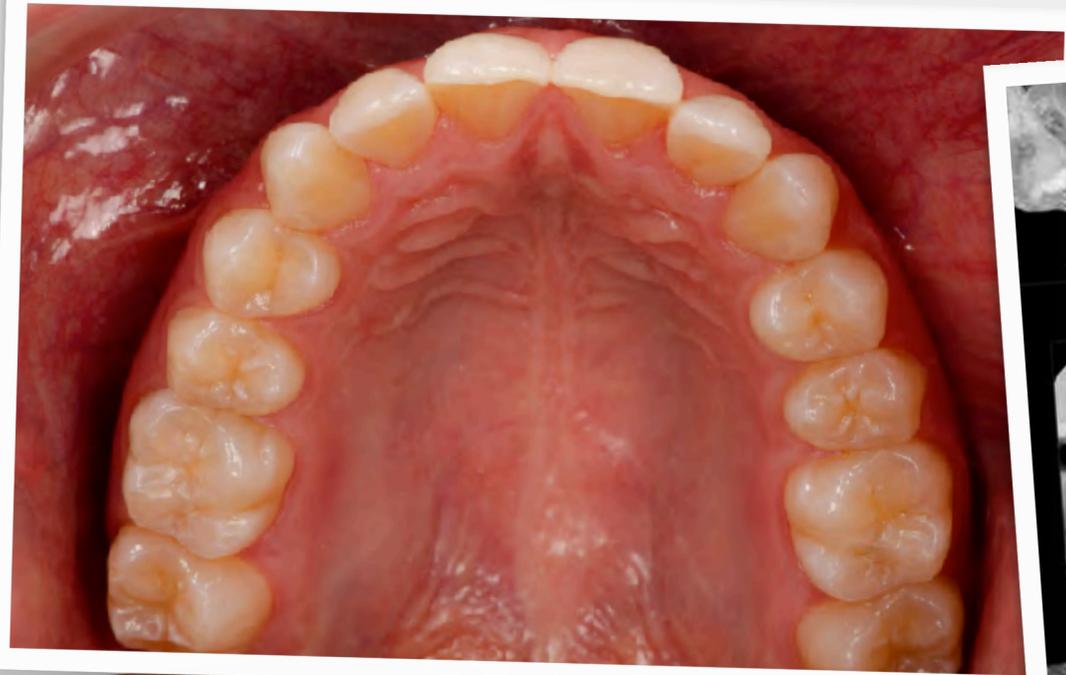


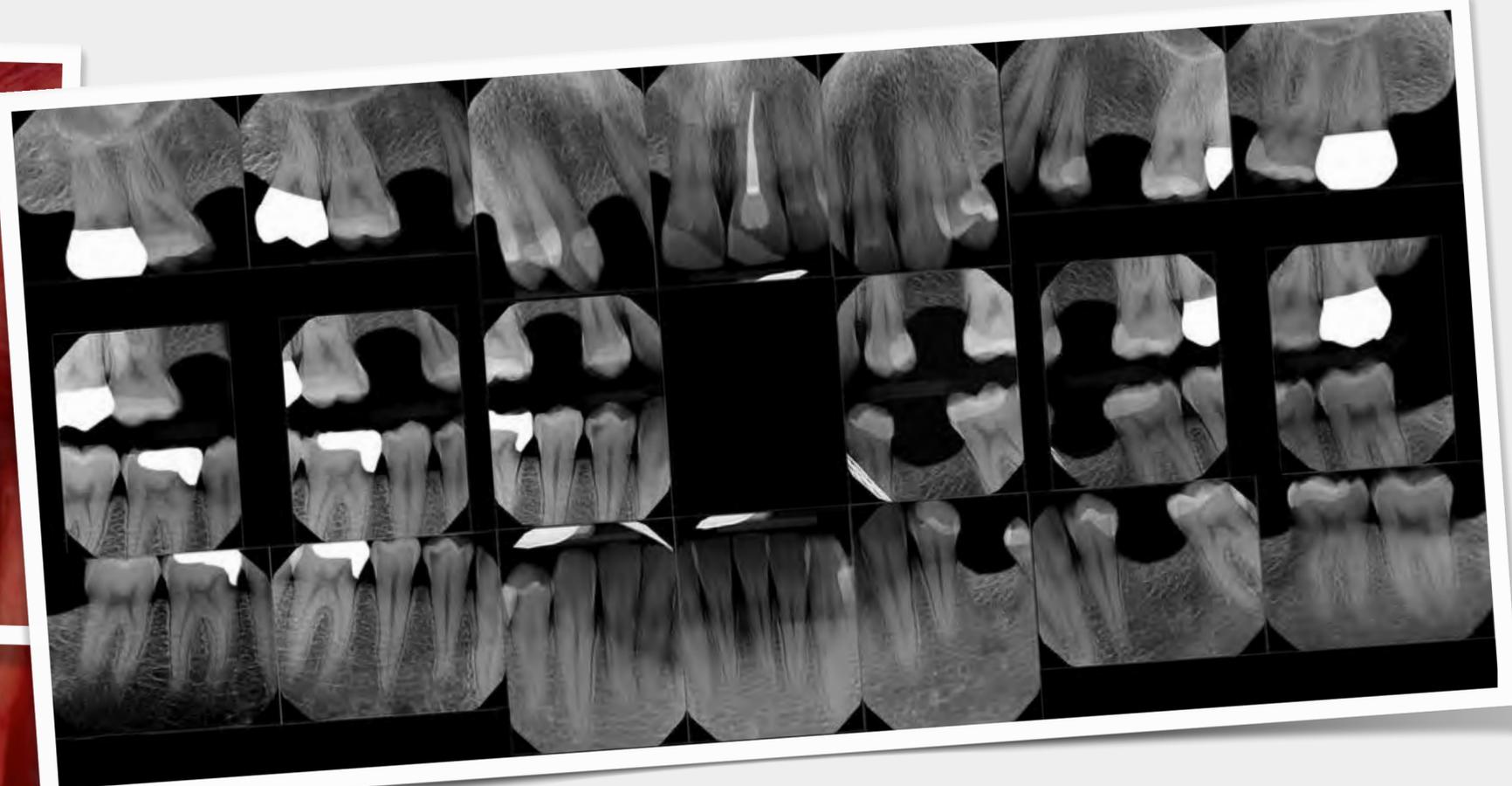
