



- *Headworn Mic Buyer's Guide*
- **Reviews of Three New Cyc Lights**
- *Tips For Buying Used Gear*



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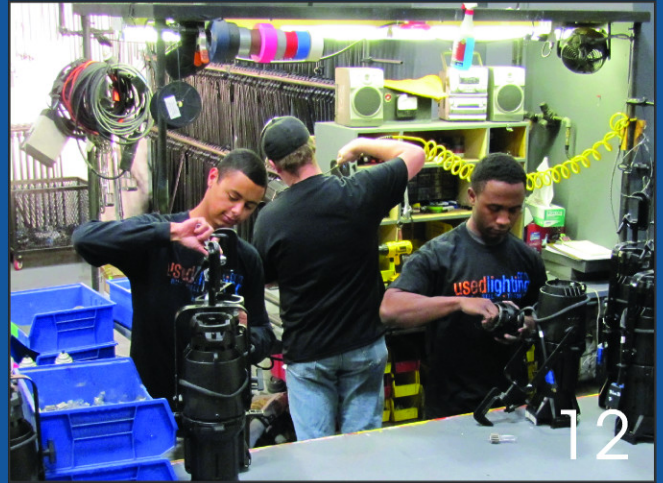


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ON OUR COVER: Composition by Garret Petrov



Gearheads

We're busting out the gear coverage to make sure your shelves are stocked with everything you need

Welcome to the premiere *Stage Directions'* Gear Issue! This month we're dedicating our entire issue to reviews, buyer's guides, and advice that's all about the gear, gear, gear. Some of our most popular material is about the gear, and more gear coverage is one of the biggest requests we hear from our readers. With this issue's front-to-back gear coverage, we're happy to oblige!

In future months you'll be seeing more gear reviews as a regular feature, and more ways to help you navigate the thicket of new gear that comes out at a seeming faster and faster pace. If you have a piece of gear you want us to review, or a branch of the industry you want to know more about—Wireless dimming? Automation? CAD programs?—let us know! I'm open to ideas online at Twitter (@stagedirections), Facebook (facebook.com/stagedirectionsmag) and of course simply via email at jcoakley@stage-directions.com.

The idea of what it takes to make theatre technically is changing rapidly, yet still beholden to centuries-old techniques. All the wireless dimming won't mean a thing if a designer doesn't know how to paint with light, and all you need for *The Odd Couple* is a simple unit set. But as spectacles like the Cirque du Soleil shows in Vegas and *Spider-Man* or *Big Fish* on Broadway prove, the opportunities for technical wizardry are expanding exponentially. We'll help you keep up, no matter what scale of theatre you want to create.

And for everyone who's not a designer, builder, electrician or

other tech creative in theatre—don't worry, we still got you covered, too. Last month's coverage of *Big Fish* is actually a really good example of how we like to cover shows: in-depth reporting on both the technical aspects (projection, in this case) of a show as well as the creative elements behind it all (the composer Andrew Lipppa). We're still dedicated to covering all aspects of theatre for our readers—we just wanted to give gear the spotlight this month.

Finally—back to gear—don't be shy about telling our advertisers where you saw their ad, and how much you appreciate their support of *Stage Directions*. We're able to send this to you for free every month because of their support, and they want to help you. Give them a call, check out their website, and tell them you learned about them here.



Jacob Coakley
jcoakley@stage-directions.com



This month's Video Editor's Note can be seen at bit.ly/sdfebed2014

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South Coast Repertory Theatre Renames Complex to Honor Founders

South Coast Repertory Theatre renamed their theatre complex to honor their founders, David Emmes and Martin Benson, at a ceremony on Jan. 22. SCR Board President Paul Folino—whom the theatre complex was originally named for—called for the renaming to honor "the important role that Emmes and Benson have played as arts leaders in Orange County and around the country."
bit.ly/sdscrname

Two Standards in Public Review Before Revision

The standards BSR E1.17-201x, Architecture for Control Networks, EPI 19, ACN Discovery on IP Networks; and BSR E1.19 - 201x, Recommended Practice for the Use of Class A Ground-Fault Circuit Interrupters (GFCIs) Intended for Personnel Protection in the Entertainment Industry are up for revision. They are currently available for public review until March 3. bit.ly/sd2stdrd

Oregon Shakespeare Festival Receives Grants to Expand PEEPS and Outreach Efforts

The Oregon Shakespeare Festival will expand their Professional Education and Experience Program for Students (PEEPS) thanks to a \$26,000 grant from the Oregon Arts Commission.
bit.ly/sdosfpeeps

Additionally, OSF received \$7,000 from the Oregon Arts Commission to support their work reaching out to the Latino communities in Portland and Rogue Valley as part of their Community Conversations program.
bit.ly/sdosfoutreach

Broadway League Releases Audience Stats for 2012-2013 Season

The Broadway League has released the 2014 version of their annual *Demographics of the Broadway Audience* report. The new version studies the demographics of Broadway's 2012-2013 season. Key takeaways include: 23% of tickets were purchased by foreign tourists, the most ever; online ticket sales now account for 41% of all ticket sales.
bit.ly/sd2014bwaydemo

Cirque du Soleil Creates New Theatrical Division

Cirque du Soleil has created a new division to develop "unique theatrical" productions based on "traditional theatrical practices." The new division, Cirque du Soleil Theatrical will be headed by Scott Zeiger, co-founder of Base Entertainment. The formation of the division continues Cirque's efforts to add diversity to their show slate, adding productions more similar to a traditional stage show than their popular tent shows. During his time at Base Entertainment Zeiger helped create *Phantom - The Las Vegas Spectacular*, as well as *Disney's The Lion King*, and *Wicked*, presented in Singapore. His credits also include current hit Broadway shows such as *Jersey Boys* (Las Vegas and world tour) and *Rock of Ages* (Las Vegas). The new division will be based in New York City.

"I have been close to and have worked

with Cirque du Soleil for more than 10 years. I have witnessed their incredible ability to create, produce and distribute the very highest quality live entertainment. This new venture for Cirque is very exciting for me and I look forward to developing new theatrical productions and having access to the best creative talent in the world. I believe there is a huge potential for us on Broadway, the West End and global touring," said Zeiger.

This move will also enable Cirque Eloize – a Cirque du Soleil sister company – to take its development and promotion in theatrical venues to a new level. BASE Entertainment will continue under the leadership of its CEO and co-founder Brian Becker. Zeiger will take on his new responsibilities at Cirque du Soleil Theatrical beginning March 3, 2014.

USITT to Honor Sound System Design Pioneer Bob McCarthy

USITT will give Bob McCarthy the 2014 Distinguished Achievement Award in Sound Design at USITT's Annual Conference & Stage Expo in Fort Worth March 26-29. USITT will honor McCarthy for his pioneering work in sound system design, including helping to develop the Meyer Sound SIM analyzer. McCarthy is now director of system optimization at Meyer Sound.

USITT annually bestows Distinguished Achievement Awards on major contributors to the industry. Besides McCarthy, this year's honorees are *Saturday Night Live* and *Wicked* set designer Eugene Lee, Oscar-winning costume designer Ann Roth, Austin Stage Management Mentor Susan Threadgill, Broadway lighting designer Shirley Prendergast, and theatre technology educator Dana Taylor. All six of the 2014 Distinguished Achievers will appear together in conversation in a session on Friday, March 28. USITT also will highlight McCarthy's specialty by dedicating this year's Sound Lab interactive design experience to live music, allowing participants to mix live shows by Dallas-Fort Worth area bands.



