

INTRODUCTION AND OVERVIEW

Modeling is a visual art, and thorough, high-quality photo coverage that illustrates the model building process is absolutely critical to getting your article published. How much we offer to pay for your work is based in large part on:

- Quality of photos (resolution and size, focus, adequate and balanced lighting, etc.)
- Clarity and completeness of story told by photos
- Suitability of captions
- Compliance with these directions and how hard we have to work to make photos ready for publication (i.e., file naming conventions, consistency between captions, file names, and text placement, etc.)

Speaking from experience, your biggest challenge will be managing your own attitude and habits.

- **Get used to interrupting the building process to take photos.** Download and check your photos often, especially before sealing up part of the model that will not be easily accessible later.
- **Modify your work area to make it suitable for taking pictures. Keep your camera and other equipment handy.** Alternatively, create a separate work area to take pictures close to your model bench. Get some Berna clamps, modeling clay, and tape to help hold things still while you pose them. You may need your spouse or modeling buddies to help hold things while you take pictures.
- **Use a picture instead of text at every opportunity.** It will save you from writing more text! A picture is worth a thousand words: exploit that tremendous leverage and let the pictures tell the story.
- **Please comply with these instructions for naming your image files and integrating your photos, captions, and text.** Otherwise, our workload on this end skyrockets.

Photographs of your model and how it was built are crucial to your success, but other high-quality photos in the Historical or Technical Background sections of your article also add significantly to the value of your article in the minds of AMM readers. Specifically, you might want to include photos of the subject in actual use or walk-around photos or detail photos of actual subjects preserved in museums.¹ If you don't have all the images you need, we'll put a team together to create them or acquire them to beef up your article. You may also want to buy original pictures from other sources.²

Likewise, graphics (e.g., color profiles, scale line drawings, simple sketches that explain how parts should fit, etc.) are highly desirable. If you can create high-quality graphics, do it. If you can't, make sketches or simply mark up a copy of the kit instructions and we'll find someone who can.

The rest of this guide is divided into sections.

- Technical Suggestions
- Integrating Images and Captions in Your Article (this is critical!)
- Troubleshooting Images
- Data Transfer

¹ Resolution requirements, file naming conventions, and caption requirements apply to all images submitted for publication.

Historical photos of the real subject will usually have to be scanned, preferably as TIF files. Detail or walk-around photos of the full-size subjects are generally taken at airfields or museums, where lighting conditions, depth of field requirements, and close focusing techniques will differ markedly from the macro photography techniques describe here.

² We can recommend sources if you need us to, and we're establishing standing agreements with as many vendors as we can to make things easier for you. If you know of some sources, please tell us. In general, AMM does not pay authors and contributors for such photos separately. Rather, it's part of the author's negotiated compensation and the authors pay for the photos. At our discretion, however, we may pay for pictures separately.

Please read these other guides before engaging Geoff and me in speculation about projects you have in mind. We simply don't have time to repeat all of this information over the phone or by e-mail.

- The **AMM Feature Article Author's Guide** describes our editorial goals and doing business with us.
- **Writing Feature Articles 101** is about the nuts and bolts of writing articles, including integrating photos, graphics, and captions into your text.
- Articles are built around photos and graphics and captions. The **AMM Digital Photography Guide** (this guide) covers what we expect technically from your photos and graphics.
- Kit reviews are a special kind of short, structured, narrowly-focused article. The **AMM Kit Reviewer's Guide** provides further insight into AMM's editorial focus and tone.
- The **AMM Kit Reviewer's Template** serves as a checklist for gathering and presenting valuable information about the kit under review. It's also valuable for feature articles.
- The draft **Letter Contract / Invoice** will prepare you to negotiate sale and assignment of your work.

TECHNICAL SUGGESTIONS

ISO Settings

ISO is a measure of how sensitive your camera is to light, but it also affects image quality. A higher ISO setting allows photography in lower light conditions, but the images will appear "grainier." Lower settings will require more light but the images will be sharper.³

Be aware of the default ISO setting in your camera. The default setting in a consumer-grade camera (usually 100, 200, or 400) is probably close enough for model photography. If you're having trouble with graininess or adequate exposure, however, consider changing it.