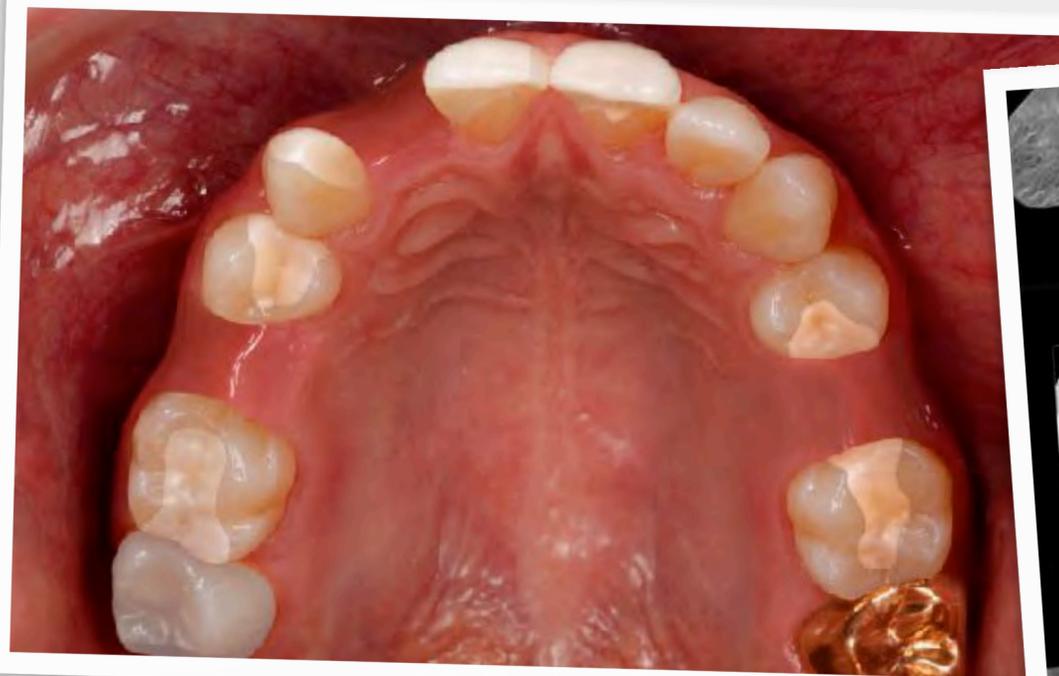
Sketchfab
3D model viewing