Bob McCarthy will receive the 2014 Distinguished Achievement Award in Sound Design

McCarthy's career in sound engineering has had a huge impact on sound system design. A 1970s roadie for the Grateful Dead, the Kinks, and other bands, in 1984 he helped Meyer Sound founder and previous USITT honoree John Meyer create SIM, a precision audio analyzer that has revolutionized the art of sound design and improved listening experiences around the world.

iWeiss Names Jennifer Tankleff President, Richard Parks VP

iWeiss named Jennifer Tankleff president, with an equal stock partnership with David Rosenberg, iWeiss CEO. As iWeiss president, Tankleff will oversee all day-to-day operations at the company along with its larger projects. Tankleff joined iWeiss in 1994, managing the drapery shop and developing expertise in custom fabrication. After 10 years of production work, she was named director of operations and, subsequently, vice president.



Jennifer Tankleff



Richard Parks

The company also named Richard Parks vice president. Prior to his promotion as vice president, Richard Parks, a 13-year company veteran, most recently served as senior project manager. As vice president, he will now oversee all rigging and installation work along with the company's continued expansion into automation products and services.



Eric McAfee

Eric McAfee Joins InterAmerica Stage as Director of Safety

Eric McAfee has joined InterAmerica Stage in Sanford, Fla., as their new director of safety. He will also work on product quality control and help out in sales and project management as needed. McAfee has 25 years of experience in the theatre industry, including time in project management and sales at J.R. Clancy and was most recently was at the consulting firm Westlake Reed Leskosky. McAfee is an ETCP-certified rigger.

The Future (and Present) of the TD Role

In our January TD Talk article, Todd Proffitt broke the role of TD into two camps, and gave a couple options for getting the training you needed to become one (bit.ly/sdtdtalkjan14). The reaction to the article on Twitter was mixed, and many seemed to think we hadn't painted a clear enough picture of what the TD position actually can be now, and the training necessary to be a good one.

@dboevers: There're WAY more than 2 kinds of TDs, and they work on far more than theatre.

@rothermellon: Architects, engineers, & even chefs go to school before they try it on people; why should TDs be any different?

@rothermellon: For too long, "TD" has been equated w/ "really good carpenter;" that's not only short-sighted but flat-out WRONG.

@stagedirections: What would be a good, NEW definition of a TD? One that takes into account skills and new fields?

@48V: mixture of project manager, engineer, and foreman. Proportions and education needs vary widely by institution.

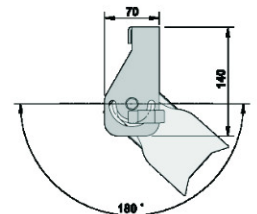
@rothermellon: To incorporate EVERY position and EVERY different field, you'd have to get awfully vague.

@julaface: I'd love for someone to make that list, I'd like to see it.

What do you think? What would be a good description of a TD now? What possibilities does training for a TD position open up—and what does that training need to include now? Let us know on Twitter at [@stagedirections](https://twitter.com/stagedirections), or head over to bit.ly/sdtdtraining to leave your comments!



Aleph 2: ET LED Light Bar



The 'EnTertainment' is the new addition to the Aleph2 light bar range.

With on-board mains power supply, CREE LEDs, and dimming options including an 8 bit S-curve optimized for the human eye, or 16 bit resolution if preferred, this fixture will produce clear and crisp light output. The 'ET' is neatly packaged with 6 color mixing LEDs, making it ideal for deep color or soft pastels.

Features:

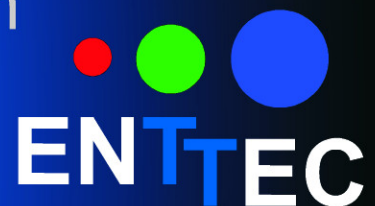
- Four sizes available.
- Power can daisy chain using loop in loop out.
- Housing constructed of aluminium with shape to enhance heat management
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DPA MMP-F Modular Active Boom Microphone

DPA Microphone's new MMP-F Modular Active Boom microphone is part of the d:dicare Series of microphones and is designed to be used for podium, floor stand or hanging applications. The MMP-F relies on the same technology as the company's MMP-E active cable, comes equipped with an active boom pole pre-amp and is available in a variety of lengths and gooseneck options. It fits to any modular d:dicare capsule and offers excellent radio frequency rejection, which is obtained through the DPA-designed impedance balancing with active drive. The MMP-F Booms are available in 15-, 30- and 45-cm hanging/table/podium options and as 75- and 120-cm floor stand choices. www.dpamicrophones.com



Elation Professional EZ4 LED Video Panel

The EZ4 from Elation Professional is a high-quality, 4mm pixel pitch LED video panel. It is a lightweight yet sturdy panel designed to deliver high-definition image quality indoors. Each panel includes 10,816 (104 x 104) black face LEDs for high contrast and high density. The EZ4 has a brightness level of 1,200 Nits, high enough to perform well in high ambient lighting conditions. www.elationlighting.com



ETC Product Portfolio App

ETC released a new app for computers and tablets that gives instant access to complete documentation (datasheets, application sheets, brochures and more) for all ETC products. The new app, ETC Product Portfolio is available for computers running Windows and the Mac OS as well as iOS and Android tablets. www.etcconnect.com



Mackie SRM550, SRM650 and SRM1850

Mackie's new SRM550, SRM650 and SRM1850 Subwoofer extend their SRM 1600-watt, powered-loudspeaker line with the 12-inch SRM550, 15-inch SRM650 and the new SRM1850 subwoofer, with a 18-inch driver. The SRM line features Mackie High Definition Audio Processing including patented acoustic correction DSP, plus system optimization tools like application-specific speaker modes and a feedback suppressor. They also have an integrated two-channel mixer with Mackie Wide-Z input. www.mackie.com/SRM



Video at bit.ly/sdmackiesrm

Rose Brand Website Fabric Finder ColorApp

Rose Brand's new Fabric Finder ColorApp on its website gives users quick and easy access to more than 1,500 choices of fabric from Rose Brand. Users can search Rose Brand's fabric by color, type, width, opacity, sheen and more—and even combine qualities in a highly visual way to narrow down fabric choices for a project. Scrolling over the fabric choices gives users more information about the fabric. Once the user selects the colors and / or other fabric attributes of interest, they're presented with a set of fabric swatches that match their criteria. bit.ly/1egvcjO



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Back to Front

A trio of tests on the next generation of cyc lights

A cyc's large, blank canvas is a designer's dream and nightmare combined into one. It provides a vast surface area designers can project sweeping color washes on, but producing an even and uninterrupted wash with multiple fixtures on such a large surface is always a challenge.

But despite their importance, cyc lights have not shared the technological advances of lekos and fresnels. The curved parabolic reflector based around the FEL or FCM lamp has been around for the past 50 years. The three-color strip light—from the R40 with glass roundels to the later MR16 low-voltage lamps—is a staple of theatres, concert halls and rental companies. Creating even flat color washes with these primitive tools has challenged generations of LD's and changing gel in them is the least favorite chore of lighting technicians.

Recently, all of this started to change, with more options and new designs for the humble fixture. We took a close look at three new entries into this field. **S**

Let the Sun Shine

By Justin Lang

Traditionally, lighting designers turned to large, multi-cell boxes or strip lights to provide an even wash. Those are still around—both incandescent and LED sources—but over the past couple years, manufacturers have re-thought that design and started producing smaller fixtures with beam angles. Chauvet Professional took that a step further with their Ovation C-640FC.

