Natural Colors

Photographs by Pat Cooney

A SoFoBoMo 2010 Book

Introduction

It all started with an old wooden bowl that sits on our kitchen counter and holds fresh produce. The color contrast between a small bunch of tomatoes and a few whole garlic in the bowl caught my eye. I took some shots of this still life with my iPhone, made a few prints and shared them with some friends. They too enjoyed the contrasting colors of these simple subjects. At this point my memory of three prior photographic experiences kicked in. These three memories moved me along to this "Natural Colors" project.

The first of these influences came from seeing, a few years back, an original print of Edward Weston's *Pepper No. 30* at the Getty Museum in Los Angeles. The success of Weston's iconic image validated for me the otherwise goofy idea of photographing a single fruit or vegetable, then eating your subject.

My second influence sprang from portraits by Richard Avedon like those from his book *In the American West.* He made these portraits with a white seamless paper background and simple, diffuse lighting. I adopted this approach to focus on the particularity of each of my subjects.

Third on my list of influences is Bill Atkinson's marvelous book, *Within the Stone*, (Browntrout, 2004) in which he went to extreme lengths to assure the best possible reproduction fidelity of his color photographs of polished stone surfaces. My modest efforts toward color fidelity in this project are only a faint shadow of what he accomplished.

My "produce portraits" are presented in colored frames. The color of each frame represents the dominant color of the subject, captured by averaging the colors in a small patch of the subject's skin. I have labeled this color with three numbers, its "Lightness" on a scale where zero is black and 100 is white, its "Lab hue," an angle ranging from zero to 360 degrees representing its basic color on the Lab color wheel, and its "Lab chroma" which measures on a scale from zero to 180 how "colorful" this particular color is.

Feel free to ignore this additional color information and just enjoy the photographs themselves. But if you get curious about ways of representing colors quantitatively, you can learn more in the Appendices at the end of this book.

To most faithfully render these color images I recommend viewing *Natural Colors* with a recent version of Adobe Acrobat Reader which supports color-managed images.