Image File Types

Most consumer-grade cameras used by model builders automatically default to JPEG⁴ image files. JPEG compression is "lossy," which means that some image quality is lost during digital compression. A JPEG file will be much smaller than an uncompressed file, which makes it ideal for e-mail attachments and web postings. The visible result resembles poor focus in a conventional film image, caused by loss of digital information at the edges. The compression (and fuzziness) is not a critical factor when viewed on a monitor with 72 dpi resolution, but the effect is severely aggravated when viewed in a 300 dpi print image.

For this reason, we strongly prefer uncompressed image file formats such as TIF⁵ and EPS.⁶

These uncompressed files are much larger, so they require more memory in your camera and on your hard drive and more bandwidth on your internet connection, but the improved image quality is essential for print images in a magazine. The downside is that we usually can't send large, uncompressed images over most internet lines or by e-mail conveniently. Instead, we have to burn images to CD or DVD and use snail mail for large numbers of images or use FTP (File Transfer Protocol) to bypass our e-mail servers.⁷ We can occasionally get away with sending one or two images via e-mail to make corrections or replace a single image, etc., but it's not practical to send all 30 or 40 images that might be associated with a feature-length article by e-mail.

³ Think in terms of film speed. We used to buy ASA 400 film for darker conditions, but the finished photos were usually grainier than ASA 100 film, which may have required flash in similar conditions.

⁴ Joint Photographic Experts Group, often abbreviated JPEG or JPG.

⁵ Tagged Image File Format, often abbreviated TIF.

⁶ Encapsulated Post Script, often abbreviated EPS.

⁷ Contact us via the AMM website for FTP instructions and passwords.

You have to set your camera and computer interface to convert your raw camera data to these file formats. If you don't, it will probably assume you want JPEGs. Once it gives you JPEGs, you may not be able to recover a TIF file from the camera.

We want the image in the most primitive format you have (beyond RAW or other camera manufacturer's format).

Special requirements for JPEGs include:

- When creating or saving a JPEG, choose the options for ***largest file size*** or ***minimum file compression***.
- MINIMIZE the number of times you adjust, process, or save as a JPEG image.
- DO NOT convert JPEGs to TIFs. We'll do it.

Other requirements include:

- DO NOT use LZW compression with TIF files.
- DO NOT convert image files from RGB to CYMK.
- DO NOT resize or resample images to increase pixel count or resolution.

If you want to crop your images or adjust them for color, brightness, contrast, etc., that's OK, but please include the most primitive images in a separate folder.

Bitmaps, GIFs, etc., are simply unusable and cannot be accepted.

Image Size (Resolution) Settings

Suggested image size settings are strongly driven by print resolution requirements and our desire to make the images as large and sharp as we can.

We require a minimum of 300 dpi (dots or pixels per inch) in the finished image size for printing photo images. That's for TIFs, and we prefer more for JPEGs.

We think of photo images in terms of fractions of magazine pages (e.g. quarter page, half page, full page, etc.) Keep in mind that some image size and resolution will be lost when the image is cropped to properly frame your subject. Here are some suggested image size settings when creating TIFs:

- Use a minimum "normal" setting of 3 Mpix for shooting in-progress photos, which will provide uncropped photos up to around ¼ page (or about 3.5" wide x 4.5" high).
- Shoot several 5 Mpix images (or larger) of the finished model that are suitable for half page (7.5" wide x 6" high) header photos. We often refer to these as "glamour shots" of the finished model.
- If you intend to use an image as a full page or cover image, you need a properly framed image (i.e., your model fills most of the image) that is at least 6 Mpix.

The previous suggestions are for TIF files. JPEGs require higher resolution settings.

Use the "image size" utility in your image processing software to check finished image size. For example:

- Consider an image that's only 72 dpi, but the image size is 15" x 12". Since the ratio of 300 to 72 is roughly 4 to 1, the same image is roughly 4" x 3" image at 300 dpi.
- Going the other way, a "1 square image at 800 dpi could go up to around 2.5" square without violating the 300 dpi requirement.

Up to some reasonable limit, it's OK to send larger pictures that need to be made smaller, but avoid using photos that have to be enlarged.

Unless the website tells you otherwise, photos suitable for those websites or obtained from websites usually have very low resolution and are unsuitable for magazines. They're usually 72 dpi (compatible with your monitor) instead of 300 dpi required for printing. That's a factor 4 on one dimension, which is a

factor of 16 in two dimensions. (They're also in RGB color instead of CYMK.) These images work well on your monitor and for e-mail, but they're entirely unsuitable for printing. There's usually no way to fix such resolution problems.