What It Is

Part of Chauvet Professional's Ovation line of LED fixtures for the theatrical market, the C-640FC is designed with a color temperature to work with the incandescents currently in your rig. The small Ovation C-640FC (just over 1 square-foot at its base) is reminiscent of an architectural fixture. The fixture is designed to be able to be either a ground-row or hung from an electric. For easy cabling, Chauvet has designed the C-640FC with the 5- and 3-pin DMX in's and PowerCon in's on one side, with the outs on the opposite side. At just 175W max power draw per fixture at 120V, nine C-640FC's can be power linked together off a single 20amp circuit.

The C-640FC features two banks of LEDs placed on top of each other offset by 45 degrees. Each bank has 32 LEDs (a mixture of red green, blue, amber and white) and is individually tilt-able for even coverage on almost any cyc height. The two banks are independently controllable depending on which mode you're operating the light in. The fixture has 11 modes, using three to 18 DMX channels depending on how much of a control freak you want to be. Finding the right mode for your needs is all based on how you plan to use the fixture in your production and the limitations of channel counts of your controller.

I put the unit into PIX3 mode which uses 12 DMX channels and gave me individual bank control, then used the color controls in the split banks to create a setting sun look with a slow cross fade that changed into a stunning evening scene. Even with my long cross-fade time and 8-bit dimming I still didn't notice any stepping, and was able to get the look I wanted.

To Many Colors To Choose From?

Some will argue that color mixing LEDs can be hindering to a designer: so many color possibilities mean time lost in tech trying to get just the right color. I know I have spent more time than I should have tweaking a color. Chauvet Professional aimed to help designers save time with their Virtual Color Wheel. The team at Chauvet measured more than 30 of the most-popular Roscolux filters on a 650W, 3200K

Colors and transitions shine on the Chauvet Professional C-640FC LED Cyc Wash

fixture and pre-mixed the C-640FC to match that output, saving each of those colors as an entry in the Virtual Color Wheel. You can't tweak the VCW colors, but Chauvet shares the RGBAW levels for each of the colors in the manual so you can load those settings and create your own tweaked pre-sets if you have time to get just the right look.



Final Impressions

The C-640FC performed nicely. I had to spend some up-front time determining the optimal operating mode for my needs, and getting the split-head fixture into the sweet-spot of distance from the cyc took some playing around (I found my optimal distance was 3 feet, YMMV). But after that, working with the fixture was simple and straightforward. Its form-factor may look different from the typical cyc light, but its output doesn't, and it performs admirably. **S**

Chauvet Professional C-640FC LED Cyc

Pros:

- 16-bit dimming control, smooth dimming curves
- Virtual Color Wheel presets of popular colors
- Individually controllable banks of LEDs
- Data and power in's and out's on opposite sides of fixture for quicker daisy-chaining

Cons:

- No tweaking of VCW colors (but you are given the values for each of the VCW colors, to tweak as you need.)

List Price: **\$1,795**

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Cycology 101

We throw the ETC Source Four LED's color up against the wall
By Marshall Bissett

With the LED Cyc light ETC has set out to change the way we think about cyc lighting.

"Accessorize to maximize" is an often quoted slogan of retail sales and ETC has followed this maxim with the introduction of its LED Cyc light. This ingenious unit is offered as an accessory to ETC's very popular line of Source Four LED fixtures or "engines" as they are often dubbed. ETC proclaims, "It's like having a paintbrush right on stage."

The ETC LED Cyc Light replaces the lens tube on the Source Four LED luminaire. As you would expect from ETC's x7 color system, the color rendition of this unit is excellent. A 40-foot-wide-by-20-foot-high cyclorama or backdrop requires only six or seven Cyc Lights at a setback of three feet to produce even coverage. Operating at a 65° throw angle, units can be placed in accordance with the 2:1 spacing formula (for every one foot back there can be two feet between luminaires). While this is the spacing of traditional fixtures, it is almost impossible to produce a direct comparison with incandescent single-cell or three-cell unit. The richness and range of color is simply not achievable by conventional means.

Size and Shape

Based on an optically precise mirror and diffuser, the ETC Cyc attachment creates a footprint somewhat larger than a traditional cyc light, but is lightweight and rugged. The units cannot be nested but

could travel in a slotted flight case. Including the floor mount stand, the entire fixture is a bit taller than its strip light counterpart so would need to be snuck in behind set pieces or soft goods in practice. It should be noted that this unit only attaches to the Source Four LED fixture bodies, not to the Selador range also marketed by ETC.

If you already own ETC Source Four LEDs, then at \$395 list price the LED Cyc offers terrific value for money. The savings in labor, power and gel will over time offset the higher initial purchase price of the fixture. It's the hybrid car of the lighting industry. The LED Cyc is sure to appeal to rental companies who make up the core of ETC's customer base. Dual-purpose fixtures are a winner for the purchasing department and the designer.

In our testing process we kept thinking of additional applications for this versatile unit. It would work well inside tents, atriums or as set fill light for TV. On film they could provide a quick additional soft light. If lighting techs were to make all purchasing decisions these units would be everywhere. The ease of set up, cabling and focus is perhaps their finest quality. The extra programming time to manipulate the seven colors is cut down by assigning each fixture a "personality" on the lighting console.

LED's offer designers a great chance to re-think how they approach their lighting. The ETC LED Cyc is a handy example of adapting new thinking to an oft-overlooked tool, beautifully. **SD**



FAST FACTS

Pros:

- Great richness and variety of color
- Big savings in labor, power and gel over time
- Good field of light

Cons:

- Somewhat larger footprint than traditional cyc light

List Price: **\$395**

(ETC Source Four LED not included)

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Step Right Up

Enttec enters the theatre market with the Aleph2 ET color bar By Mike Wharton

In the past, Enttec mainly serviced and catered to the architectural, commercial and industrial segment of the lighting market. With their new second-generation LED color bar the Aleph 2 ET in its inventory, though, the company is now clearly bidding to be a player in the entertainment and theatre market.

The Aleph 2 ET fixture comes in four lengths: 300, 600, 900, and 1200 millimeter (approximately 1, 2, 3 and 4 feet, respectively). I reviewed the 300mm unit, and was certainly impressed with its solid construction. The Aleph2 is a well-built unit, and could easily stand up to the rigors of touring.

Accurate color rendition and enhanced lumens is where Enttec placed their efforts. It was money well spent.

The Aleph 2 contains 30 LEDs, five each of red, blue, green and amber plus two sets of five white LEDs. Depending on the value of the channel a full range from true warm at 1,500 to cool white at 12,000K can be accurately reproduced.

The Aleph 2 also has a "True CCT" mode to simulate tungsten light behavior. The fact that you can have varying color temperatures emitting from different units of the same type of fixture is appealing for designers. Variable strobe and dimming capabilities, standard on this fixture as well, further enhance its design chops.

There are three modes of control, or "personalities," which use 6, 9, or 12 channels, with the 12-channel personality offering 16-bit resolution on color control. The fixture comes with 64 factory presets. These can be accessed either with the console or in stand-alone mode. In my side-by-side comparison with a conventional fixture with various gel filters, the Aleph 2's colors were rich in saturation and accurately mimicked the primary colors from the conventional.

