ONE OF THE SINGLE MOST DIFFICULT elements of a laboratory technician’s job is creating a custom shade for a single anterior porcelain restoration surrounded by natural dentition. Add to this the natural esthetics and often multi-colored enamel appearance of a patient more advanced in age, and technicians can encounter even more obstacles than usual in executing a natural-looking restoration. Often, the aged demographic can also have additional “character” to their smile line that cannot be ignored, such as craze lines, mammelons, and hypocalcified cervical lesions. How these complex variables are used when characterizing a layered porcelain restoration can make the greatest impact in custom shade matching.

Elderly dentition shade matching first requires identifying all of the colors present in the patient’s smile. The base shade selected should be predominant in adjacent and occluding dentition, and all other colors are then included in the fabrication process. Commonly, aged teeth include low-value shades in combinations of orange, gray, brown, tan, and white. Knowing how to achieve a shade match that is not too high in value, with the same hue and saturation as the surrounding dentition becomes the challenge. To strategize these elements, each porcelain layer will need to work in harmony, adding subtle characterizing features intrinsically to create a natural shade match with the adjacent dentition.

Case Study
The case reviewed illustrates a complex shade match involving an elderly patient’s lateral incisor with no other surrounding dentition maintaining a porcelain restoration. The central incisor and canine both had a halo effect at the cervical one-third aspect, with the addition of gray and milky striated vertical streaks extending from the middle body one-third to the incisal edge. Additionally, worn incisal edges contained both translucency and white speckling along the one-third incisal edge to the middle body aspect. The presence of craze lines appeared running horizontally through the middle one-third of the body of surrounding dentition, which would have to be recreated for a successful natural match.

When this patient presented for a shade match, the first step was to accurately match the color of each visible characterizing feature. Achieving the end shade began with selecting the base shade that represented not the tooth being fabricated, but also the surrounding dentition.

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Fig 1. Dentin body shade A4 was selected and an assessment was done of surrounding dentition color.

Fig 2. Shade tabs were selected for representation of additional characterization.

Fig 3. GC Initial™ Translucent Powder Porcelains.
dentition. The technician also needed to select the shade that would best represent the intrinsic shade (Figure 1).

Finding a shade tab that matched the same hue, saturation level, and that best represented all of the dentition may not have been possible. By selecting a darker intrinsic value for this restoration using A4 as the base, the characterization required an overlay of translucency and enamel to add the correct level of saturation to balance the value.

The next step was choosing a shade tab that represented all of the additional characters. In this case, the additional shades were orange, gray, tan, red, and white (Figure 2). Once these shades were determined, the author began to strategize how to incorporate these effects into the layering process. The subtlety of the gray and translucency that ran throughout the patient’s teeth led the author to use GC Initial™ Zirconia Translucent, Opalescent, and Enamel powdered layering porcelains (GC America, www.gcameric.com) and internal stains in the buildup process (Figure 3).

The first additions of porcelain over the dentin body A4 created the high intrinsic translucency. Using TO, translucent opal, reflected the opalescence from within when layered along both mesial and distal axial one-third widths and extending to the middle one-third of the body. The IV-5 light orange stain was applied to the incisal middle two-thirds edge extending to the body, diminishing just slightly from the horizontal midline with a thin layer of the TO translucent opal encircling the light orange stain (Figure 4 through Figure 6).

The first intrinsic definition of the horizontal craze line was added using Enamel Intensive EI-13 in red through the body midline and highlighting the mammelon along the distal middle one-third of the incisal edge (Figure 4 and Figure 6). The enamel opal, EOP-4, in gray was layered over the stained horizontal midline highlight to increase the depth effect while building the middle body of porcelain (Figure 5 and Figure 6). Over the incisal highlight, translucency was created with the addition of TM-05, and buildup of the hue was increased along the incisal borders (Figure 7). Growing thicker as incremental buildup of colors were layered side-by-side, the streaks created a mammelon effect, and the addition of mesial and distal translucency was created with a translucency modifier TM-01 in blue (Figure 8).
Between layered translucency additions, stain was applied to create the maxillary mammelons (Figure 9 and Figure 10). Light orange IV-5 stain helped lower the intrinsic addition of red hue added previously to the midbody and incisal edge. Layered between translucent mammelon additions, the necessary combination of orange spread this stain color visually throughout the body of the buildup (Figure 11 and Figure 12).