Focus, Depth of Field, and Macro⁸

Start with some definitions.

- The terms ***close-up photography*** and ***macro photography*** are generally interchangeable. They refer to creating finished images that are close to or larger than life size.
- An image is ***in focus*** when all the objects of interest in that image are sharply defined or not "fuzzy."
- An image is ***out of focus*** when some of the things I want to see in the image are fuzzy or distorted.
- The difference between the minimum and maximum distances that the lens can create a focused image is ***depth of field***. This is a critical concept for macro photography! Depth of field is also a function of distance from the camera: it gets shorter as you get closer to the camera and longer as you get farther away. Since most macro photography is done "close up," depth of field is usually very shallow and must be watched carefully.
- A ***macro lens*** is made for close-up photography.⁹ You'll get less angular distortion, especially around the edges of the image, with a macro lens.

If you have one, you'll probably want to use a macro setting for close-up shots, but it's not a "magic stick" that lets you take any image at any distance. There are two main problems associated with macro photography: depth of field and lighting.

Depth of field and minimum focus distances apply to macro lenses, only more so, because you're usually trying to get in very close. This can reduce depth of field to something smaller than the characteristic dimensions (i.e., length or span) of your models or even the characteristic dimensions of its components (e.g., the height of an ejection seat compared to the width or depth of the cockpit it's sitting in, etc.). The result will be inconsistent focus across the image: one part of your image will be in focus, but the rest will not. This is a physical limit and not necessarily a deficiency in your camera or your technique. Typically, you'll get one of two unsatisfactory results:

- If you've properly framed the image so that the point of interest is in the center of the image and focused, the edges of the image will be out of focus.
- Your auto-focus may select the closest object in the image, and objects farther away but still in the area of interest in the image (i.e., near the center) will be fuzzy.

The only solution to this inconsistent focus and lack of depth of field is to:

- Physically back up some to get enough depth of field to cover the whole model or area of interest, then optically zoom back in.
- Turn up the resolution.
- Crop the image afterward.

Your camera may have several focus regimes, and you have to be aware of the valid focal ranges for each of those regimes. Without a doubt, those distances are in a table in your owner's manual.¹⁰ I suggest you write them down in large numbers and post them near where you take your pictures until you memorize them.

Getting even lighting is also critical in macro photography. The built-in flash – or even a conventional external flash – probably won't work for a variety of reasons. The only solutions are:

⁸ For those who've studied photography, please forgive the liberties I'm about to take with the technical accuracy of the details in the interests of helping people do a better job of taking pictures of their models.

⁹ A macro lens operates more like your eye than a standard lens, especially at close distances. The glass elements are shaped and grouped and positioned differently than for lenses use to shoot objects at longer distances.

¹⁰ My Fuji *FinePix* S7000 has three regimes and their associated valid focal ranges: normal (about 3 ft to infinity), macro (about 4 in to 2.6 ft), and super macro (1/2 in to 8 in). That info is on pages 36 and 56. Flash is not available in super macro mode.

- A good set of daylight-balanced flood lamps
- A ring flash (a flash shaped like a ring that goes around the end of your lens)

Lights, Stages, and Backgrounds

Use adequate numbers of **daylight balanced lights** to avoid color shifts and excessive shadows in your images. Use some kind of reflector to increase usable light on the object while minimizing heat. Both daylight balanced lights and reflectors are available at local camera and hardware stores.

Your camera may allow you to automatically compensate for unbalanced lights, but DO NOT use mixed light sources (i.e., some fluorescents, a few incandescents, some halogens, etc.). Your camera will not be able to compensate for the mix. Likewise, turn off all the unbalanced lights in the room (especially incandescents) to keep them from contaminating the image.

In general, use neutral gray backgrounds.

You may want to have several shades of gray backgrounds, from black to white. Occasionally, an odd-colored subject may look better on a light gray, light tan, light blue, or even black background. Avoid stark or unusual colors (orange, purple, bright reds and greens, etc.).¹¹

Photos of larger parts or the whole model should be taken on some kind of stage where the back of the ground transitions smoothly into the backdrop.¹² You can buy these, make one, or improvise one. Portable light boxes are becoming increasingly popular as they become available in larger sizes and lower prices.