The Aleph 2 also contains a temperature



Enttec Aleph2 ET

Pros:

- 16-bit color control for deep color control
- True CCT mode to simulate tungsten behavior
- Solid construction

Cons:

- None

www.enttec.com

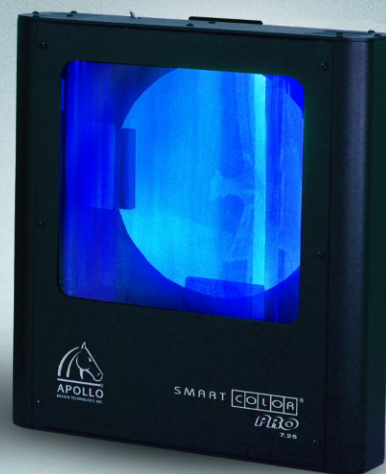
degree readout and Test function, available through the address menu. The Test function can also act as a standalone option without having to use a console. While the unit is convection cooled by fans, the fixture can also be cooled down quickly at the end of the event via a full on fan option available in the test mode as well.

It is a versatile fixture. In addition to being used as a cyc wash the Aleph 2 could work well in the corporate or architectural market as a truss toner, set, or wall wash, with its compact build and 25° beam spread. The quality of its construction coupled with its excellent performance points toward a long and useful life in a designer's arsenal. **S**

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Encore Performance

The tips you need to insure the used gear you get behaves like new

Everyone knows the first advantage of buying used gear: Cheaper prices mean more gear, or higher-quality gear.

"You might only be able to afford four new Vari*Lite VL3500's," says Leigh-Anne Aiken, managing director at SHS Global, a used-gear broker service which prides itself on its long relationships with production companies that are looking to sell and its personalized, attentive care to buyers. "But if you buy them used, maybe you can afford eight, and suddenly you're a contender for shows in your area. Buying used allows some people who couldn't afford that class of lighting to do it without having to buy something inferior."

Buying used also means you can get better gear. "You get a lot more quality," says Wes Bailey, director of marketing at UsedLighting.com, a division of 4Wall Entertainment Lighting that sells 4Wall gear, but also brokers from other companies and re-sells gear it has re-habbed from trade-ins. "It's not about getting the cheapest thing possible. If you're a school, you need something that will hold up over a long period of time." You'll also avoid getting a dud fixture—used gear has been in the real world long enough to gain a reputation. If you do your research, you can avoid instruments with perennial problems—as long as you know your seller and take a few precautions.



UsedLighting.com techs bench testing gear and getting it ready for sale.

Reputation, Reputation, Reputation

The biggest pitfall everyone we spoke to talked about was knowing who you were dealing when acquiring new gear. Ebay is not the way to go. Oshine Najarian, CEO of Solaris, a broker firm for high-end AV and lighting gear, has spent 15 years building a network among distributors and production companies and doing everything he can to make sure buyers get what they need and are happy with their used gear. "You have to make people happy—that's what it's about. We offer superior post-sales support and will take care of any problems, no matter what," Najarian says. "The way I look at it, we can lose some money on a sale now, but will get it back because we've created a happy, long-term, repeat customer."

To make sure he stays happy, and in business, he puts all of his prospective sellers through a rigorous qualifying process. "The core of quality control is qualifying our sellers. We don't just let anyone sign up and start selling their equipment. We qualify our sellers and every piece of equipment that gets added to our website."

And he isn't the only one. Aiken sells from a core group of trusted vendors in the U.S., Europe and Asia that she's visited "many, many times over the last 20 years" and UsedLighting.com mainly brokers gear from 4Wall Entertainment—which means it's been thoroughly bench tested and is ready to go out on any one of their shows.

But maintaining high standards from their sellers isn't enough for good used gear brokers. Absolutely everyone was adamant about offering a warranty for their gear. "We'll negotiate a warranty up front, so the seller's feet are held to the fire if something goes wrong," says Aiken.

"Sellers are required to give us a warranty, otherwise we reject them" adds Najarian.

A warranty also helps reassure buyers if a company hasn't been around for many years. Light Auction, a division of Revolution Lighting, was started in the fall of 2013 by George Studnicky IV.

Unlike brokers they buy gear themselves, service it at their in-house shop, then sell to the market from their own inventory. "What that does for the customer is guarantee the availability of what you're looking at on the website," says Studnicky. And in order to make sure people are comfortable buying the gear, they offer a generous warranty. "If you're unsatisfied, just return it. I'll do a money-back guarantee, within 30 days. I allow them to return it and I'll give them back their money. I reverse the risk to myself because I physically own the gear and prep its quality to a high standard. I can guarantee satisfaction, as I'm easy to work with as your partner. We could do a one-for-one swap, for example, if a light didn't work out."

Check Yourself

To insure you get what you want out of the used market, you have to be sure you know what you need.

"What's your budget? What are you trying to achieve? What's your business?" asks Aiken. This will determine not only what gear you need, but possibly where you should be looking as well. "If it's a fixed installation—like in a church—you'll want something more cosmetically sound than what you might find from a touring company, where the equipment may be road-worn. We try hard to match price but also quality, condition and accessories that fit the application that they'll be used for."

"People have to do their own research," adds Bailey. "We try to make a video of our fixtures in action and put it on the website. That gives you a chance to see what a light really does—photometrics will only tell you so much. Before you get to a seller's website, do your homework."

But you don't have to do that research alone. The experts at Bulbtronics have been selling bulbs for entertainment and specialty lamps for close to 40 years. At their Manhattan location (they have another office outside the city as well as ones in Las Vegas, Miami, and Burbank, Calif.) their staff has more than 100 years of experience in entertainment lighting. They're more than willing to discuss used gear with you—and whether or not you'll still be able to use it once you've got it.

"One of my words of advice or anybody who is buying product: Find out if there is a replacement lamp for it," says Lee Vestrich of Bulbtronics. "Over the years we've built up a good lamp-to-equipment reference database that we can look up by manufacturer and

model number and give you the data on the lamp that goes in it." Which is good, as even some manufacturers don't keep track of that info.

They can also help out with more gear than just bulbs, though, too. "Fixtures that wear and tear, wires could be beaten up pretty good—we can actually provide a lot of the original sockets as replacements." They even stock "tricky" proprietary gear that you may not be able to find anywhere else.

In addition to parts, research accessories. You may have your light—but do you need barndoors to go with it? Every page of UsedLighting.com has the accessories for a unit listed on it. "You should be well-versed about what accessories you need," insists Bailey. "Everyone can find out 'Oh, this is the LED fixture I need,' but if you grab Color Kinetics, you need to know you'll need the power data supply." He even relates the story of the customer who was told they needed a dimming rack, so they bought one from eBay ... without any dimming modules in it. "There are some places that won't be forthcoming about what they're selling you. Find out exactly what components you need, or you can get really burned."

Don't be afraid to ask detailed questions about the inside of the gear, too. Do all your

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W: www.lightauction.biz

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moving lights have the same software version on them? "That will make a big difference if the fixtures all appear onstage

together," says Studnick. "If there are different versions they might have made adjustments to how the motors react, or

gobo speed adjustments, or—who knows what the manufacturer did? Make sure they match. We default all our similar fixtures to the same software version so when you turn them all on, all six will look the same."

