Achieving High-Quality, Low-Cost Skin: An Environment Approach

Adelle Bueno
Chief Environment Artist
Advanced Technology Division
Square Enix CO., Ltd., TOKYO

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UBM

Character Skin Texturing Workflow: Overview

- Introduction
- Where we started
- Looking at skin like an environment artist
- Understanding Pores
- New workflow
- Next steps

About Me

- Chief Environment Artist, Advanced Technology Division, Square Enix CO., LTD.
- Past credits include: *FINAL FANTASY XV, Bloodborne, The Last of Us, Uncharted 3: Drake's Deception*

ADVANCED TECHNOLOGY DIVISION

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Where we started

Where we started

Texture	Resolution	Purpose	Shared
Unique 1-to-1 map	2048×2048 ~ 4096×4096 (…and higher…)	Primary, secondary, tertiary details	No
Tiling microdetail	128×128	generic noise	Yes

Issue #1

- Character sculpts have to carry an immense range of detail – from primary/secondary shapes, down to tiny pore details (tertiary/microdetail)
- The need to also represent highly detailed pore variations necessitated at least 2-4k resolution
  - High-res textures ≠ pore detail quality (still not satisfied with results)

Issue #2

- Microdetail map falls short: pore types differ throughout the human face in pore type and placement
  - → can’t get away with simply applying uniform tiling pores

But...

- Unique map: Ignoring the microdetails, most facial characteristics (primary & secondary details) could actually be well represented with lower resolution textures

Various small details *and* larger forms? Sounds like a familiar problem…

Environment texturing

- Assets as small as rocks, as large as mountains
- Tiling textures
- Can maintain high fidelity at close distances while keeping textures sizes fairly low
- Blend textures to produce different combinations of details

Texture a character with tiling textures?

- Not a new concept
  - Microdetail for skin, usually in the form of a generic noise
  - Cloth weaves

Looking at skin like an environment artist…

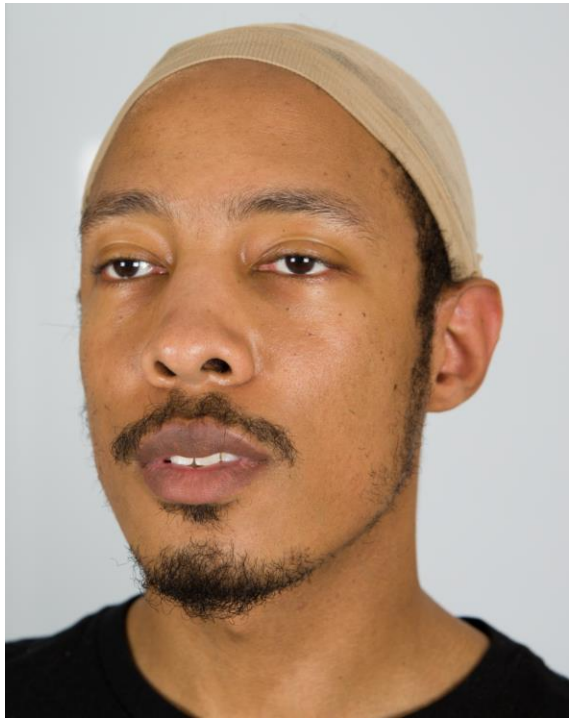
- First step in texturing an environment: identify common, repeated elements that will form the base tiling textures
- For skin, common, repeated elements = **pores**

Understanding Pores

- Goal: Look for common pore patterns in terms of shape and placement

Understanding Pores - Method

1. Collect reference:
   - Scan several faces around the office
   - Gather reference photos



Understanding Pores - Method

2. Identify as many different microdetail types as possible
3. Then simplify these details into commonly occurring shapes