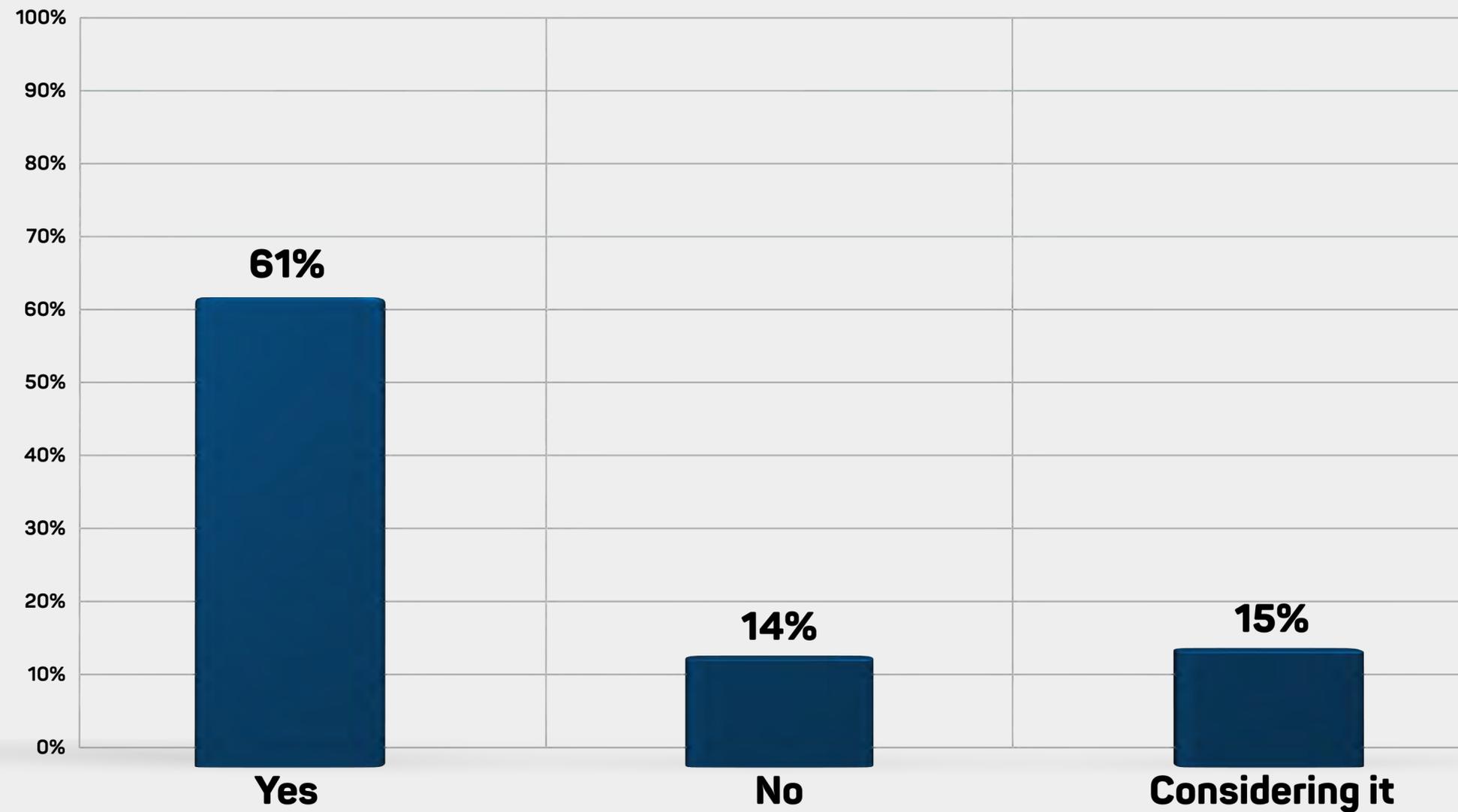
Case-based simulation exercises and exams

Cases can be created using editing tools to simulate clinical situations for treatment planning, comprehensive skills assessments, stimulating critical thinking, problem solving, and favoring a good transition to clinic



