

# Digital Restoration from Start to Finish

**Ctein**

Acquisitions Editor: Diane Heppner  
Assistant Editor: Stephanie Barrett

Project Manager: Paul Gottehrer  
Marketing Manager: Christine Degon Veroulis

Cover Design: Alisa Andreola

Focal Press is an imprint of Elsevier

30 Corporate Drive, Suite 400, Burlington, MA 01803, USA  
Linacre House, Jordan Hill, Oxford OX2 8DP, UK

Copyright © 2007, Elsevier Inc. All rights reserved.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the publisher.

Library of Congress Cataloging-in-Publication  
Data  
British Library Cataloguing-in-Publication Data

A catalogue record for this book is available from the British Library.

ISBN 13: 978-0-240-80814-7

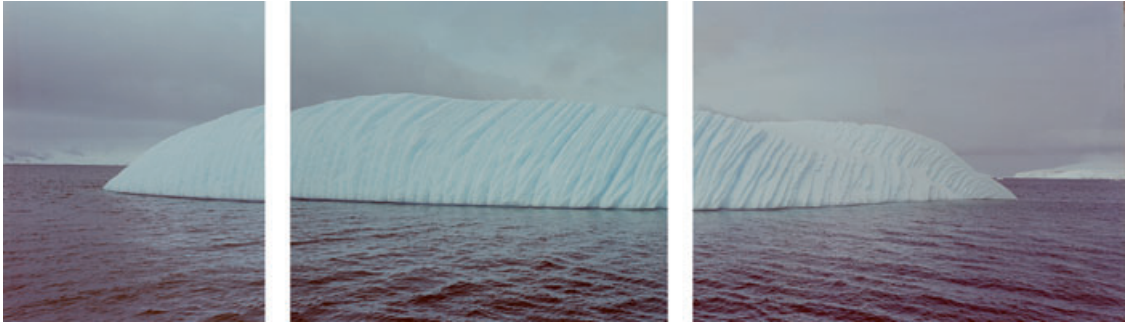
ISBN 10: 0-240-80814-2



AMSTERDAM • BOSTON • HEIDELBERG • LONDON  
NEW YORK • OXFORD • PARIS • SAN DIEGO  
SAN FRANCISCO • SINGAPORE • SYDNEY • TOKYO

Focal Press is an imprint of Elsevier





**Fig. 9-20** I needed to scan this 6-cm by 17-cm negative in three sections because it was too big for my scanner. Here are the three overlapping scans I created. There is a slight color mismatch; there's also a little bit of geometric distortion. (Original photograph copyright by Stuart D. Klipper.)

### Stitching Scans Together

#### HOW TO COMBINE SCANS TO MAKE ONE LARGE PHOTOGRAPH



Sometimes you'll want to restore a photograph that is larger than your scanner can accommodate. Scanning a photograph in sections is not difficult, but there are two problems to address when stitching sectional scans together: Some misregistration and slight differences in exposure might exist between the separate scans.

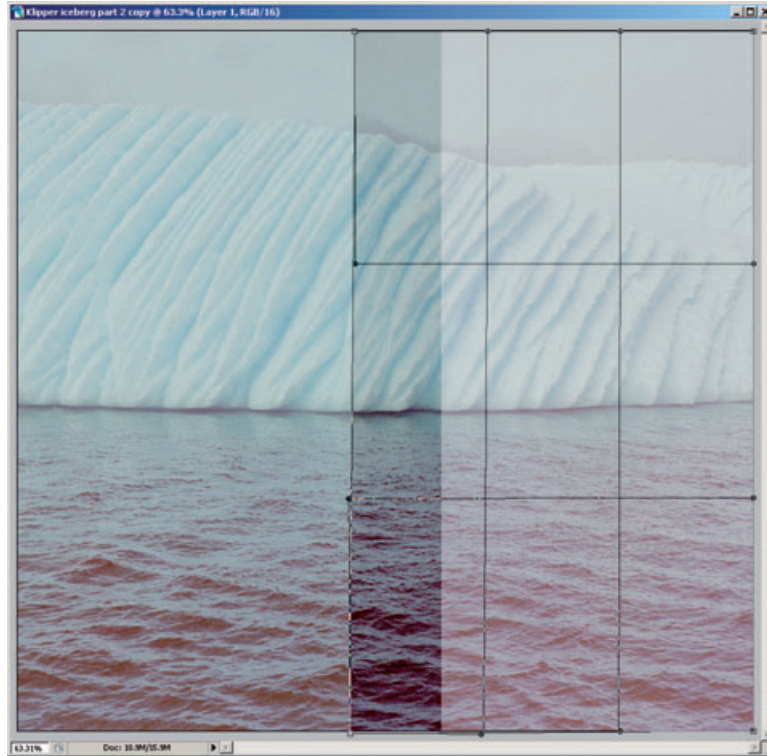
You won't want the scanner making different exposure and contrast adjustments for each section of the photograph, so turn off as much of the scanner's automatic exposure control as you can. Ideally, the exposures for all the sections should be absolutely identical. In practice, this doesn't always happen. The internal scanner calibration from scan to scan may not be identical. You should expect to see some slight exposure mismatches between the sections.