Many small parts can be photographed on flat pieces of mat board¹³ or even on your model bench, if it's not too cluttered and if you can control the lighting. Those green self-repairing cutting pads make an ideal background, too, if they're not too beat up.

Taking Pictures

Regardless of whether you use a conventional film camera or a digital camera, you need to develop skill with your camera, just like you do with your airbrush.

- For starters, read the directions. Buy a book if you have to, just like you buy books to help you build better models. Get control over the settings and defaults, in the same way you get control over needle position, pressure, and thinner-to-paint ratio when using your airbrush.
- If you use a digital camera, get some image processing software and develop skill with it, too. Again, get control over the settings and defaults.
- Properly frame your pictures to emphasize the subject. Include enough background for scale and effective composition, but minimize space wasted on background.
- Focus! Make sure you have enough depth of field for all pertinent parts of the image to be in focus.
- Consider buying a tripod and cable release.

RECOMMENDATIONS FOR BUYING DIGITAL CAMERAS AND OTHER EQUIPMENT

Here's my advice on buying a consumer-grade (i.e., not professional grade) digital camera for model photography. It's based on two years of working with a wide variety of authors to create magazine

¹¹ I use full sheets of mat board from the picture framing section at Hobby Lobby or Michael's. You can also buy big rolls of background material from your local camera store. It's expensive, but there's enough on a roll for 5 or 6 people, and that would bring the cost down to less than \$10 per person.

¹² I bought a portable frame that bends standard sheets of mat board into the proper shape from ProCam Sales in Longmont CO. www.digalite.com. It's the one I use to take photos at model shows, so ask me about it when you see me.

¹³ I use scraps from the picture framing section at Hobby Lobby or Michael's.

articles. These are not hard and fast requirements, and we've seen excellent work done with older digital cameras that don't have these suggested features.¹⁴

- You need at least 6x optical zoom. That's an absolute minimum, and more is better. Digital zoom is not a factor in your purchase and shouldn't be used for model photography anyway.
- You need at least 6 Mpix resolution. That's an absolute minimum, and more is better.
- You should be able to extract TIF files from the camera. Make the salesman show you how and demonstrate that it works before you buy. (If your camera does not provide the capability to download files as TIFs, ensure their "RAW" format is convertible into TIF using image manipulation software such as Photoshop or Photoshop Elements. For example, you need Photoshop Elements 5.0 or later to convert Nikon's "NEF" format to TIF.)
- Your camera should operate with generic batteries and memory cards. Don't get stuck buying name brand accessories that may not be readily available. You can buy good-quality, generic NiMH batteries and chargers at Wal-Mart. (A back-up battery is a really good investment so you can shoot with one while the other is charging.) You can buy good-quality, generic memory cards at most electronics and office supply stores. Your camera should use cards with at least 512 Mb capacity, and 1 Gb or even 2 Gb is better. (As it was with the battery, it's a great idea to have a back-up memory card.)
- The camera should come with an AC adapter and a USB cord to attach to you computer. You need the AC adapter to keep from running the batteries down.
- Form factor (e.g., weight, size, shape, balance, how it feels in your hand, etc.) is personal. You either like it or you don't.
- The user interface is also personal. Do you think the viewfinder is big enough? Does it swing around when you have to hold the camera at odd angles? Do the buttons and switches make sense?
- It should have an integrated flash. You should be able to turn the flash off or force it to fire under any conditions.
- Auto-focus is nice. So is auto-compensation for unbalanced lighting.
- As long as you don't get the cheapest in their line, any of the big name brands will work. Look for one you like for a price you can stand. You should be able to get a first rate camera for less than \$500, and probably a lot less if you look for sales, close-outs, rebates, etc. Get the extended warranty if they offer it.
- If you buy local, you should be able to get help from the store. If you buy off the web, it'll be cheaper. If possible, get a 30 day trial and exchange period. You really don't know what you like until you try it.
- I won't comment on buying used equipment.

Besides a camera, you may need a tripod and a cable release. You'll certainly need lights and backgrounds. Keep this equipment ready and handy while you're building your models! You may have to get help from a modeling buddy or a spouse if you want to take pictures with both your hands in the image. You can buy special background paper, purpose-built photo stages, and lights from your local camera store or on-line, but it can be expensive. You might consider going in together as club to buy some equipment.