I routinely use AI tools in my research and/or educational activities

Results of 2025 Northern Lights Dentistry Questionnaire

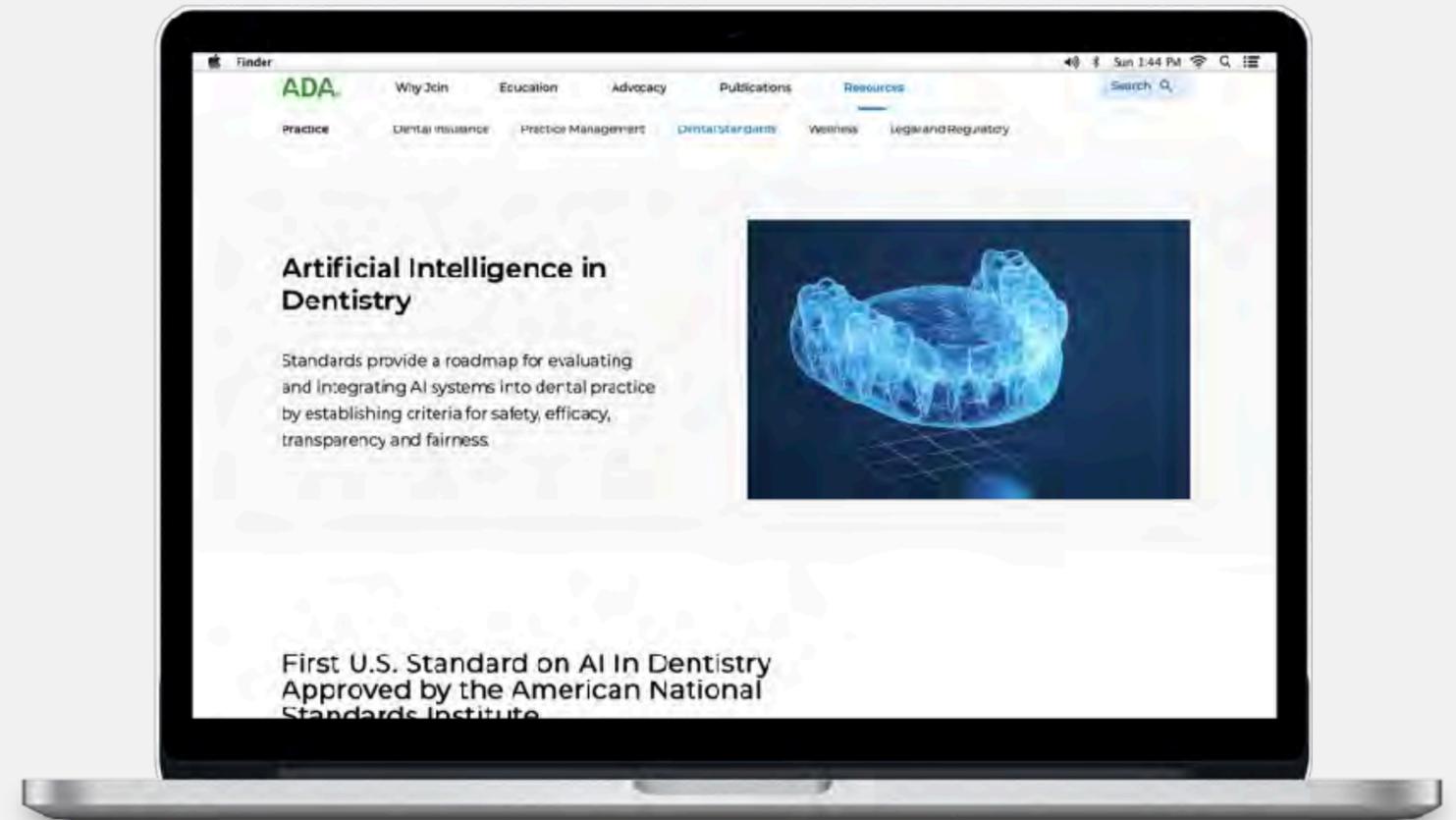


AI in Dentistry



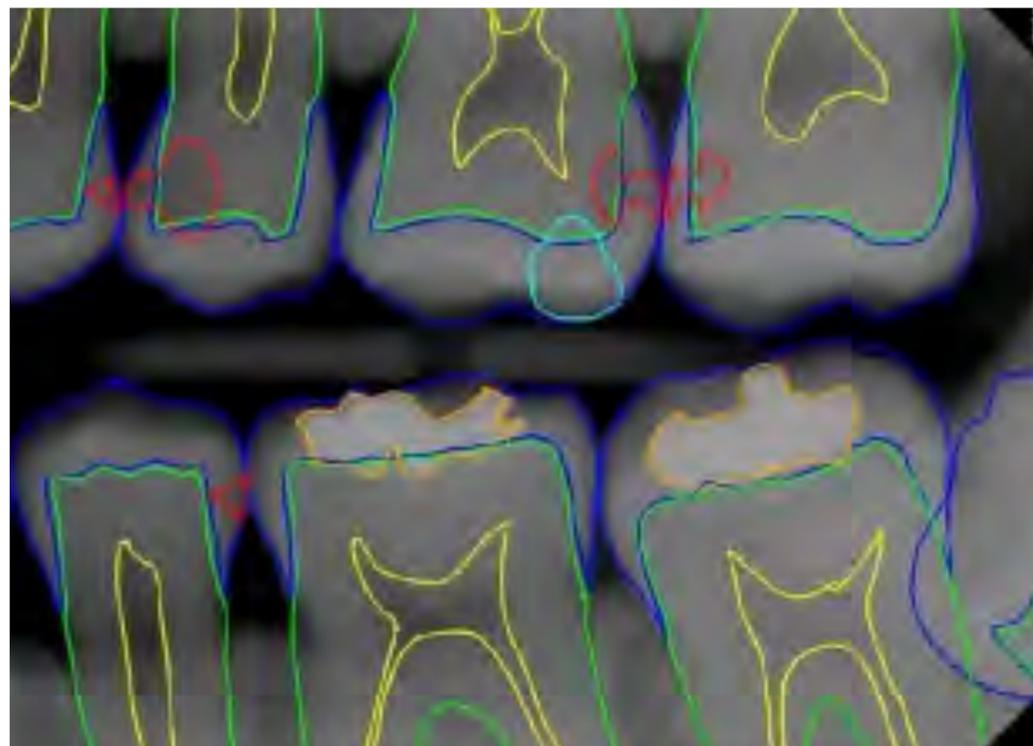
| Category | Function / Application |
|----------------------|--|
| Administrative | Appointment scheduling, no-show prediction |
| | Insurance claim automation |
| Diagnostics | Radiograph analysis (caries, bone loss, lesions) |
| | Oral cancer detection |
| | CBCT segmentation (teeth, roots, nerves) |
| Treatment Planning | Prosthetic design (crowns, inlays) |
| | Implant positioning via CBCT |
| | Clear aligner / bracket simulation |
| | Smile simulation & esthetic previews |
| | Risk prediction (caries, perio) |
| Education / Training | Simulated prep evaluation, student skill assessment |
| | Ceph tracing / orthodontic progress via mobile scans |
| Communication | Before/after visualizations |
| | Annotated images, treatment reports |
| Surgery & Robotics | Real-time navigation, surgical guide generation |
| | Dynamic updates during surgery |
| Patient Engagement | Personalized plan visualization |
| | Outcome prediction (e.g., implant success) |
| Efficiency Tools | Charting, measurements, tracing automation |