Figure 9-20 shows three sectional scans I made from a 6-cm by 17-cm negative. This magnificent photograph of an iceberg by Stuart D. Klipper had been damaged and was in need of repair. First I aligned the scans so that they'd blend seamlessly when I merged them. I copied them into separate layers of a single file and set the layer opacities to 50% so that I could see how they overlapped. Figure 9-21 shows a close-up of the overlap between the center and right-hand scans. I registered the two scans at a point at the top of the iceberg. The doubled images at the bottom of the overlap band indicate that one of the scans has a little geometric distortion.



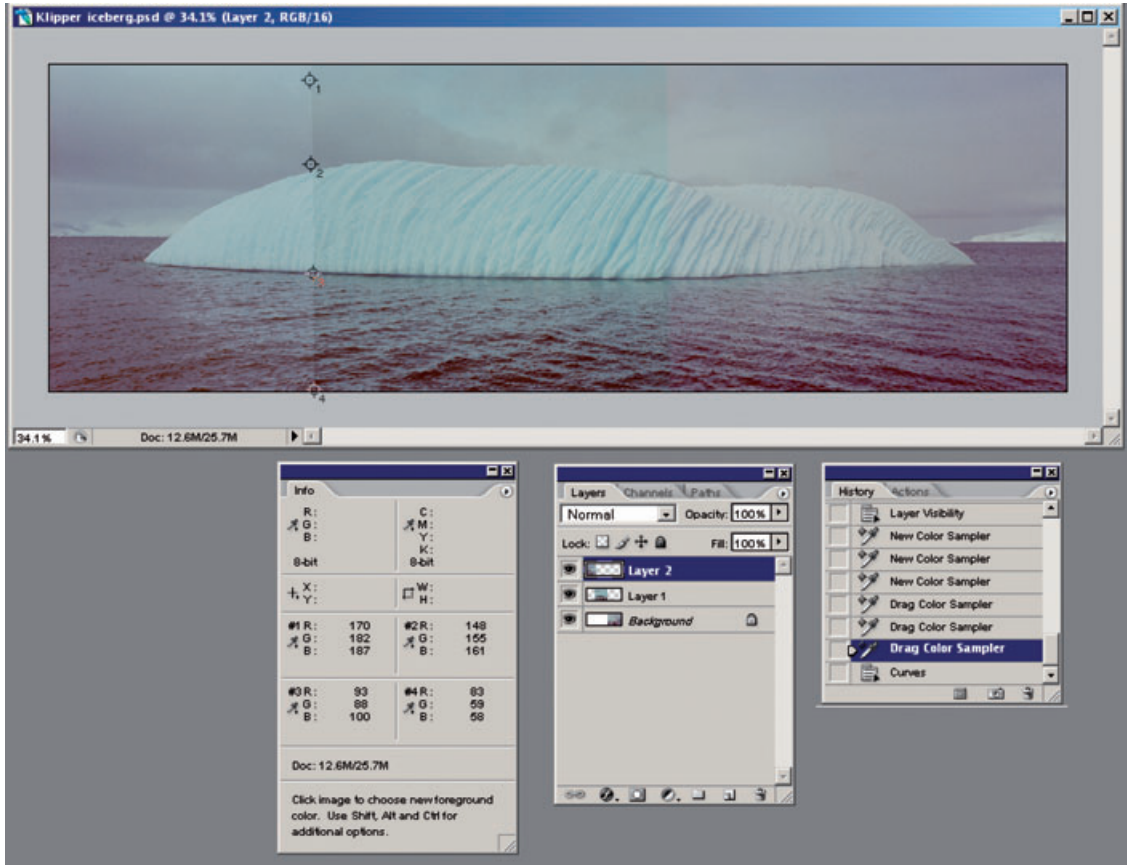
**Fig. 9-21** Overlapping and aligning the middle and right-hand scans shows that they don't quite match up. The iceberg is perfectly superimposed at the top, but the wavelets at the bottom of the photo are misaligned. This is visible as a doubled image. I can fix this with Photoshop's Transform/Warp tool (Figure 9-22).