1. Shape

Skin detail can be generalized into “dot” and “line” patterns…

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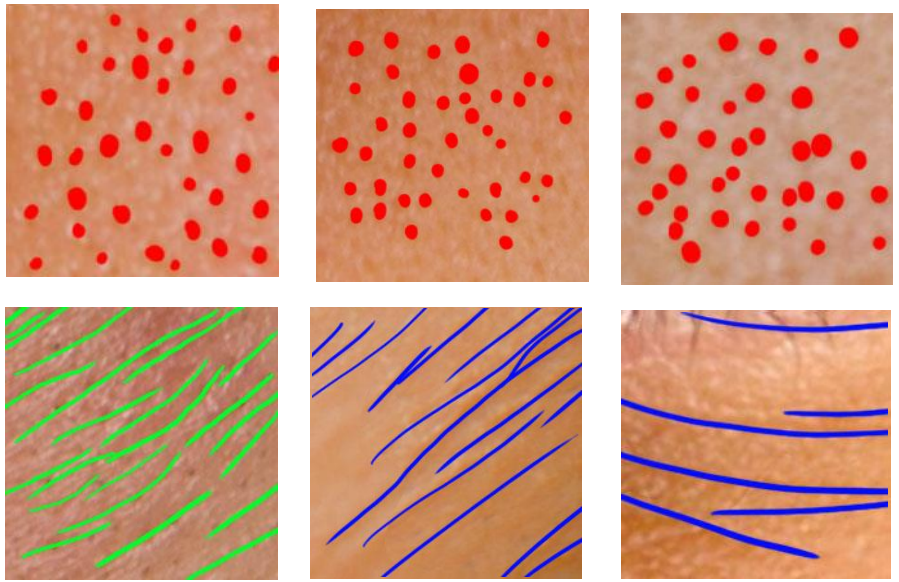

1b. Compound Shapes

Additional details can be obtained by blending basic pore shapes together

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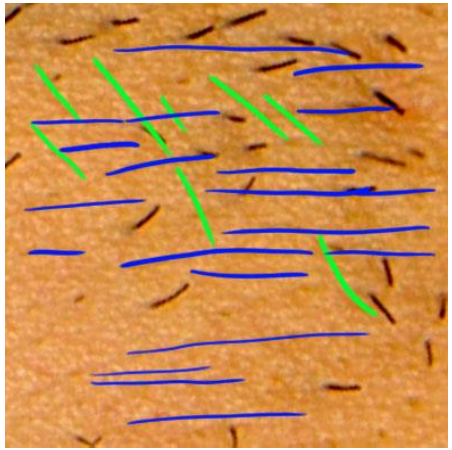
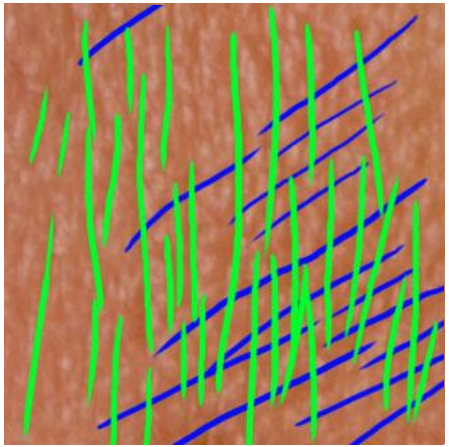




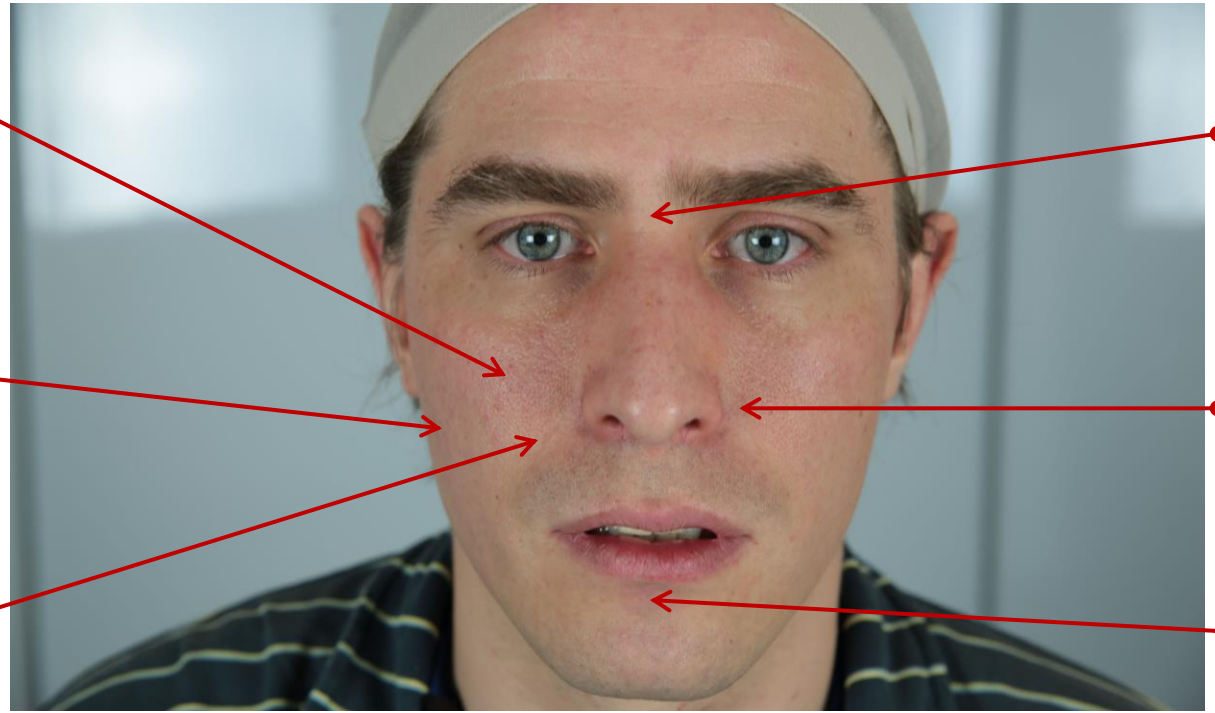
(…plus the nose)