Off-White

Garlic

Lightness = 95

Lab hue = 90°

Lab chroma = 2

White Mushrooms

Lightness = 86

Lab hue = 81°

Lab chroma = 6

White Corn

Lightness = 84

Lab hue = 82°

Lab chroma = 15

Red

Grape Tomatoes

Lightness = 47

Lab hue = 38°

Lab chroma = 87

Tomatoes

Lightness = 47

Lab hue = 40°

Lab chroma = 79

Royal Gala Apple

Lightness = 46

Lab hue = 41°

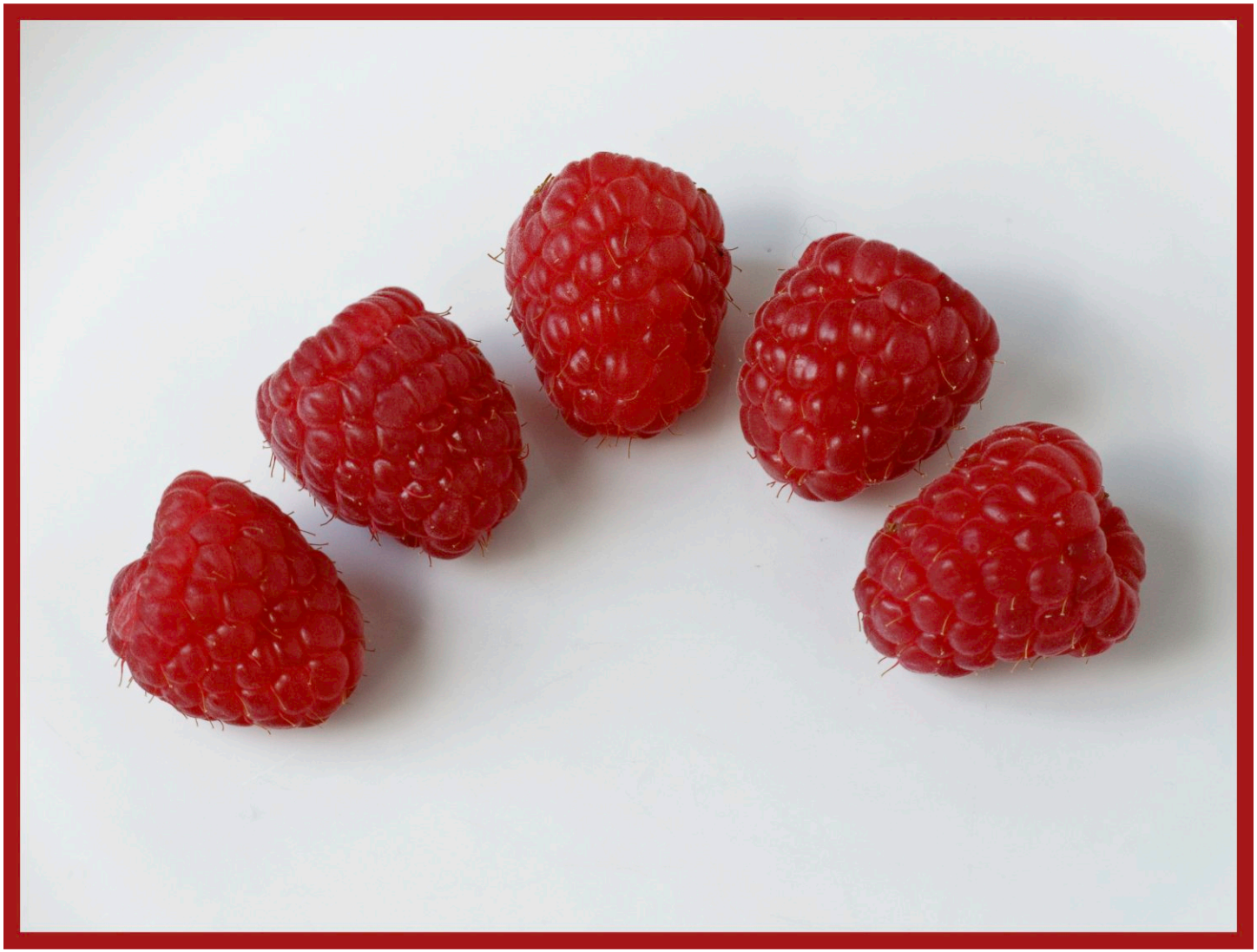
Lab chroma = 57

Radish

Lightness = 44

Lab hue = 29°

Lab chroma = 71



Raspberries

Lightness = 37

Lab hue = 36°

Lab chroma = 67

Red Onion

Lightness = 35

Lab hue = 27°

Lab chroma = 42

Nectarine

Lightness = 35

Lab hue = 40°

Lab chroma = 59

Red Pepper

Lightness = 33

Lab hue = 41°