Once you get it, don't be shy about checking for damage. Najarian says, "Make sure you inspect anything before you sign off on any delivery paperwork. You've got to look around. Make sure there are no forklift holes" or other obvious damage. Before you buy, ask what sort of recourse you'll have if there's concealed damage from shipment.

Najarian warns people to not forget about deadlines, either. "Make sure you give us a delivery date," he says. "Just because something is on sale doesn't mean it's packed up and ready to ship—especially for high demand items, it might be on a rental. Make sure you do things ahead of time. Don't drag your feet."

Theatre remounts shows all the time—now you know what you need to make sure gear that premiered someplace else has a long life in your space. **S**

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Easy Alternative

The Backdrop Lift from Grosh Backdrops & Drapery, Inc., aims to make hanging drapes and backdrops in non-traditional spaces easier and safer

The Backdrop Lift, created and distributed by Grosh Backdrops & Drapery, Inc., is a mechanical system engineered to make hanging drops, and other soft goods, quick, safe and efficient. The Lift's benefits are best seen in "non-theatrical" spaces which include any indoor venue that doesn't have the means to fly rigging pipes by an arbor or chain motor.



Across America, events are being staged in warehouses, churches, classrooms, hotel conference rooms, without any decent way to properly rig a drop or piece of drapery. Now, Grosh has given the staging and theatrical community a long-awaited alternative in the Backdrop Lift.

What I like about the Backdrop Lift is its simplicity in design and function. The Lift replaces the need to use a cumbersome "pipe and drape" system or a bulky truss frame and base. I always found having to use pipe and drape a tedious but necessary evil (there really was no other solution to the task at hand). Pipe and drape equipment is awkward and heavy, and I always seemed to find a way to get my finger pinched in the connection points. But the Backdrop Lift is now a viable, and affordable, alternative. It also replaces having to climb ladders, or rig from unsafe non-rigging points. Have you ever seen a curtain hung from the flimsy frame of a drop ceiling? Then you know what I'm talking about!

The assembly of the system takes two people about 15 minutes to completely set up a 40-foot-wide-by-17-foot-high drop, and they never have to leave the ground. The system comprises of three major components: legs, Lift and sections of 5-foot-long triangular truss. All of these components are easily assembled and interlocked by means of sleeves and truss pins that are attached to the units. So no more misplacing the nut and bolt bag!

The triangular aluminum truss comes in 5-foot sections that sleeve together. This allows for greater versatility in matching the size of the frame to the size of the soft good, resulting in a cleaner overall look to the presentation. The truss profile is also small in size, which makes transporting and assembling easy on the back. The truss then attaches to the lifts by way of extension posts. Once the truss is attached the drop is tied, or spring clamped, to the truss from the ground before the Lift is raised.

The Lift component looks like a manual Genie lift and is operated in much the same fashion. A hand winch is used to raise and lower a telescoping pole built of aluminum box tubes and strung with aircraft cable. The bottom of the Lift is comprised of four pieces of horizontal box tube creating the base for the legs to sleeve into; there is a screw leveler on the end of each leg. Grosh has added a bubble level on the bottom of each Lift to assist the user. There are also leg substitutes Grosh calls "Beaver Tails," because, well, they look like beaver tails. They are wide, flat, low-profile paddles that sit on the floor and are used to replace a leg due to a walking path obstruction or sightline issue.

The Backdrop Lift is sold, or rented, in two package sizes: One size to accommodate a drop of up to 25 feet wide; a second package to accommodate a drop of up to 40 feet wide. For every 20 feet of truss, there needs to be a vertical Lift, and there should be no more than 8 pieces of truss bolted together. Grosh will also custom fit your order to whatever your particular needs may be.

BACKDROP LIFT

PROS

- Safe, elegant solution to hanging drape in non-traditional spaces.
- Easy assembly with interlocking truss pieces, sleeves and attached truss pins.
- "Beaver-tail" stands to accommodate walking paths.

CONS

- None, unless you like dealing with pipe and drape.

www.backdroplift.com

Theatre can't always be done in theatres, but the new Backdrop Lift makes it a lot easier (and safer) to make non-traditional spaces look like one. **S**

Chad Smith is the Associate Technical Director of Center Theatre Group in Los Angeles, CA.

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A New Horse in the Race

Apollo Design Technology enters the LED wash market with their Avid 7 Wash LED

Static LED wash fixtures are a dime a dozen nowadays – you practically can't walk into a theatre or onto a show without kicking over a few different manufacturer's versions. Therefore, I was somewhat skeptical to see Apollo Design Technology, a gobo and gel manufacturer, taking on this large spectrum of the industry. By the end of my test, though, they won me over.


The Avid 7 seems extremely well-built, weighing in a hefty 14.4 pounds, and is built in the USA at Apollo's Indiana facility. The exterior is anodized instead of powder coated to help with heat dispersion, which means that in addition to black (which is standard) you can also get the unit in red, blue or silver for an additional fee. The test unit we got was a lovely Apollo blue, and was very sleek while still appearing durable.

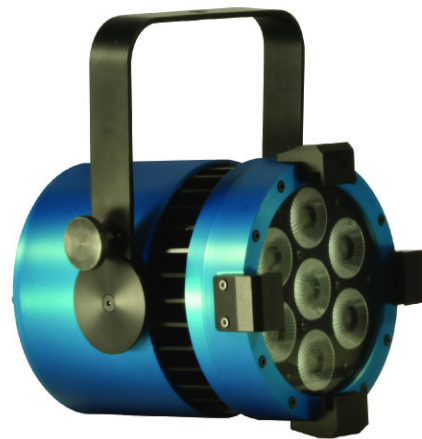
Coming from Apollo, you'd expect the Avid 7 to have beautiful color rendering, and it doesn't disappoint. The primaries are saturated and well-chosen, allowing almost any color to be mixed using the RGB engine. The blue LEDs in particular have a spectacular hue, enabling extremely saturated cool colors that some LED fixtures can't match, although we did have trouble getting a saturated teal or amber. This is an RGBW fixture, and different modes allow for creating pastels by adding the white LEDs or color-correcting using the white engine and built-in CTC. The RGB + Color Temp mode of the

light allows an operator to simultaneously mix colors with RGB engines while adjusting the temperature of the engines between 2500K-6000K. This is one of my favorite abilities of newer LED fixtures in that it gives another dimension of color control. We found that matching the Avid 7's color temperature to tungsten was fairly easy using the color-correction mode, however even at the maximum CTC level (approximately 6000K), it still produced a fairly warm/pink-ish white.

The fixture seems like it would be well-suited to being in the studio more so than on larger stages, as it had trouble keeping up with the brightness of a 575W Source Four unless comparing saturated colors. The brightness of the 21° fixture used for testing was noticeably dimmer than both Chauvet COLORado and PL3 wash fixtures in a shootout, so I'd recommend going with a narrower beam angle model (a custom 12° is also available) and using frost as needed to get more punch out of the Avid 7. The fixture would benefit greatly from built-in zoom, or even variable frost filters to help control the beam spread, since barn doors won't control the beam very well due to the LED engine lensing. With that said, the intensity of the fixture and color mixing were even across the entire field.

My favorite feature of the Avid 7 is how smoothly it dims and fades with both intensity and color. There are multiple dimming curves selectable within the fixture's menus to match other fixtures in a rig, as well as an "LED Smoothing" option that can be changed at the back of the light, allowing complete flicker-free dimming. Dialing LED Smoothing to the second or third setting curves the response of the LED engines to the point that it matches the filament after-glow of a Source Four. It was with LED Smoothing enabled that I witnessed the Avid 7 perform an exceptional 20-second fade up and down that beat the other LED fixtures we had in the room. This is something the Apollo team clearly worked hard on, and its dimming should give the Avid an advantage over its competitors when it hits the market.