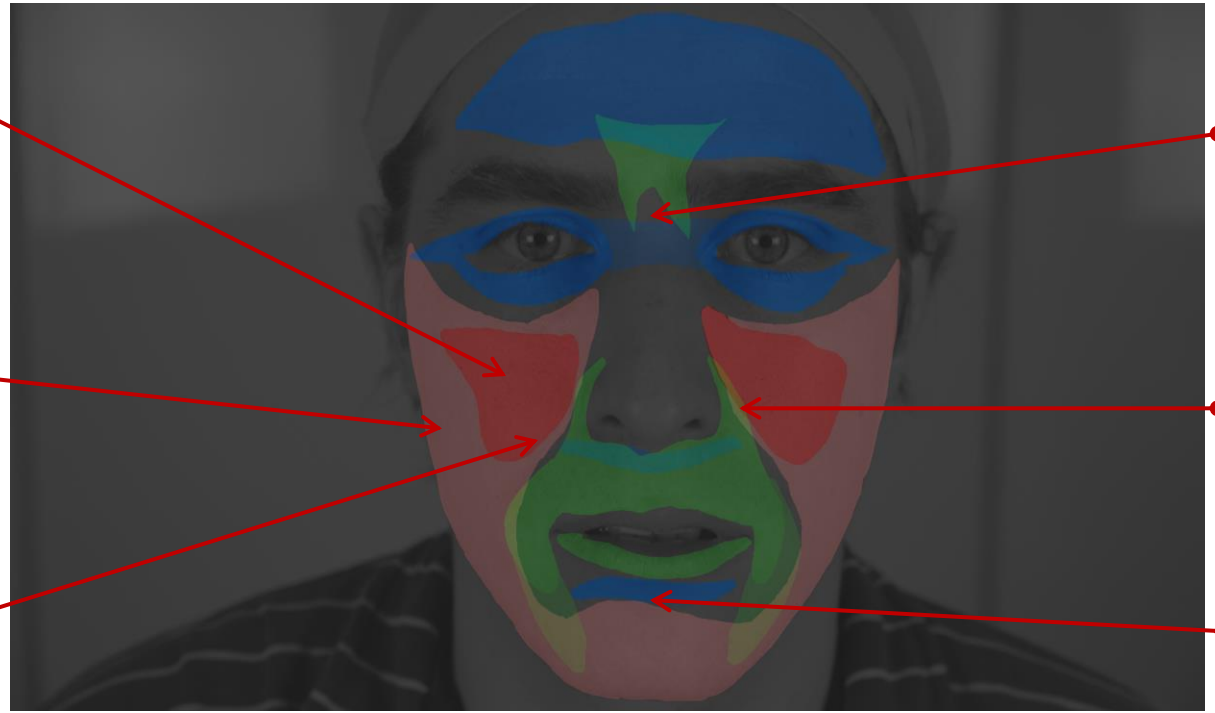

2. Placement

Certain types of pores generally tend to be found in the same areas of the face

2. Placement



2. Placement



3. Directionality

- Static stretching – pore shapes in certain areas are by default “stretched” at neutral expression
- Pores on human skin generally follow the same directional pattern

3. Directionality

New Workflow - Goals

1. Reduce texture memory -- Share textures between many faces
2. Reduce texture authoring time
3. Increase quality of microdetails
   - accurately reflect variation of skin pores
   - Maintain high fidelity at close distances
4. **Maintain artist control and flexibility**