Lab chroma = 69

Red Delicious Apple

Lightness = 31

Lab hue = 34°

Lab chroma = 55

Red Grapes

Lightness = 26

Lab hue = 39°

Lab chroma = 40

Strawberry

Lightness = 23

Lab hue = 37°

Lab chroma = 48

Cherries

Lightness = 10

Lab hue = 27°

Lab chroma = 27

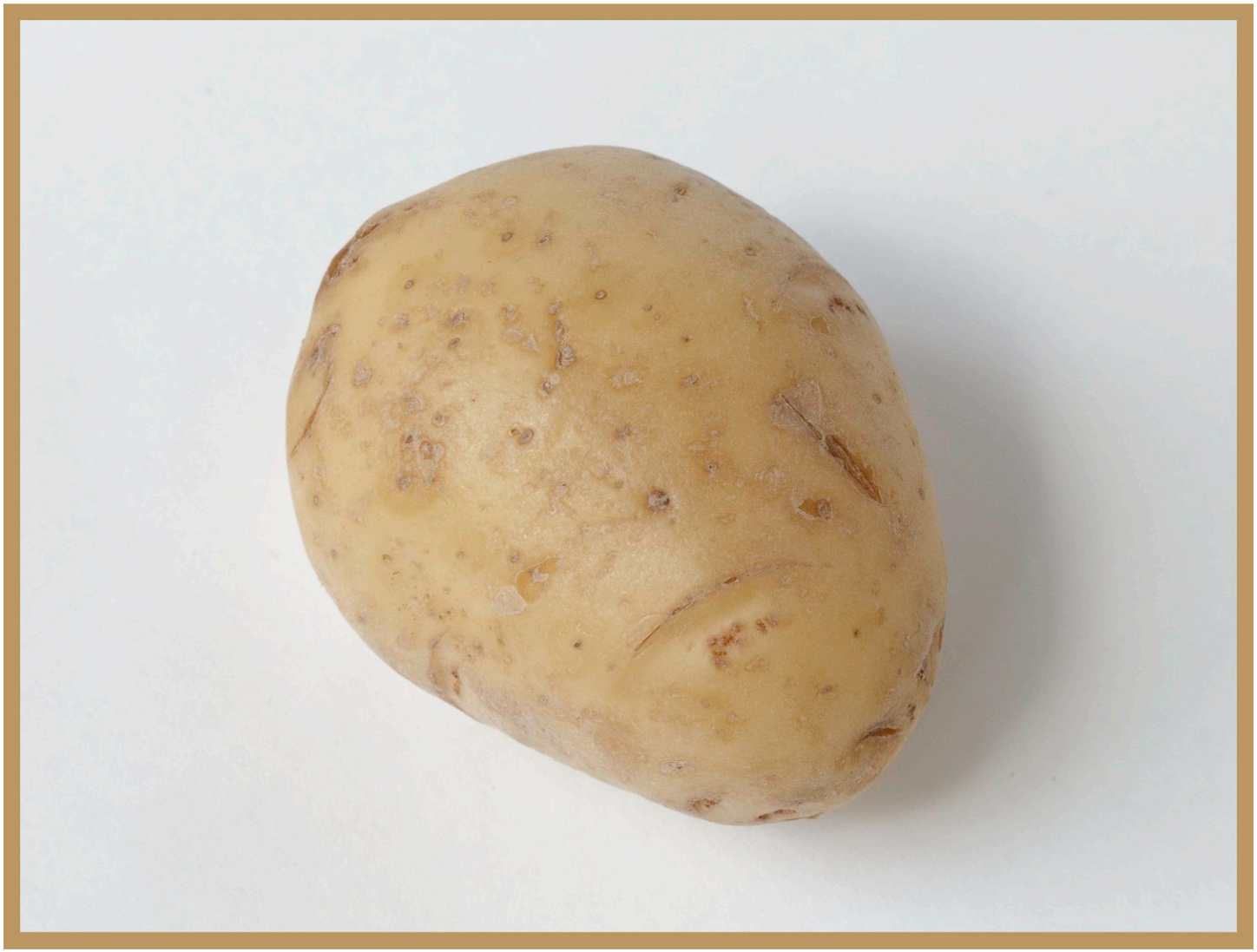
Orange

Vidalia Sweet Onion

Lightness = 80

Lab hue = 73°

Lab chroma = 31



Yukon Gold Potato

Lightness = 65

Lab hue = 73°

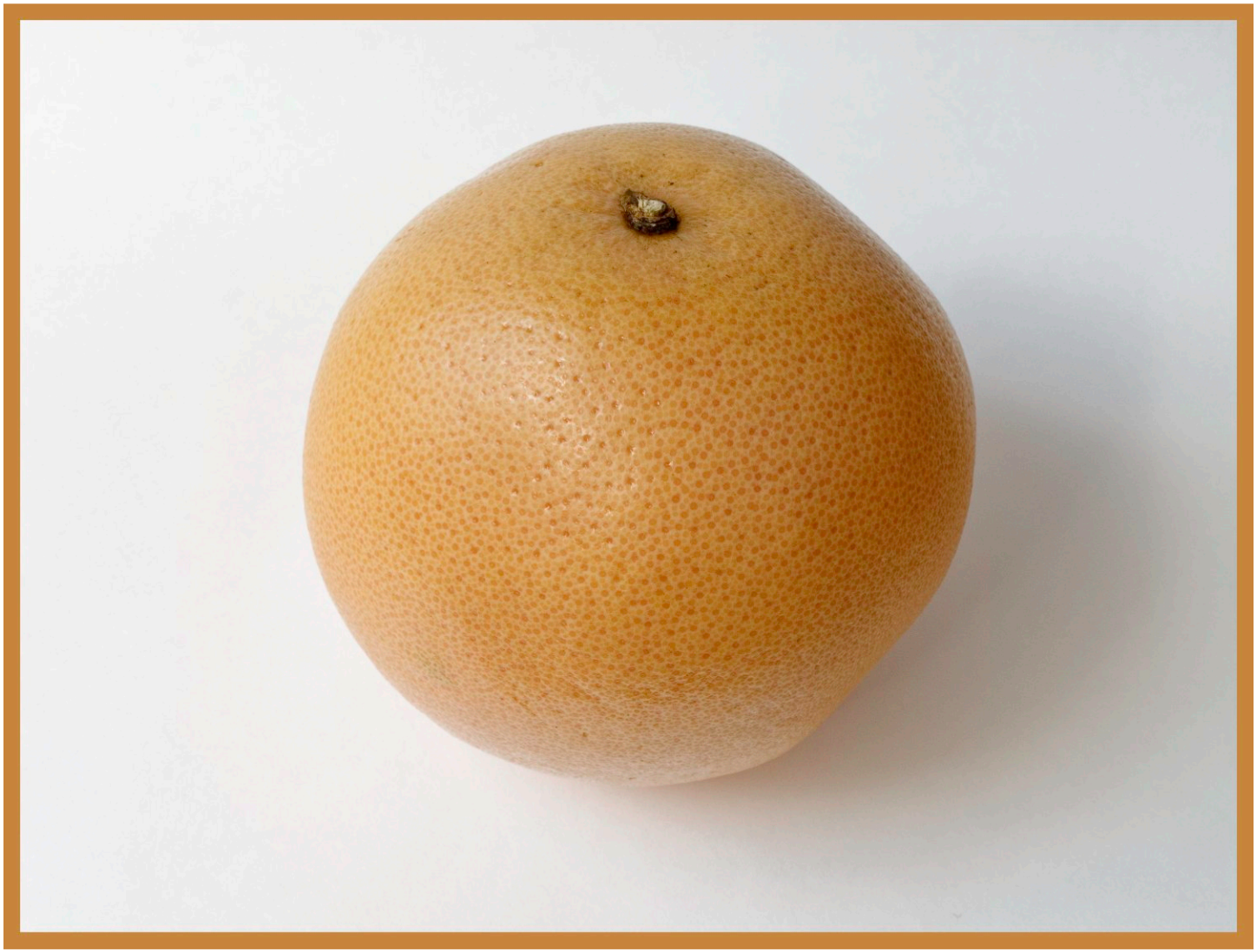
Lab chroma = 34

Star Fruit

Lightness = 64

Lab hue = 70°

Lab chroma = 70



Star Ruby Grapefruit

Lightness = 63

Lab hue = 66°

Lab chroma = 52

Ginger Root

Lightness = 63

Lab hue = 68°

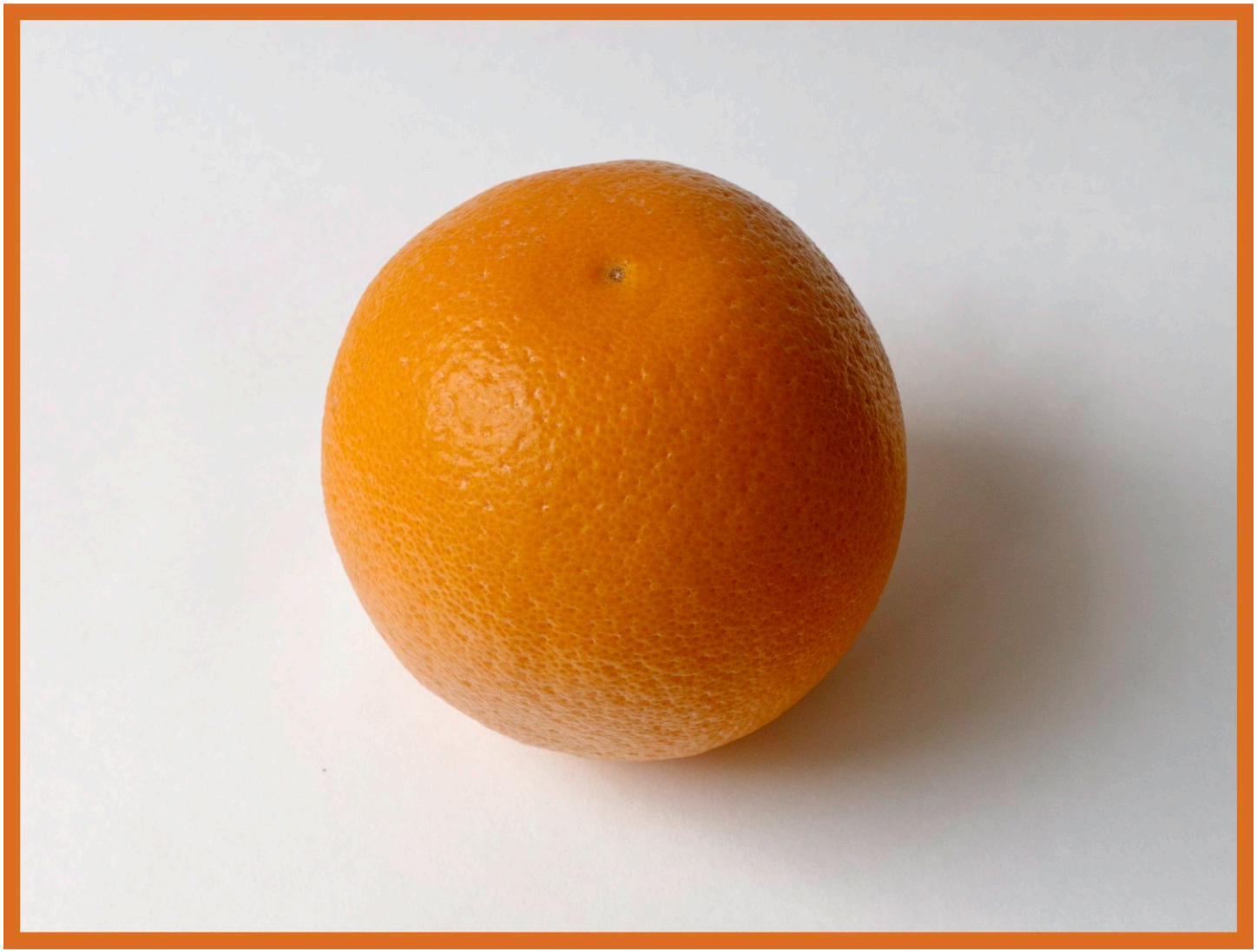