Apollo has produced a fixture that will meet the needs of those in smaller theatre spaces and film/TV studios that require smooth dimming and precise color rendering for a reasonable price tag. 



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AVID 7

- PROS**
 - Beautiful dimming
 - Rugged body
 - RGB + Color Temp mode
- CONS**
 - Would like to see more brightness out of 21° model

Price (street) **\$1,585**

MORE INFO
www.apollobydesign.net

Point Source Audio Series8

Over the past few years, Point Source Audio has gained a reputation for supplying tough, good-sounding miniature microphones in headset, earworn and lavalier styles. Now, with its new flagship Series8 line, the company is poised to take things up a notch—or two.



Point Source Audio CO-8WS earworn mic

Versatile and Flexible

Intended for performance vocals, the Series8 mics feature back electret condenser capsules in omni or cardioid patterns in beige or black. Another option is an omni capsule that's water/sweat/makeup-proof. The 2mm omni capsules are nearly invisible for a discreet, low-profile appearance. Other features include tough "Unbreakable Booms" that are bendable to 360 degrees and earworn models that are left or right wearable. The dual-ear headset model can also be adapted for left or right side use. Point Source also offers adapters that can convert any of its single-ear earworn mics into to dual-ear mount models.

All Series8 models ship with an interchangeable X-Connector (specified when you order) with a termination for popular wireless transmitters from AKG, Audio-Technica, Lectrosonics, MiPro, Sennheiser EW, Shure or Telex. Lemo-style connectors for Sennheiser SK or Zaxcom are also available. The X-Connector attaches to the 4-foot mic cable with a simple, secure twist. Additional X-Connectors are offered for users who need to switch between different brands of transmitters.

For this review, I checked out several Series8 models: earworn CO-8WS (waterproof omni, \$315); earworn CR-8S (standard cardioid, \$399); headset CO-8WD (waterproof omni, \$449); and the lavalier CO-8WL (waterproof omni, \$285). Stated prices are MAP and all were fitted for 4-pin Shure X-Connectors as well as an optional CON XLR converter for use in hardwire applications.

Getting Physical

The mics ship in hinged cardboard boxes with magnetic closures. They're sturdy, but not quite the field-ready, so I repacked them into generic zippered bags when going out on gigs. The lavalier shares the same omni or cardioid capsule (your choice) as the headworn models and includes a swiveling mount for secure attachment to clothing or hidden in hats or wigs. All mics include an effective foam windscreen.

The earworn models adjust for secure mounting and the

flexible boom can be easily adjusted to suit. The boom length (between base of ear and capsule) is about 3.25 inches, which was fine for most people, but a bit short for performers with larger heads. The headset models offer a much wider range of adjustment and are quite secure, even with the most active performers. The headset earpieces swivel flat for storage and are released by a slight 1/4-inch tug to lock them in place. This procedure isn't obvious, so practice it once or twice before going out in the field. And that "unbreakable boom" isn't far from the truth. I couldn't believe how much torture these could take without a hitch.

Ready to Perform

As mentioned earlier, the Series8 mics are designed for vocal performance. Models optimized for spoken word application are also offered, but the Series8 capsules are intended for wide, response/wide dynamic range use such as singing, which can present an exceptionally demanding source to any microphone, let alone a miniature transducer. The omni capsules in the Series8 line can handle 148 dB SPLs, which is indeed a lot, but with the proximity of the mic placed within an inch or so of the mouth, seems achievable—at least with some of the vocalists I have occasion to work with. The cardioid versions clock in with a 135 dB max SPL rating, still impressive nonetheless. In these instances, headroom is where it's at, and with the mics' low-self noise performance, dynamic range should never be a problem with the Series8 mics, particularly when used with a wireless rig.

Besides the obvious polar pattern and max SPL specs, the main difference in the cardioid and omni versions was evident both in overall frequency response and linearity of the bandwidth. The omni models have a stated 20 to 20k Hz response and were almost ruler flat in the critical 50 Hz to 10k Hz range. The cardioid capsule (stated 160 to 12k Hz response) has a rising upper mid presence boost peaking about +7 dB between 3,500 Hz and 7k Hz. The net effect of the cardioid is similar to the response of a "typical" handheld vocal mic, which provides a nice "cut through the mix" edge that's ideal for many male vocalists. In contrast, the omni mics offer a smooth, natural palette that's fine as is, or ready to EQ to suit: The response is more like you'd encounter from a quality small-diaphragm mic, yet without the rising upper 10k to 12k Hz boost such mics often exhibit. With the omni's, you have a clean slate to tweak as you'd like, without being boxed into any existing response curve. I like that.

Overall, the Series8 are impressive, offering natural and clean sound, affordable pricing and versatile options that fit into nearly any production need. Keep these on your "A" list. **SD**

SERIES 8

PROS

Rugged Boom
Natural, clean sound

CONS

Boom length might be short on large heads

www.point-soureaudio.com

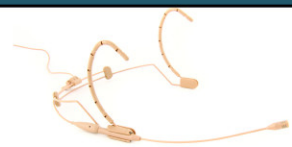
Miniature Headworn Microphones

Over the years, headworn microphones have evolved from clunky, low-fi affairs into lightweight, nearly invisible transducers capable of serious audio quality capable of equaling or matching many hand-held models.

We checked out some low-profile headworn mics that are suited for theatrical applications. In this quest, we encountered a wide

selection in a variety of prices (all given in MSRP; street prices may vary) with terminations for various systems, and both headband and earworn styles to fit the individual preferences of any performer. It should be noted that most suppliers also carry headworn mic models in other styles and prices, and websites are listed if you require additional information. **S**

AKG HC577 L

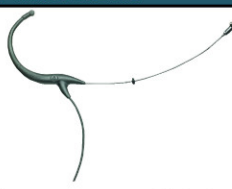


Style: Headband
Type: Condenser
Pattern: Omni
Colors: Beige
Termination: 3-pin Mini-XLR-F
Notes: Can mount on either side; push-on presence cap boosts 12 kHz range by 3 dB; optional phantom adapter for hardwire applications.

PRICE: **\$449**

akg.com

Audio-Technica BP894 MicroSet




Style: Earworn; convertible to dual-ear mount
Type: Condenser
Pattern: Cardioid
Colors: Black, beige
Termination: Avail. unterminated or for all major pro wireless systems.
Notes: Rotatable capsule can aim directly at sound source; wearable on either ear.

PRICE: **\$539**

audio-technica.com

Sanken COS-11D HWM-R




Style: Headband
Type: Condenser
Pattern: Omnidirectional
Colors: Beige, cocoa
Termination: Available unterminated or with connectors for major wireless systems.
Notes: Includes two screw-on replaceable cables

PRICE: **\$695 to \$795**
depending on termination

sanken-mic.com

Beyerdynamic TG H54c




Style: Headband
Type: Condenser
Pattern: Cardioid
Colors: Beige, black
Termination: Mini 4-pin XLR-F
Notes: Optional CV 18 for phantom powering; similar omni model also avail.