**Fig. 9-22** In this screenshot of the Warp tool in action, I selected a rectangular region in the right-hand scan and created the Warp grid. By adjusting individual points in the grid, I can transform the left side of the scan so that it matches the middle scan perfectly. Warp creates a smooth transition from this bit of distortion into the rest of the rightmost scan.



**HOW TO COMBINE  
SCANS TO MAKE  
ONE LARGE  
PHOTOGRAPH  
(continued)**





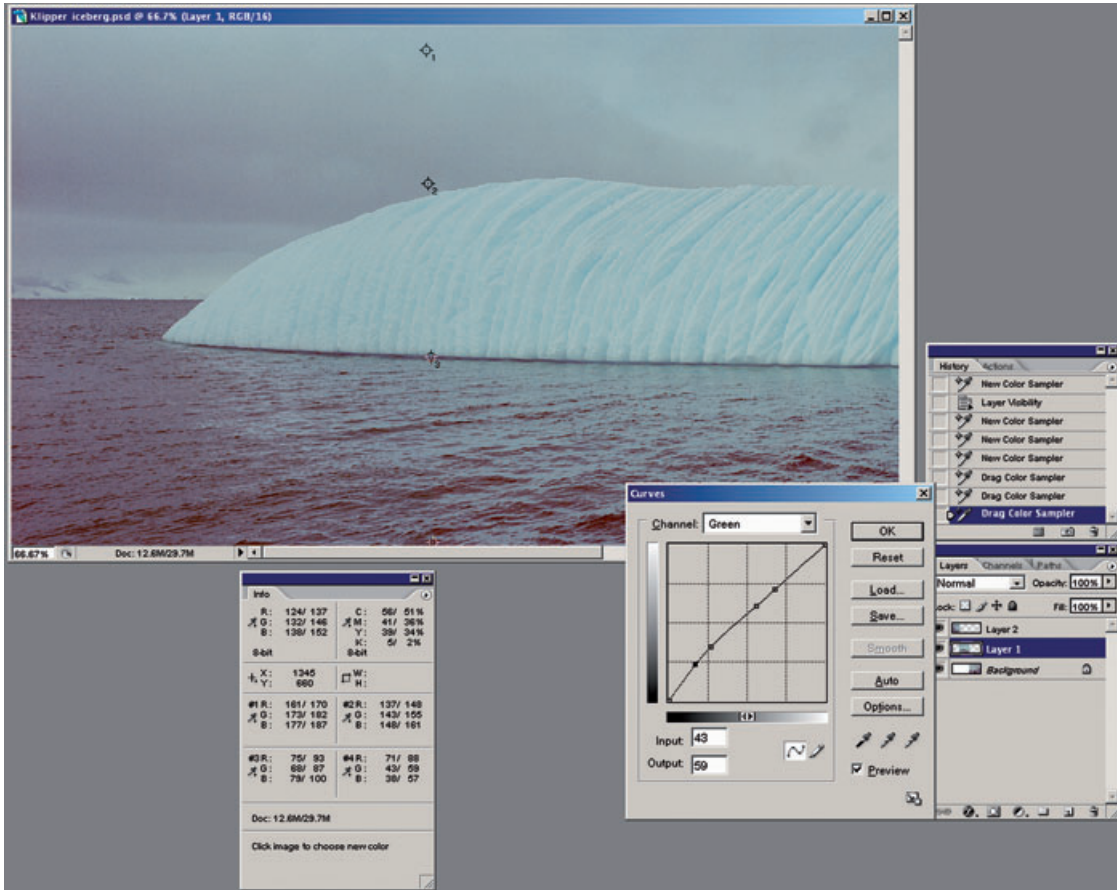
**Fig. 9-23** This screenshot shows me setting up the sample points that will let me match the color between the left (Layer 2) and middle (Layer 1) scans in Figure 9-24. I set four sample points near the boundary between the scans that encompass a broad range of tones and colors.