Primary & Secondary Details

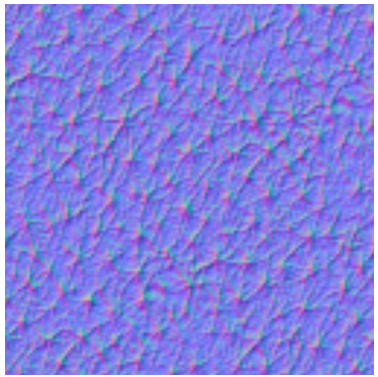
- Unique 1-to-1 map
  - 512 x 512 ~ 1024
- Large wrinkles, pockets of fat, medium to large scars
- Does not include pores, microwrinkle details
  - Sculpting time reduced by 40%
  - Could use smoothed scan data

Primary & Secondary Details

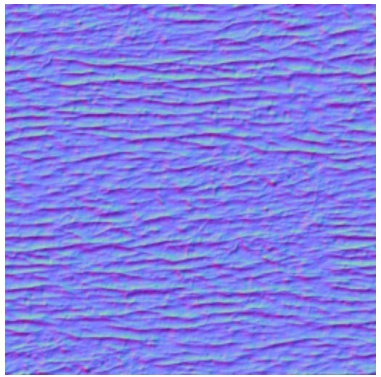
- Sculpt with only Primary and secondary shapes

Tertiary Details - Shape

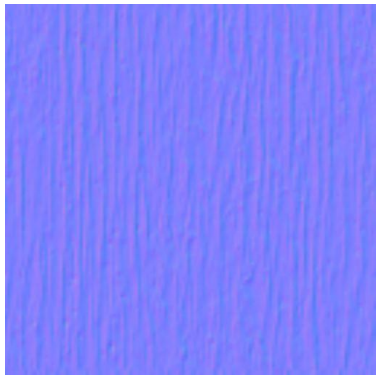
- = pores, microwrinkles
- 4 tiling pore normal maps (128x128) shared across every human character



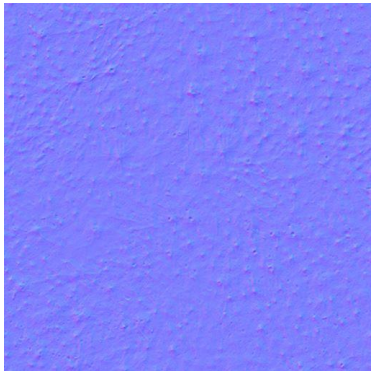
Dot



Line (HORIZONTAL)



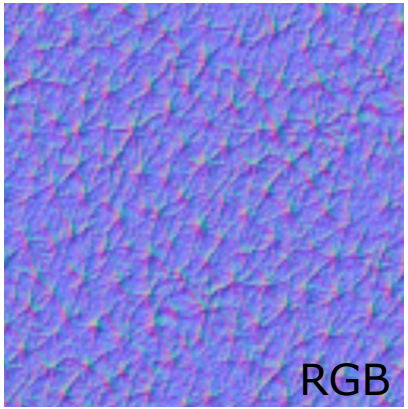
Line (VERTICAL)

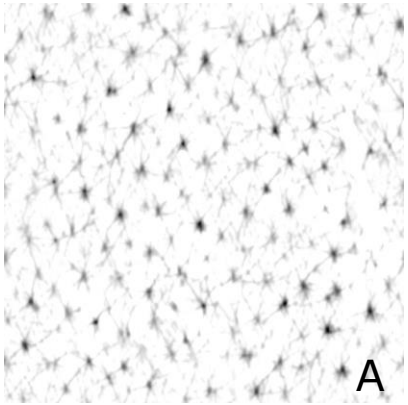


Nose

Tertiary Details - Shape

- Cavity map in the Alpha channel → used as a mask to add detail to base colour, roughness channels