USING SCANNERS TO CREATE IMAGES

To create images of flat objects (e.g., decals sheets, book covers, box art, PE frets, etc.), a scanner is far superior to using your camera. Again, the guiding principle is that we need 300 dpi in the finished image size, and we prefer TIF files. If we know the image will be printed less than full size (e.g., box art, etc.), you can use lower resolution to reduce file sizes and scanning times. On the other hand, if you want to enlarge the finished image beyond life size (e.g., photo-etched parts, etc.), you have to scan at a higher resolution. Create TIFs whenever possible. Here are some typical resolution values:

- 150 dpi for book covers and kit box top art
- 200 dpi for standard size decal sheets and large PE frets

¹⁴ We even still have some guys using conventional film cameras.

- 400 dpi for hard copy photos of your model less than 5" x 7", small PE frets, kit box end flap art, or any other images you may want to show larger than full size

Use the highest resolution available for colors:

- For color images, use the largest color resolution available (usually 48-bit).
- For B&W images, use the highest gray-scale resolution available (usually 16-bit).
- For line drawings, use the B&W setting. If that's unsatisfactory, revert to grayscale.

If you take film pictures or slides, you can use a scanner to convert them to digital images, but scan with at least 300 dpi in the finished size. (You'll need to scan at considerably more than 300 dpi for slides. Until you develop some intuition for using it, use the entire capability of your scanner.)

INTEGRATING IMAGES AND CAPTIONS IN YOUR ARTICLE

How many photos is enough?

There's no minimum or maximum number of photos required for articles, but we do want lots of photos. One of the first things we often do when evaluating your draft is to see if we can convert your text to captions and tell the whole story as a photo essay.¹⁵

- You need at least one large photo (a glamour shot with enough size and resolution for a half page or larger) of the finished model or the real subject that can be used as a lead photo for your article.¹⁶ If you expect your model to be featured on the cover, you may need more than one large photo.
- You need several more "glamour shots" or walk-around photos of the finished model from a variety of angles. You should also take some close-ups of things you that talked about in the text as they appear on the finished model. (For example, you may have several photos of the cockpit or of a pylon holding a missile as finished sub-assemblies, but you also need shots with these sub-assemblies installed on the finished model.) Don't forget the bottom.
- Let the pictures and graphics tell the story of the assembly and finishing! You need a picture at the beginning and end of every major or critical stage of the project and as many photos (or graphics) in between as it takes to make your point.
- "Speak to the photos and graphics." Use the text to narrate the story being told by the photos. The text should make reference to every picture.
- Use captions to amplify the photos. Tell the reader what's in the image, what's important about the image, and what to look for in the image. A caption and a photo or graphic should stand alone. Avoid repeating what's in the text in the captions.

Image File Names

DO NOT just use the default filenames created by your camera!¹⁷ You can use something simple like "photo31," but it's better to create a descriptive filename for every photo in your article. The image file name example shown below corresponds to the image shown at right.

bc afti 02c air data probe.tif

It telegraphs a lot of useful information during editing and layout. (See the table on the next page.)



¹⁵ AMM also serves an international and often non-English speaking audience. Articles with more pictures and fewer words are much more suitable for their use.

¹⁶ If your digital camera won't create an image that's large enough with adequate resolution (300 dpi minimum on the finished image size), take a film image and have it printed in large format (e.g., 8" x 10"). You can then scan it to create a digital image or send the print to us with your article and we'll scan it.

¹⁷ Usually, these are just meaningless alphanumeric gibberish. You may have to learn how to rename files, but that's easy.

In this example,it provides...	...and means...
bc	Author's initials	Billy Crisler
afti	Aircraft type	AFTI/F-16
02c	Image sequence number and alternative image suffix	The third alternative photo that goes in the second numbered photo location in the text
air data probe	Descriptive title	Close-up of the flight test air data probe
tif	Image type	Tagged Image File

When numbering photos, use sufficient leading zeroes to keep the format consistent. If you have fewer than 100 photos, use a leading zero for numbers less than 10 (e.g., 03, 08, etc.) If you have 100 or more photos but fewer than 1000, use more leading zeroes (e.g., 008, 074, etc.) Likewise, use letter suffixes when you have alternate photos for the same photo placeholder (e.g., 08a, 08b, 08c, etc.). **If you do, your browser will automatically sort your photos for you!** That's a big help. Make sure your image file names include and correspond to the photo callout number of the image in the text.