| Specialty | AI Enhancements |
|-----------------|---|
| Restorative | Detects caries/margins, auto-designs crowns, boosts case acceptance |
| Periodontics | Measures bone loss, flags calculus, auto-fills perio charts |
| Endodontics | Finds apical lesions/canals, simulates treatment, builds reports |
| Orthodontics | Auto-traces cephs, plans aligners/brackets, monitors via phone |
| Implantology/OS | Maps nerves/sinuses, suggests positions, builds surgical guides |
| Pediatrics | Detects early caries, labels teeth, predicts eruption/space issues |

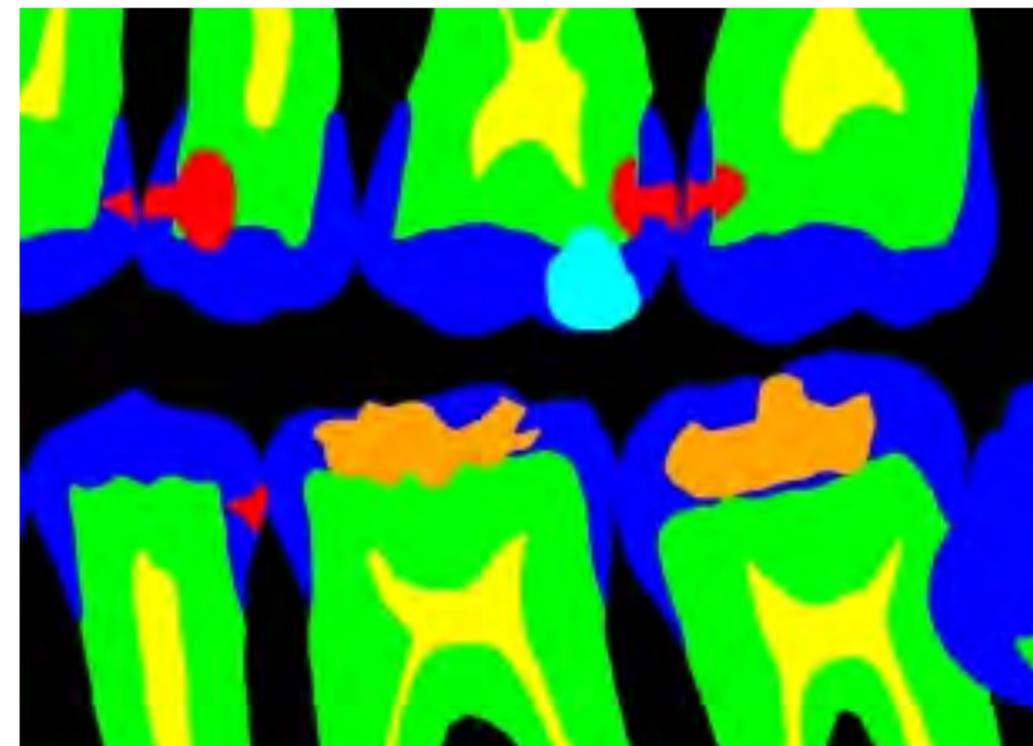




Dentist's tagging

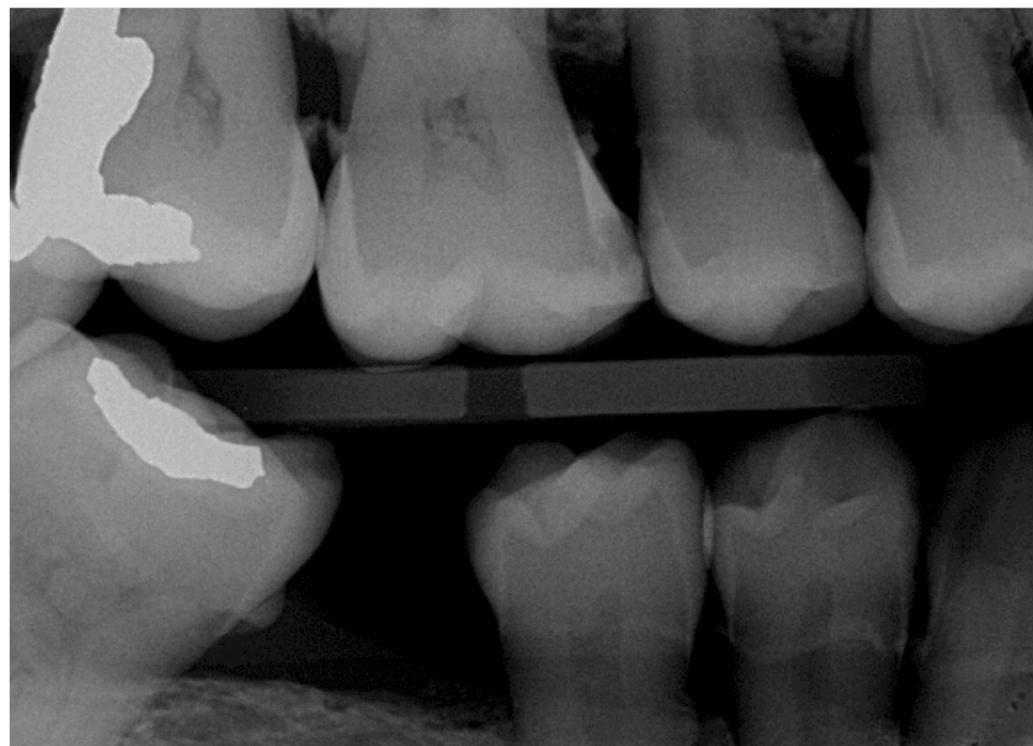


Deep learning model

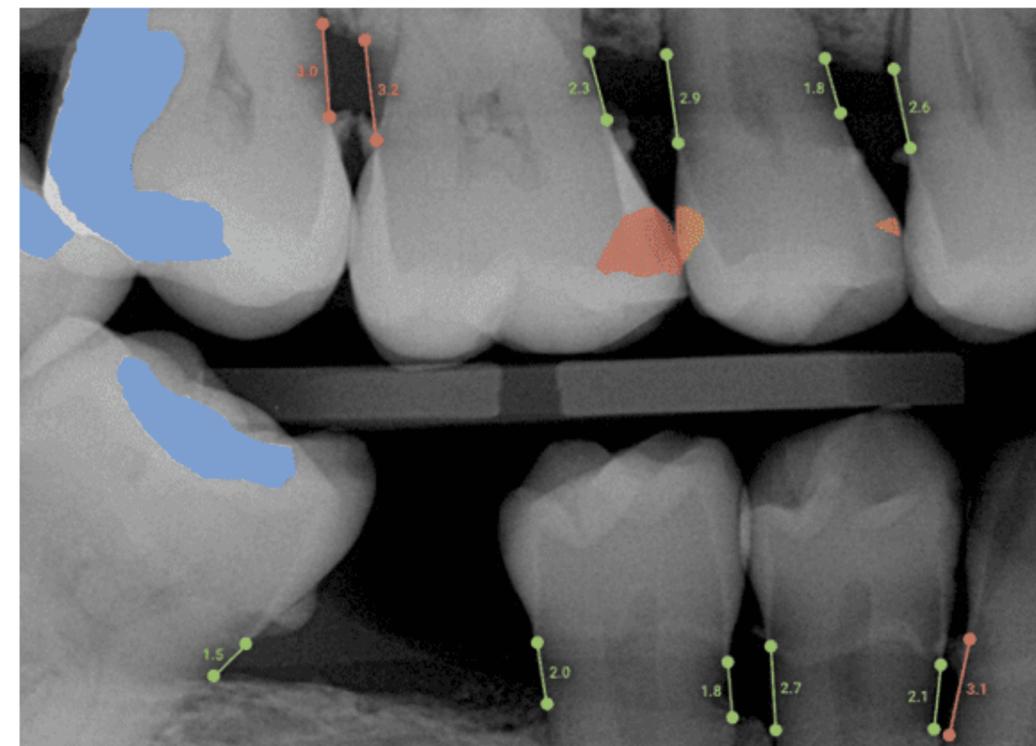




Without Overjet AI



With Overjet AI





**AI is also one the best learning /
teaching tools ever created.**

It is as good as your prompts.