In Photoshop, the Warp operation is the best way to fix that. It superimposes a 3-by-3 mesh on the layer (Figure 9-22). You can grab a point in the image and drag it to a new position and the rest of the layer smoothly warps to accommodate the change. Alternatively, you can manipulate control points at the corners of the mesh by their little solid-dot handles and warp the mesh that way.

If Photoshop's Warp adjustment doesn't give you enough control over the geometry of the image, turn to Picture Window, which has a much more powerful Composite Transform. You can set up to 63 control points in the Composite Transform mesh using the multipoint option. The Composite Transform does scaling, rotation, and warping all in one operation.

Once I had the three scans aligned, I set their opacities back to 100%. Now I had to match their colors. In Chapter 5, Restoring Tone, I told you about clicking on a photograph to create sample points in the Info window and to assign control points to curves (Figure 5-16). I set four sample points in the

HOW TO COMBINE  
SCANS TO MAKE  
ONE LARGE  
PHOTOGRAPH  
(continued)



**Fig. 9-24** This screenshot shows me making a Curves adjustments to the green channel of the middle scan that corrects sample point #4. Compare sample point #4's values in the Info windows in Fig. 9-23 and this figure. I've adjusted the Green curve for that point to make the two values equal (a value of 59). Doing this for all four points in all three channels produces a very good match between all the colors in the scans.

### HOW TO COMBINE SCANS TO MAKE ONE LARGE PHOTOGRAPH (continued)

left-hand scan layer, right next to the boundary with the center scan layer (Figure 9-23). All four points are actually in the region where the scans overlap; you can't see the overlap in the illustration because the upper layer opacity is 100%. That overlap's important because I use the sample points to compare the RGB values in the two layers.

I picked those points to represent a broad range of tones. The RGB values for the sample points are shown in the Info window. I made a screenshot of the Info window and pasted it into a new image window so that I could refer to the RGB values for the left-side scan layer while working on the middle scan layer. (If you don't want to clutter your computer screen with unnecessary images, you can print the screen with those RGB numbers onto a piece of paper for reference.) I switched to the middle scan layer and launched the Curves tool. (I could have created a Curves adjustment layer associated with the scan



**Fig. 9-25** The top figure shows the three merged scans after color matching and alignment. This appears to have been a single, seamless scan. The bottom figure shows the fully restored photograph after color and tone correction with a Curves adjustment layer. (Photograph copyright by Stuart D. Klipper.)

layer if I wanted to preserve the option of going back and readjusting the curves later.) I shift-control-clicked each of the sample points, creating four control points in the Curves window (Figure 9-24).

To match the colors between the two layers, I moved the control points in the individual curves so that their output values were the same as the ones I had recorded for the left-hand scan. For example, Figure 9-24 shows me working on sample point #4 on the green curve. That had a value of 59 in the left-hand scan, so I typed 59 into the output box for that curve point. In this manner I entered all of the sample-point RGB values for the left-hand scan into the curve control points for the center scan.

The two scans now blended perfectly; as long as scans don't differ too much to begin with, this four-point adjustment scheme can produce a perfect color match. I repeated this procedure for the middle and right-hand scan layers. That gave me a seamless blend between all three sections of the photo, as you can see in Figure 9-25, upper. All the file needed was overall color correction to produce a lovely, finished photo-graph (Figure 9-25, lower).

**HOW TO COMBINE  
SCANS TO MAKE  
ONE LARGE  
PHOTOGRAPH  
(continued)**