Lab chroma = 24

French Cut Carrots

Lightness = 60

Lab hue = 57°

Lab chroma = 73



Valencia Orange

Lightness = 57

Lab hue = 62°

Lab chroma = 75

Orange Pepper

Lightness = 56

Lab hue = 52°

Lab chroma = 79

Forelle Pear

Lightness = 44

Lab hue = 57°

Lab chroma = 53

Kiwifruit

Lightness = 41

Lab hue = 72°

Lab chroma = 39

Yellow

Yellow Pepper

Lightness = 76

Lab hue = 80°

Lab chroma = 83

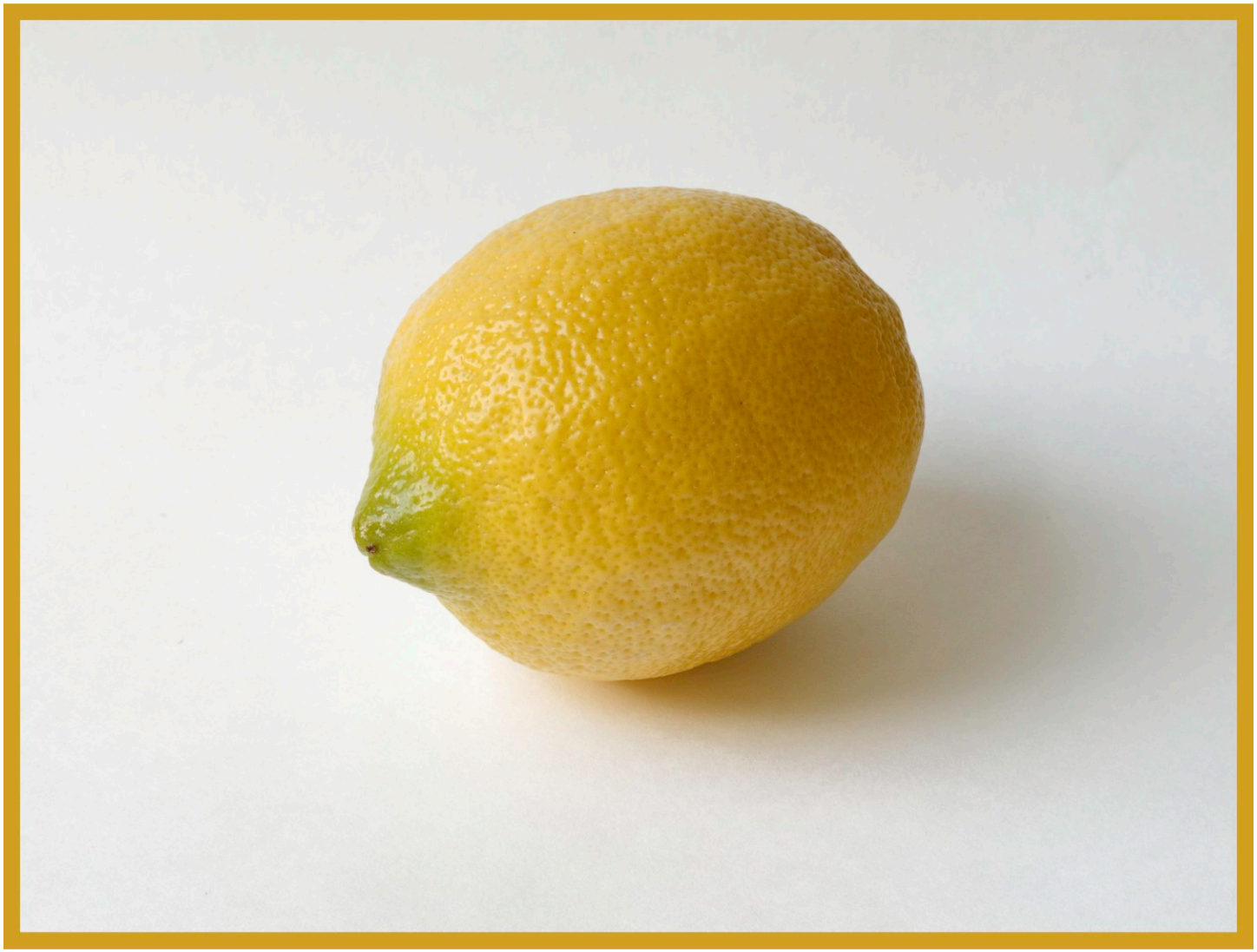
Golden Delicious

Apple

Lightness = 76

Lab hue = 90°

Lab chroma = 57



Lemon

Lightness = 70

Lab hue = 82°

Lab chroma = 68

Banana

Lightness = 70

Lab hue = 83°

Lab chroma = 55

Green

Green Onion

Lightness = 76

Lab hue = 104°

Lab chroma = 44