**AI is sometimes brilliant
and sometimes terrible **

Be careful with
made-up
information /
hallucinations





RSDM 5511 Grade Simulator

Dental Materials - Fall 2026

194/218 · 88.99% **B**

My Grades | Min A | Min B | Min C | Max F

LECTURE PORTION

| | | |
|------------------|---------|--------|
| Quizzes 1 (1-6) | 4 / 6 | 2.75% |
| Exam 1 | 31 / 34 | 15.60% |
| Quizzes 2 (7-15) | 7 / 9 | 4.13% |
| Exam 2 | 33 / 36 | 16.51% |

ADAPTIVE LEARNING PORTION

| | | |
|-------------------|---------|--------|
| Quizzes 3 (16-25) | 7 / 10 | 4.59% |
| Exam 3 | 25 / 30 | 13.76% |

BIOMATERIALS CLINICAL SEMINARS

| | | |
|-------------------|---------|--------|
| Group Evaluation | 47 / 50 | 22.94% |
| Intra-Group Eval | 7 / 10 | 4.59% |
| Quizzes 4 (26-36) | 11 / 11 | 5.05% |
| Exam 4 | 22 / 22 | 10.09% |

Excused quiz points (adjusts total) 0

Fill Max | Reset

A ≥89.50% | B 79.50-89.49% | C 69.50-79.49% | F <69.50%

DHYG 3150 Grade Simulator

Dental Materials - Spring 2026

72/84 · 85.71% **B**

My Grades | Min A | Min B | Min C | Min D | Max F

QUIZZES (14.29%)

| | | |
|--------|-------|-------|
| Quiz 1 | 1 / 3 | 3.57% |
| Quiz 2 | 2 / 3 | 3.57% |
| Quiz 3 | 2 / 3 | 3.57% |
| Quiz 4 | 2 / 3 | 3.57% |

EXAMINATIONS (85.71%)

| | | |
|---------------|---------|--------|
| Mid-Term Exam | 31 / 36 | 42.86% |
| Final Exam | 34 / 36 | 42.86% |

Excused quiz points (adjusts total) 0

Fill Max | Reset

A ≥89.50% | B 79.50-89.49% | C 69.50-79.49% | D 59.50-69.49% | F <59.50%



DHYG 3150 Course Assistant

Dental Materials

Ready

Hello! I'm your course assistant. Ask me anything about DHYG 3150 materials, schedules, concepts, or exam preparation.

YOU

When is the final exam?

ASSISTANT

According to the syllabus, the **Final Exam** is scheduled for:

Date: May 4, 2026 **Time:** 1:00 PM - 1:50 PM **Location:** BC 1030

The final exam will have 36 multiple choice questions and is worth 42.86% of your final grade. It covers the second half of the course material (Sessions 9-15) and is **not cumulative** - meaning it only covers topics from after the midterm exam.

The topics covered on the final exam include:

- Sealants (5 questions)
- Dental Cements (5 questions)
- Glass Ionomer Cements (5 questions)
- Abrasives and Polishing Agents (5 questions)
- Metals and Alloys (5 questions)
- Dental Ceramics (5 questions)
- Digital Technologies (6 questions)

Make sure to review all the behavioral objectives from these lecture sessions, as each exam question is linked to specific learning objectives from the handout materials.

Type your question...

Send

Press Enter to send • Shift+Enter for new line



DHYG 3150 Course Assistant

Dental Materials

Ready

Hello! I'm your course assistant. Ask me anything about DHYG 3150 materials, schedules, concepts, or exam preparation.

YOU

When is the final exam?

ASSISTANT

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Type your question...

Send

Press Enter to send • Shift+Enter for new line

DHYG 3150 Course Assistant

Dental Materials

Ready

YOU

What is alginate?

ASSISTANT

Alginate is an irreversible hydrocolloid impression material that's commonly used in dental hygiene and dentistry. Let me break this down for you:

What is Alginate?