PRICE: **\$229**

beyerdynamic.com

Countryman H6




Style: Headband
Type: Condenser
Pattern: Omni or directional model
Colors: Light beige, tan, cocoa, black.
Termination: Avail. unterminated or for all major pro wireless systems.
Notes: High-strength detachable cables can easily swap to fit different wireless models; left/right side wearable boom; removable caps can vary HF response to individual needs.

PRICE: **\$670 to \$695**

countryman.com

DPA d:fine



Style: Headband
Type: Condenser
Pattern: Omni and directional versions available
Colors: Black, brown, beige and green.
Termination: Microdot; adapters available to XLR hardwire and all major wireless systems.
Notes: Left/right switchable; also single-ear, short/long boom versions offered.

PRICE: **\$620**

dpamicrophones.com

Sennheiser HS2



Style: Headband

Type: Condenser

Pattern: Omnidirectional

Colors: Beige, black

Termination: Underterminated or with connectors for major wireless systems.

PRICE: \$389 to \$449

depending on termination

sennheiserusa.com

Lectrosonics HM172



Style: Earworn

Type: Condenser

Pattern: Omnidirectional

Colors: Beige

Termination: TA5F wired for Lectrosonics UHF beltpacks.

Notes: Removable HF peak cap adds control of excessive high frequencies

PRICE: \$395

lectrosonics.com

Line 6 HS 70



Style: Headband

Type: Condenser

Pattern: Omnidirectional

Colors: Tan, black

Termination: TA4F "mini XLR"

Notes: Designed for Line 6 V75-BP, V70-BP, V55-BP, Relay G90 and G50 bodypacks.

PRICE: \$199

line6.com

Mogan Elite ICE Earset



Style: Earworn

Type: Condenser

Pattern: Omnidirectional

Colors: Transparent

Termination: Available for Shure, AKG, Sennheiser or Audio-Technica bodypacks.

Notes: Interchangeable cables with attached plugs allow easily switching between several models of transmitters.

PRICE: \$400

moganmicrophones.com

Shure MX 153



Style: Earworn

Type: Condenser

Pattern: Omnidirectional

Colors: Black, tan and cocoa

Termination: TA4F connector for connecting to Shure bodypacks

Notes: Wearable on left or right side; Kevlar-reinforced soft flex cable.

PRICE: \$249

shure.com

Point Source Audio SERIES8 CO-8WS



Style: Earworn; optional dual-ear mount avail.

Type: Condenser

Pattern: Omnidirectional or cardioid avail.

Colors: Beige or black

Termination: Interchangeable X-Connector cables for all major wireless systems.

Notes: Waterproof; left- or right-side wearable.

PRICE: \$430

point-sourceaudio.com

Sony ECM-322BC



Style: Headband

Type: Condenser

Pattern: Omnidirectional

Colors: Black

Termination: Sony 4-pin SMC9-4P for use with Sony WL-800 Series bodypacks.

Notes: Can be work on left or right ear.

PRICE: \$200

sony.com/proaudio

RODE HS-1



Style: Headband

Type: Condenser

Pattern: Omnidirectional

Colors: Pink, black

Termination: RODE MiCon, with optional adapters fit all major wireless systems.

Notes: Detachable Kevlar reinforced cable.

PRICE: \$449

rodemic.com

Samson SE50T



Style: Earworn

Type: Condenser

Pattern: Omnidirectional

Colors: Beige, black

Termination: 1/8" TRS; includes three adapters for other systems.

Notes: Left/right side wearable.

PRICE: \$249

samsontech.com

Sorting the Pattern

Digital textile printing is more available than ever—but can still bewilder

Digital textile printing originated as a way of creating quick sample pieces for fabrics that would later be printed using the old roller screen method. Initially, one or two large format digital printers would handle these samples, or strike-offs, for a factory that specialized in printing fabric. But in the past 15 years digital fabric printers have become faster and more efficient, and now there are entire factories full of digital fabric printers working round the clock to print fabric. As they have become more efficient, printers have also become more available, and some costume shops are moving towards purchasing a digital fabric printer to take care of some of their surface design needs.

A costume shop manager who is considering purchasing a digital fabric printer has many options. This is intended not so much as a complete guide as a jumping-off point for the research you will need to do in order to choose the best digital fabric printer for your needs. And given the cost of these machines, it is definitely worth researching your options before buying. In addition to your research, the process of choosing a digital fabric printer should involve a long conversation with the dealer about price, maintenance and the availability of supplies.

As you look at your budget for this investment, there are a couple of considerations that might impact how much you have to spend: extra fabric costs, printer maintenance, and finishing equipment.

Most fabric will have to be prepared professionally for printing, and due to the feeding process, you will need extra yardage for every print project. Printers once relied on roller feed systems, necessitating paper backing for smooth transport of fabric. Smooth transport is important, because if the fabric bunches it can hit a print head, damaging it and necessitating a replacement—and considering that print heads cost around \$2000 apiece, and some

of these printers have six print heads, it's in your best financial interest to not let that happen. This "pinch" type of feeding machine is still available, and it is certainly cheaper, but newer systems use a roll-to-roll system with tension provided through cylinder transport and in a "tacky" belt that keeps the fabric moving at an even pace. If you are considering a lot of printing on knits, it would be worth investing in one of the newer transport systems. Knits can be paper backed for printing, but it is difficult to control the amount of stretch during the backing process. In any case, feeding the fabric through the machine and catching it on the tension mechanism often requires starting the print a yard into the roll of fabric.

Maintenance is another big consideration. Printers have to be used regularly to function well, and they have to be cleaned

Smooth transport is important, because if the fabric bunches it can hit a print head, damaging it and necessitating a replacement.

after each use. Anyone who uses your printer will have to be trained in operation and cleaning. It is possible that a technician on your staff can be trained in basic repairs to your machine, but it is a good idea to find out about maintenance costs from your dealer. If you feel you will need to rely on dealer service, then the best decision you can make is to buy a machine from the company closest to you. In any case be sure and talk to your vendor about training options. Often initial training and refresher/updates can be negotiated as part of the selling price.

For printing with acid or reactive inks you will also need a steamer to steam-set the printed fabric.

Type and Treatment of Fabric

Most printers today can be configured to accommodate either acid or reactive inks, so you can print on cellulosic or pro-

tein fibers. If your budget limits you to one or the other, you should consider the types of fabric you use most frequently. For either option, fabrics have to be prepared for printing. Many of the companies that provide fabric for printers will do this for a fee to a roll of fabric that you provide. The preparation process involves infusing the fabric with the chemicals necessary to accept and fix the dyes. Paper backing can be a part of this service as well.

Nano-pigments are also available for printing on cotton. These pigments are suspended in a binder system and do not react with the fabric, but rather sit on top of it. Fabrics do not have to be pre-treated before printing with nano-pigments, but they do require

heat setting. This can be done with an iron, but for bulk yardage separate heat setting equipment is ideal. Some printers come with built-in heaters, other come separately. If they're built-in, and they fail, you may have to replace the entire printer, as opposed to being able to replace an add-on.

For printing on polyester and other synthetic fabrics, sublimation printers are available. In the sublimation print process, the design is printed onto treated transfer paper that is then applied with heat to the fabric. This process also requires separate equipment, but can be a valuable investment if you primarily use synthetics. Newer sublimation printers can print inks directly on the fabric, but this application is mostly used for large format signs and banners. **SD**



A dress made from digitally printed fabric for a production by Carolina Ballet.