Use 00 image numbers for all header photos (e.g., 00a, 00b, etc.) and for any other photos that should not be numbered in the text.

This system allows you to insert additional photos or identify alternate photos without having to re-number the whole set. Again, I've highlighted the changes in red.

bc afti 02a air data probe.tif
bc afti 02b air data probe.tif

bc afti 02-1 air data probe.tif
bc afti 02-2 air data probe.tif

If you're sending us hard copy photos to scan, use a soft-point permanent marker (e.g., a fine point Sharpie) to place small, legible reference numbers on the backs of the photos. **DO NOT use a ballpoint pen – the ink will rub off on the pictures below and ruin them!**

Captions

Writing good captions is just as critical as taking good pictures. A caption should tell the reader:

- What they're looking at
- Why the picture is important
- What to look for in the picture (and there may be several things)

You can often put important information about the project in the captions, but avoid exactly repeating what's in the text in the captions. Put specific acknowledgments of the photo source in the captions. You can also include a general acknowledgment near the end of the article.

The corresponding caption for the example photo above is:

The extended flight test nose probe, showing the pitch and yaw sensors with their bulky calibration scales in place (the curved parts and their attachments to the boom). The calibration rig would not be installed during flight. Note also the AFTI logo on the inlet FOD cover. (NASA)

The photo was referenced in the magazine text by placing the number in square brackets at the end of the sentence. **[02]**

Note the acknowledgment in the caption. We'll take care of inserting the numbers, caption text, and acknowledgment text onto the pictures and making them ready for printing.

You may use a separate text file for captions, or just include them at the end of your article text. **Make sure caption numbers and the numbers in the corresponding image file names are consistent!**

DO NOT embed images (photos or graphics) or captions in your text file! Otherwise, your draft text file will be too big. Instead, use placeholders in the text to show where photos and graphics (and captions) should go. Color highlighting helps. Just put the image number at the end of the sentence or paragraph the photo supports. Like this. [02]

TROUBLE-SHOOTING

These photos illustrate some typical problems. The photo of the bottom of the nose of Earl Hosmer's 1/48 scale OEZ Su-7 (top right) illustrates what happens when you try to take photos without using your macro and with the camera too close to the subject. The image is out of focus. Some of the image is in the shadow of the flash caused by the camera body, and the rest is over-exposed because it's too close to the flash. The solution is twofold.



- Back off a about a foot to get more depth of field (or at least get past the minimum focus distance), use the optical zoom to reframe the image, and bump up the resolution.
- Get daylight-balanced lights to kill the shadows and eliminate the hot spot caused by the flash..

The head-on photo of Earl's Su-7 (middle right) illustrates what happens to focus (or depth of field) and lighting as functions of distance. The nose is well-lit and in focus, but the tail is not. The solution is the same as for the previous problem. Back off some with the camera to get a longer depth of field and add more lights.



Jerry Wells' 1/72 scale Revell *Skycrane* (bottom right) was actually photographed on a white background. The photo is properly framed and the light is adequately bright, but you can clearly see the effects of improperly balanced lighting (this orange tinge is typical of incandescent lights) and failure to properly focus the image. This is different from the yellowish tinge your pictures will have if there's not enough light. The solution is to focus better and to get enough daylight-balanced lights.



DATA TRANSFER

You have several options for transmitting your image files to *AMM*.

- Mail CDs or DVDs with your images to the Managing Editor via US Mail (we suggest certified return receipt) or receipted carriers like Fedex, or UPS. You may use more than one CD if needed, and you may put text and photos on the same CD. Please include a packing list, and identify all CDs with your contact info, article or subject name, and an item number (e.g., "2 of 4 total," etc.). Please send us a short e-mail to make us aware that your package is on the way.
- Contact us via the *AMM* website for File Transfer Protocol (FTP) instructions and passwords. FTP allows you to send large files over the internet but bypasses your e-mail server.
- **DO NOT send .TIF or .EPS files via e-mail. They're too big.**
- **DO NOT send us irreplaceable hard-copies of photos, especially rare or historically significant photos.** Make high-resolution copies (either by scanning or photographically) that we can keep.