Alginate is extracted from certain brown seaweeds and is used to make impressions of patients' teeth and oral structures. It's called an "irreversible hydrocolloid" because once it sets through a chemical reaction, it cannot be reversed back to its original liquid state.

Composition of Alginate

According to your course materials, alginate powder contains:

- **56% Sodium or Potassium Alginate** - the main reactive component that holds everything together
- **18% Diatomaceous Earth** - unreactive filler that gives body and substance to the mixed mass
- **14% Calcium Sulfate (CaSO₄)** - provides calcium ions to react with the alginate
- **10% Potassium Sulfate (K₂SO₄)** - counteracts the inhibiting effect of hydrocolloid on stone
- **2% Trisodium Phosphate (Na₃PO₄)** - acts as a retarder to provide working time

How Does Alginate Work?

The **setting reaction** is: Sodium Alginate + Calcium Sulfate (in water) → Set Alginate Material + Sodium Sulfate

The trisodium phosphate is crucial because it gives you **working time**. Without it, the calcium would react with the alginate immediately, giving you no time to mix and place the material in the patient's mouth.

Clinical Applications

Appropriate uses:

Type your question...

Send

Press Enter to send • Shift+Enter for new line



Department of Restorative Dentistry

RSD Dental Materials

PROGRAM OVERVIEW

✓ Data Updated from Schedule

26 TOTAL COURSES

1,596 TOTAL HRS

KEY FINDINGS

- Simulation dominates
- D1 curriculum is entirely didactic
- Average course load: 26 credits

FOUR-YEAR CURRICULUM MAP

SEMESTER-BY-SEMESTER BREAKDOWN

COMPLETE COURSE LISTING

Editable Data: Click any cell to edit

| COURSE CODE | COURSE TITLE | CONTACT HOURS | TYPE |
|-------------|---------------------------------------|------------------|------------|
| RSCA 5101 | Cariology | 71.5 didactic | Didactic |
| RSOC 5111 | Dental Anatomy and Radiology | 155.0 simulation | Simulation |
| RSOP 5111 | Operative Dentistry | 0.0 | Simulation |
| RSID 5211 | Introduction to Restorative Dentistry | 81.0 didactic | Didactic |
| RSBS 5201 | Behavioral Science | 220.0 simulation | Simulation |
| RSOC 5311 | Occlusal Analysis | 68.0 | Didactic |
| RSDM 5511 | Dental Materials | 89.0 didactic | Didactic |
| RSED 5511 | Esthetic Restorative Dentistry | 45.0 simulation | Simulation |
| RSGD 5701 | Geriatric Dentistry | 120.0 | Didactic |

file:///Users/rapacheco/Downloads/RSDM_5511_Course_Review-1

COURSE INTEGRATION

What to do: Click on any department that shares content, collaborates on teaching, or has prerequisite/corequisite relationships with this course. This helps identify integration opportunities.

Related Departments

Click to select

- Diagnostic Sciences
- Endodontics
- General Dentistry
- Oral Biology
- Oral Surgery
- Orthodontics
- Pediatric Dentistry
- Periodontics

SWOT ANALYSIS

What to do: Share your honest assessment of the course. A few bullet points or sentences in each box is plenty. Think about: What makes students succeed? What frustrates them? What would you change if you had resources?

S Strengths

INTERNAL POSITIVES - WHAT WORKS WELL?
Examples: Experienced faculty, strong clinical correlation, well-sequenced content, effective lab exercises, good student engagement, updated materials, clear learning objectives

List 2-3 things that make this course effective...

W Weaknesses

INTERNAL CHALLENGES - WHAT NEEDS WORK?
Examples: Outdated content, insufficient practice time, pacing too fast/slow, limited feedback opportunities, content gaps, unclear expectations, redundancy with other courses

List 2-3 areas that could be improved...

O Opportunities

EXTERNAL POSSIBILITIES - WHAT COULD WE ADD?
Examples: Digital dentistry integration, new simulation technology, collaboration with other departments, industry partnerships, updated equipment, INBDE alignment, interprofessional education

List 2-3 opportunities to enhance the course...

T Threats

EXTERNAL RISKS - WHAT COULD CAUSE PROBLEMS?
Examples: Faculty retirement/turnover, equipment aging, budget constraints, schedule conflicts, space limitations, changing accreditation requirements, competing curriculum demands

List 2-3 challenges that could impact the course...

STUDENT FEEDBACK SUMMARY

What to do: Summarize the main themes from student evaluations or informal feedback. What do students consistently praise? What do they consistently request or complain about?

Key Themes

From evaluations: e.g., Students appreciate clinical relevance; request more hands-on practice time



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Author Created: computer program



Phil McAvity

37-year old Mechanical Engineer

Start 

Muito obrigado 
Questions? Thank you.