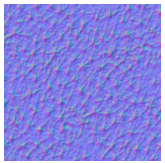




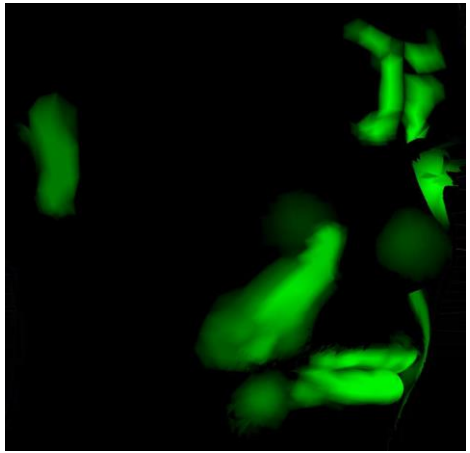
Compound Shapes & Placement

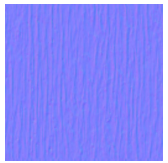
- Blending/pore placement is controlled via vertex colour
- Artist controls how strong/prominent certain pore types are and where they are placed
  - Vertex colour intensity, overlapping pore types → can make characters look older, younger, more wrinkled, etc.

Compound Shapes & Placement



Dot





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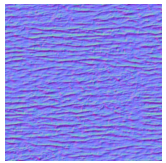
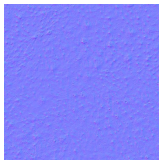
(VERTICAL)



Line
(HORIZONTAL)

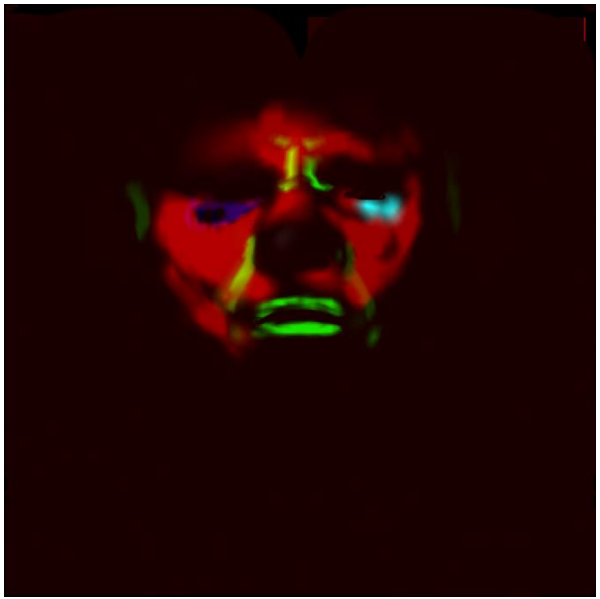


Nose

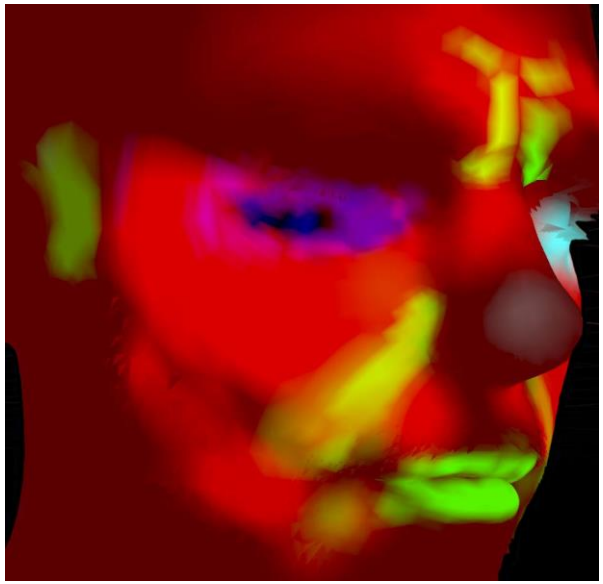
To speed up vertex painting…

- …we would begin by importing vertex colours from a standard pore placement map
  - certain types of pores generally tend to be found in the same areas of the face
  - Hero/main characters: good jumping-off point for the artist to customize exactly how he wanted the pores to appear
  - Generic characters (e.g. NPCs): vertex colours were used as-is

Standard Pore Placement



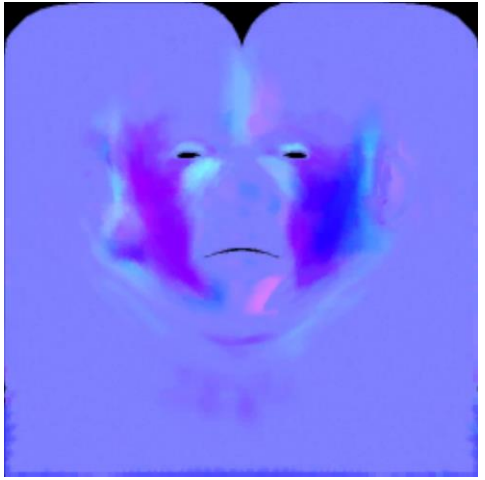
Pore placement map (not used in-game)