Next the use of white stain, IV-1, was added and brushed down between the light orange stain, creating the highlights of craze lines (Figure 13 and Figure 14). Craze lines were added to the midline, extending from the body one-third and added to the incisal one-third. Additional blue highlights were layered along the mesial and distal borders using enamel opalescent EOP-3 (Figure 15 and Figure 16). Over the full body, extending to the height of the body one-third, TM01-blue translucent modifier was applied to the mesial and distal one-third aspects (Figure 17). Translucent neutral TN was layered over all of the intrinsically stained aspects with the addition of dentin body shade C1 applied in a very thin layer in the middle body aspect around the blue enamel effect, creating the halo highlight (Figure 18). Enamel 59, matching the A4 body, was added to the incisal one-third edge, and the fabrication was removed from the model with tweezers. The restoration was approximated into proximal contact and was fired in a porcelain oven at 810°C (Figure 19 through Figure 21).

The restoration was then placed back on the model, and due to the shrinkage of porcelain, accessed for the powders that would complete the color match of the restoration (Figure 21). The buildup was lacking in translucency, needing additional TM-01 in blue to highlight the enamel layer around the middle one-third halo effect (Figure 23 and Figure 24). Visually separating the distal edge and extending to the incisal one-third edge, translucent opal TO was applied and enamel intensive EI 14 was added to the middle incisal two-thirds edge. Darker enamel shade E-60 was layered over the full contour from the height of the body one-third, thus covering the full incisal edge (Figure 22 and Figure 23).

The restoration was removed from the model and fired for a second time at 805°C in a porcelain oven and fit back on the model for assessment of the contour and texture lines needed to complement adjacent dentition. Noted texture landmarks were marked in red and black over the bisque-fired porcelain surfaces (Figure 24 through Figure 27). The working model’s adjacent tooth surfaces were painted with Renfert PICO-FIT gold die spacer (www.renfert.com), making it easier to show the existing definition of texture prominence of the natural dentition (Figure 28). The glazed and fired restoration was accessed in the patient’s mouth for custom external characterization using Initial™ IQ Lustre Paste (GC America, www.gcamerica.com) in neutral, white, light gray, and the Body Shade B (Figure 29).

Placement of Lustre Paste shade LB-3 around the halo effect was obviously needed when the
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Fig 22. Additional translucent blue TM-01 and translucent opal TO were added to the mesial contact and over the middle 1/3 horizontal craze line.

Fig 23. A darker enamel shade E 60 was built up over entire labial surface, covering all of the characterized buildup.

Fig 24. The restoration was fired for the second time.

Fig 25. After firing, the color was again reassessed.

Fig 26. The fabrication was fit back onto the model.

Fig 27. Red and black lines were placed to identify the contour and texture over labial surfaces.

Fig 28. Gold die spacer painted over adjacent teeth shows texture definition of surrounding dentition.

Fig 29. The glazed restoration was accessed for placement of external characterization with Lustre paste.

Fig 30. Lustre paste application was reviewed in the patient’s mouth for shade selection and placement of additions.

Fig 31. Immediate insertion of restoration with teeth dehydrated reveals the accuracy of the shading.

Fig 32. The restoration was observed for proper texture with the dentition hydrated.
Fig 33. Occlusal photographs show integrity of central appearance and incisal characterization.

Fig 34. Occluding dentition in the photograph show the placement of accurate characterization and how the color relates to the occluding dentition.

Fig 35. Additional cervical depth was added with LB Lustre paste.

Fig 36. The Lustre paste characterization was observed for cervical depth accuracy.

Fig 37. The restoration blends naturally with surrounding dentition.