Sugar Peas

Lightness = 65

Lab hue = 108°

Lab chroma = 45

Granny Smith Apple

Lightness = 63

Lab hue = 92°

Lab chroma = 52

Green Grapes

Lightness = 61

Lab hue = 104°

Lab chroma = 55

Brussels Sprouts

Lightness = 50

Lab hue = 120°

Lab chroma = 30

Asparagus

Lightness = 42

Lab hue = 110°

Lab chroma = 50

Dill

Lightness = 37

Lab hue = 122°

Lab chroma = 36

Broccoli

Lightness = 34

Lab hue = 133°

Lab chroma = 18

Lime

Lightness = 25

Lab hue = 125°

Lab chroma = 29

Hass Avocado

Lightness = 22

Lab hue = 128°

Lab chroma = 11

Other Colors

Blueberries

Lightness = 48

Lab hue = 256°

Lab chroma = 8

Red Cabbage

Lightness = 31

Lab hue = 344°

Lab chroma = 33

Turnip

Lightness = 33

Lab hue = 9°

Lab chroma = 40

Appendix A: Color Spaces

I set myself two goals for this book. The first was to produce a set of visually engaging, colorful photographs to be viewed and enjoyed for themselves. My second goal was to learn to better visualize colors in the CIELAB color space. CIELAB is one of rather too many mathematical representations of color perception. It uses three parameters, called L*, a*, and b*, to denote a particular color. CIELAB is designed to be "device independent" and "perceptually uniform," both good things. More importantly for this modest project, Adobe Photoshop can measure these three parameters for any color in a digital image. It calls them simply L, a, and b.