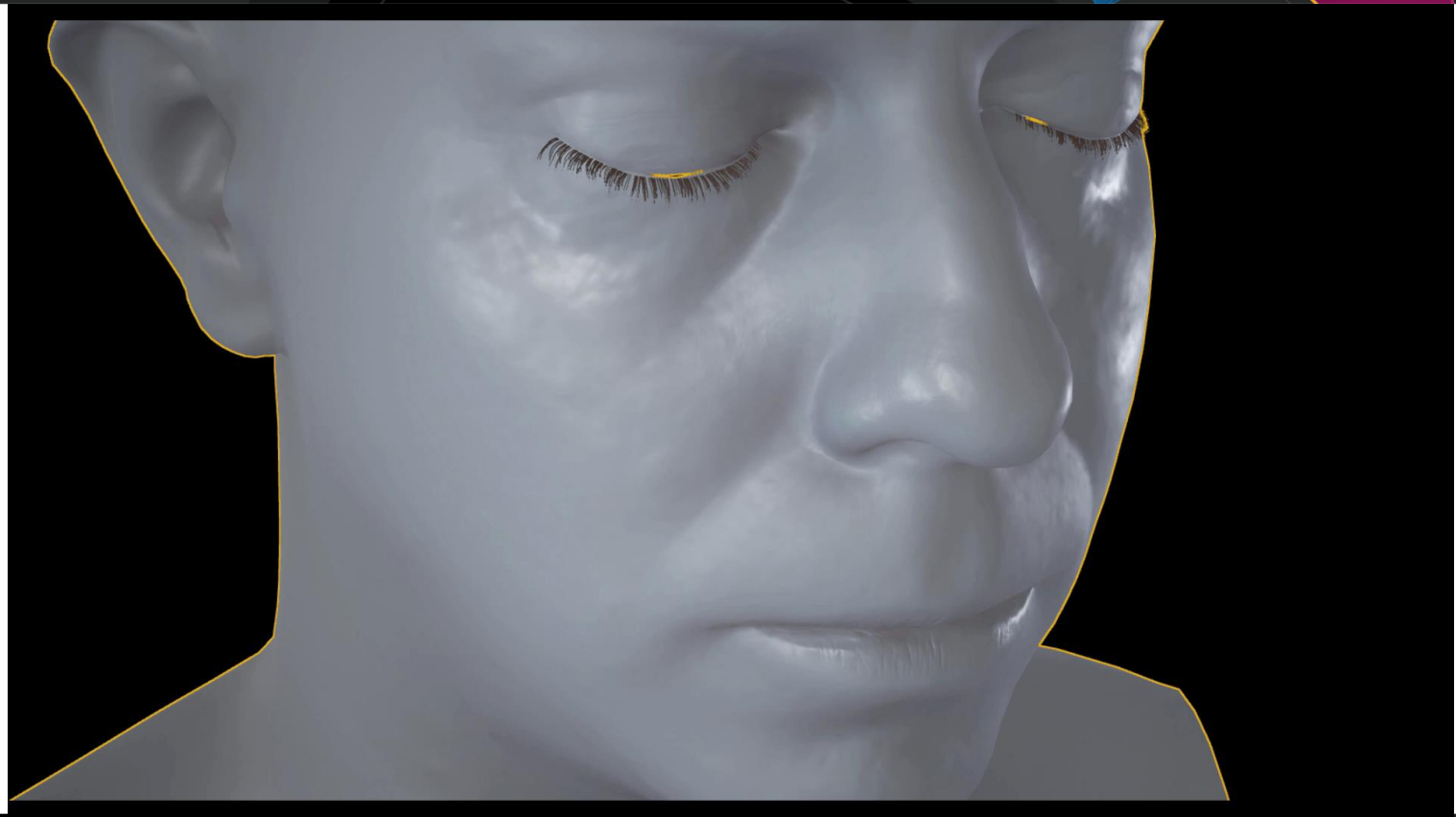


Vertex colour

Directionality

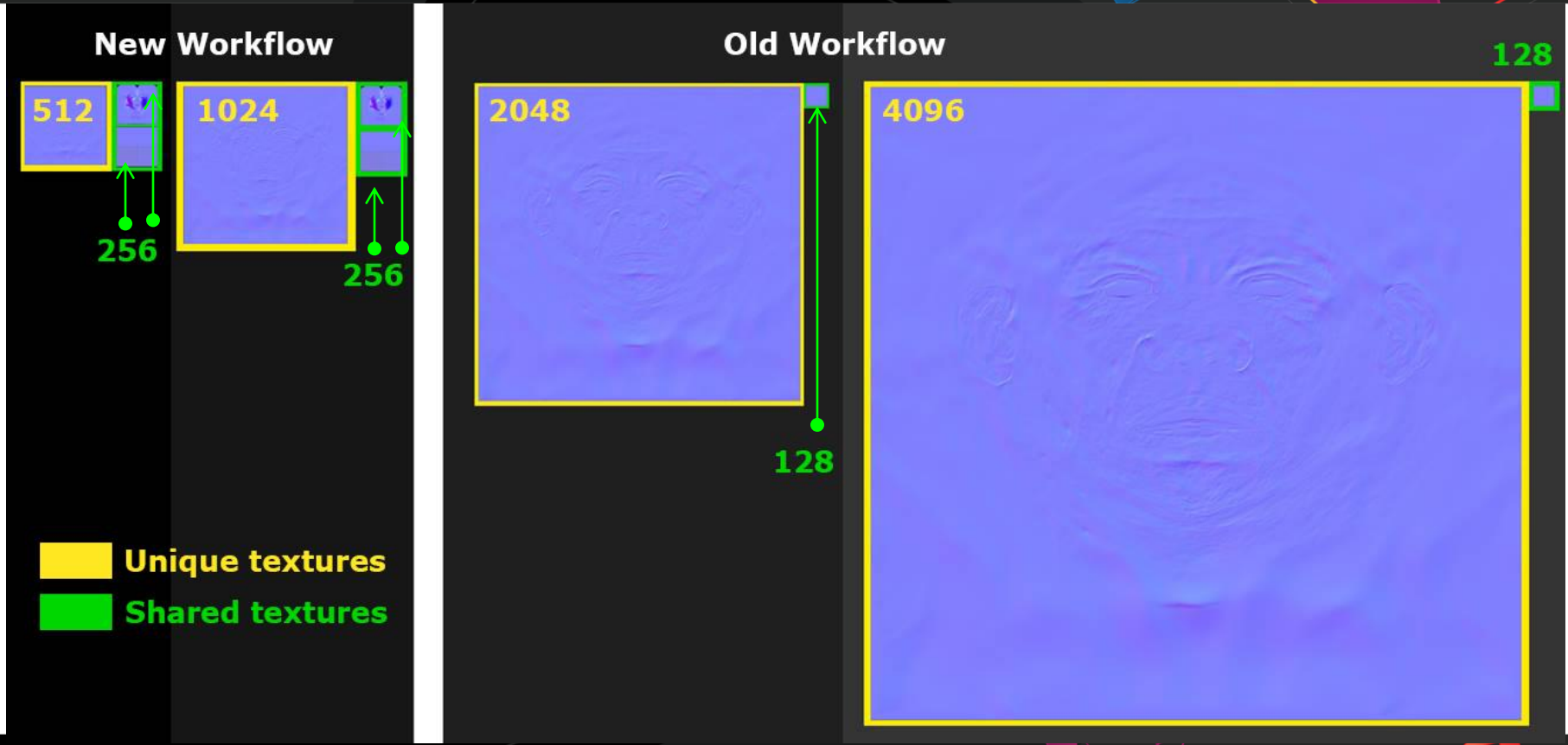
- Smear map (256x256) to control directionality
- Remember: Pores on human skin generally follow the same directional pattern
  - NPCs: shared smear map
- But directionality can vary significantly among individuals based on age, etc.
- Artist has control of smear map to achieve desired look
  - Hero/Main: custom





Texture Summary

Texture	Resolution	Purpose	Shared
Unique 1-to-1 map	512×512 ~ 1024×1024	Primary & secondary details only	No
Tiling microdetail maps	4 x 128×128 Or 1 x 256×256 atlas	Tertiary Details	Yes
Smear map	256×256	Directionality (stretching)	No/Yes