The CIELAB color space, which I'll call Lab space from now on, labels colors uniquely. The problem is to build an intuitive sense of what the numbers mean. For example, what visual color corresponds to L = 47, a = 60, b = 51? Now I know that it's tomato red. But what else has the same basic color? Well grape tomatoes would be a good guess. They measure out to be L = 47, a = 68, b = 54, fairly close. But how about a nectarine? It yields L = 35, a = 45, b = 38, not so close it seems. But actually it *is* the same basic color. Remember the color wheel you learned in school? One way to represent basic colors is to assign an angular position on such a color wheel to each color. Hue (a fancy name for specific colors) only depends on the *ratio* of b to a. In Lab space you can locate any basic color by defining its Lab color angle to be

Lab hue = atan (b/a).

Using this formula, the hue angle for tomatoes, grape tomatoes, nectarines and even red peppers, royal gala apples and red grapes turns out to be close to 40 degrees, the same basic color. When these colors differ in visual appearance it is only due to differences in their "Lightness" and/or their "Lab chroma."

The chroma value tells us how "colorful" each color is, how far it is from the neutral grey axis (a = 0, b = 0) in Lab space. Like all good distance this "colorfulness" is defined, courtesy of Pythagoras, as

Lab chroma = sqrt(a^2 + b^2).

Each image caption in this book lists these three values for the color of the frame around the image: Lightness (0 to 100), Lab hue (0 to 360 degrees), and Lab chroma (0 to 180).

For more information on color science I suggest, as a starting point, the Wikipedia articles on "Lab color space" and "Colorfulness" and the links they contain.

Appendix B: Workflow

To have any hope of extracting reasonably consistent color data from these images I tried to control as many variables as possible. Here's what I did:

- I used the same camera and lens, a Canon G11, for all the pictures. Each was taken at f/5.6 at ISO 80 toward the long end of the lens' zoom range, carefully exposing to the right and avoiding any significant highlight clipping.

- My main light source was diffuse north-sky daylight from the left plus a matte white reflector on the right to control the overall contrast of the image.

- I used a polarizing filter on the camera to manage subject skin reflections.

- I recorded each image RAW and developed it in Lightroom 2.7 using its "Camera Neutral" profile.

- In Lightroom I adjusted each image's exposure to yield a Lightness of about 93 (+/- 3) for the brightest area of the picture (almost always within the white background.)

- I white-balanced each image to the white background and checked these settings often against images of a "WhiBal" grey card on the same white background for consistency. No other color adjustments (e.g. Vibrance, Saturation, Hue, or Luminance) were used.

- My entire workflow from Lightroom to Photoshop CS2 to Scribus used images in the 16-bit ProPhoto RGB color space to minimize high chroma clipping.

- After exporting the images from Lightroom to Photoshop I selected an area (typically about 200 pixels on a side) on each subject which I averaged in Photoshop to produce the uniform color chip for the color frame. I avoided areas with specular reflections.

- I used the PDF engine in Scribus to make the final "Natural Colors.pdf." I found that I had to set its "Color" tab to "Output intended for Printer" and check "Use ICC Profile" for images but *not* check "Don't use embedded ICC profiles." These settings yielded an excellent visual color match for images viewed in Adobe Acrobat Reader 9.3.2, Lightroom 2.7, and Photoshop CS2 on my calibrated monitor.

Thanks to my wife, Margaret Cooney, and to my friends in the Lancaster Independent Photographers Group for their many helpful suggestions duing this project.

Thanks too to the Solo Photo Book Month project (www.sofobomo.org) for a framework in which to refine my craft.

This book was designed and produced by the author using:
A Canon G11 camera
Adobe Lightroom and Photoshop CS2 photo editing software
Scribus page layout software
Palatino Linotype fonts

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