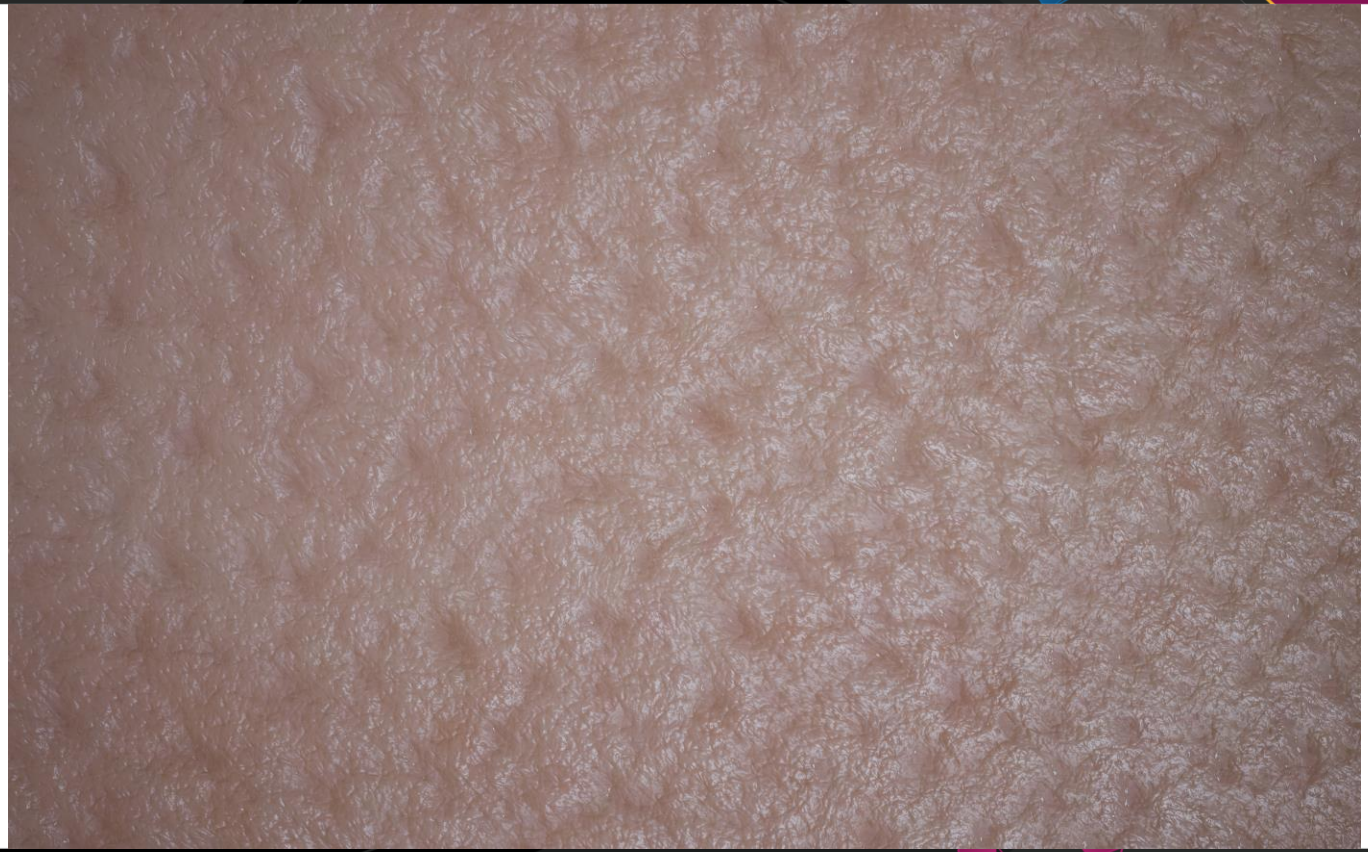


Old Workflow

New Workflow

Close-up - Old Workflow

Close-up - New Workflow



Even closer up - New Workflow

Next steps

- Procedural Substances in lieu of bitmaps
- Pore distortion for facial animation
- Increase variations using two layers of RGBA
- Further ways to customize
  - Optional masks to allow for decal application (e.g. warpaint)

Interdepartmental collaboration!

- Different disciplines require such specialized skills that we often remain isolated from each other
  - Character artists and environment artists don’t typically work together
- Encourage collaboration and dialogue between departments – inspiration can come from unlikely places!

Special Thanks

- Eduardo Mosena
- Jason Lacroix
- Chida Kazuhisa
- Ishii Haruya
- Graeme Murray
- Hendrik Skubch
- Paul Chandler

Questions?

Adelle Bueno | Chief Environment Artist
buenadel@square-enix.com

Eduardo Mosena | Chief Character Artist
moseedua@square-enix.com