Digifab StampaJet B64

Printer: Variable-dot piezo

Max Print Width: 63.3"

Colors: 8

Max Print Resolution: 1080 dpi

Fabric transport: Automatic roll unwind and rewind units, with speed/tension control

Inks: Acid, Reactive, Disperse, Pigment, Sublimation

Digifab has locations in Los Angeles and New York. Their printers are available in a range of prices and capabilities, and they also sell inks, fabrics and steamers.

www.digifab.com



Expand Systems Class I Diva

Printheads: Dual-staggered Micro-Piezo Epson

Max Print Width: 64"

Colors: 8

Max Print Resolution: 1,440 x 1,440

Fabric Transport: "Proprietary" Designed for Direct Textile Printing

Inks: Pigment, Acid, Reactive, Disperse, Sublimation

Located in Roswell, Ga., Expand Systems offers a wide range of printers. Their Class I Diva model is used in home furnishing, apparel and craft industries, as well as in academic settings. It features a fabric handling system that allows for direct printing on silk to cotton canvas without paper backing the fabric. They do not sell fabric, but they do offer inks.

www.expandsystems.com



Mimaki TX500

Printer: Six on-demand piezo heads

Max Print Width: 71.7"

Colors: 6

Max Print Resolution: 1200 dpi

Fabric Transport: Automatic media feeder, roll take-up device

Inks: Sublimation

www.mimakiusa.com

Jacquard Inkjet Solutions

Jacquard Inkjet Solutions specializes in fabrics and inks, but they occasionally have used printing equipment available. A used machine can be a cost effective option, but maintenance should be considered. They sell a range of treated fabrics for acid and reactive inks, and they can treat and/or paper back your fabric for you. Jacquard also sells two sizes of fabric steamers.

www.inkjetfabrics.com



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Battery Basics for Props and Practicals

A wireless lighting prop is just a dressed-up flashlight, and you'll need good batteries to get the most out of it.

More and more props artisans are leaving behind their unfamiliarity with wireless lighting, and easily creating such things as a “gas” lantern with LEDs as the light source, or table lamps with no unsightly wires. But despite Tesla's best efforts, there's still no such thing as wireless power delivery. (Well, at least over distance.) Which means that no matter what type of lighting prop you want to make, you're still going to need a power source nearby, which means you'll need batteries. But which ones? And what capacity? Here's what you need to think about to make sure your brilliant effect doesn't go dark halfway through the show.

A Matter of Chemistry

Essentially, batteries come in three different flavors: Sealed Lead Acid (SLA), Nickel Metal Hydride (NiMH) and Lithium Ion (Lilon). Each have their advantages—but I would never use a Lilon battery in theatre, and I'll explain why in a bit.

Sealed Lead Acid batteries may conjure images of car batteries from the middle of last century, but they're actually available in a range of sizes. In fact, they are commonly used in emergency lighting and alarm systems and work well in theatre. And while the lead is toxic, they are the easiest of all batteries to recycle—virtually 100% of the lead can be reclaimed and reused. Lead-acid design has not changed in a century, and most SLA brands provide similar performance. To ensure safe construction, choose a UL- or ETL-listed battery. Personally, I like Powersonic SLAs.

For small props, Nickel Metal Hydride (NiMH) rechargeable batteries are great. There are several formulations across a wide price range, and you get what you pay for. Start with the best batteries you can afford. Better batteries maintain their rated capacity through many charge/discharge cycles, and hold a charge for a long time when stored. In my opinion, the best NiMH batteries on the market are Sanyo Eneloop cells, easily available in AAA and AA sizes. Any

reputable brand offering low self-discharge (long charge-life when stored) will perform comparably.

In cellphones and other consumer devices, most batteries are Lithium Ion (Lilon). This battery type is lightweight with a very high energy density, which unfortunately makes it less stable. A YouTube search yields numerous examples of Lilon batteries spontaneously catching fire and exploding. For this reason, I avoid using Lilon near performers and refuse to use them in costumes. The highest quality NiMH cells have nearly the energy density of Lilon, are only modestly heavier and are vastly more stable. If safety matters to you—and it should—avoid Lilon.

Ask the Right Questions

The first question you'll need to ask when choosing a battery is: How much power does the light source draw? The answer will be expressed as Watts, Amps or Milliamps.

Next: How long does your prop need to work between charges? This can be anywhere from a few minutes to hours.

All batteries, regardless of chemistry, are most efficient delivering small amounts of power. They get less efficient and run hot when delivering a lot of power over a short period. Heat is vaporized battery power—wasted energy you never get back. Because of that unavoidable waste, you must de-rate published capacities to ensure battery-operated props meet your expectations for running time and overall life.

Battery capacity is specified in Amp-Hours (Ah). This is misleading, implying that a 10Ah battery will deliver 10A for sixty minutes. You need to know that published battery capacities are based on the most efficient discharge rate with the least heat. And that changes depending on battery chemistry. The most efficient discharge rate for lead-acid batteries is the 20-hour rate: a 10Ah SLA battery will deliver 0.5A for 20 hours, but a 10A load will drain it in 30 minutes! Similarly, a 6A load will drain a 10Ah SLA battery in about an hour.

NiMH batteries are closer to their published capacity at the 1-hour rate, but require de-rating when the load drains the battery more quickly. Theatre props with very limited space are often designed with very small batteries and running times as short as 5, 10 or 20 minutes. If you put a 1.8A load on a 900mAh NiMH battery, it will work well for only 20 of the 30 minutes you might expect.

In summary: De-rate SLA batteries by half. De-rate NiMH less severely, but don't expect anything better than half the published capacity when drawing at greater than 2 times the rated hourly capacity.

Regardless of batteries, there's one rule you should always follow: Don't let anything run hot. If you can't comfortably hold a fuseholder, switch, connector or wire while your load is at full, something is wrong. At the very least, heat is valuable power wasted; at worst, it's a fire hazard.

One last very important consideration: a good charger, correctly matched to the battery you are using, is mandatory. Choose a knowledgeable supplier who will help you purchase batteries and chargers that work optimally together.

Practical Applications

There are three sample projects with some suggested power sources on the opposite page. Here in the USA I get my custom packs from AA Portable Battery Corp (www.batteryspace.com). For a sampling of custom Eneloop packs see bit.ly/sdeneloop. It's important that you tell them you specifically want Eneloop, otherwise they will use other less expensive NiMH cells. Back in Canada, I used to get my packs made by NICA Power Battery Corp. (www.nica.ca). They specialize in Eneloop and specifically promote them as the best you can get. There are actually lots of custom battery pack manufacturers—search Google for “custom battery pack” for a more thorough list. **SD**

James David Smith is the chief product designer at RC4 Wireless

A Simple Gas Lantern Prop

Selected light source: A small cool-white LED
Power draw: 30mA (usually also requires a “dropping resistor” for use with the intended battery voltage)
Required running time: 15 minutes
Suggested Battery: 6V (5 cell) pack of AAA NiMH rechargeables rated at 900mAh. Because of the low draw on this you’ll lose very little energy to heat, which means you won’t need to de-rate this battery pack. Running time will be: $900\text{mAh} / 30\text{mA} = 30$ hours



A 50W MR16 Up-Light in a Small Table

Imagine the rose table in *Disney's Beauty and the Beast* for this application.

Selected light source: 35W 12V MR16 Halogen bulb
Power draw: $35\text{W} / 12\text{V} = 2.92\text{A}$
Required running time: 10 minutes
NiMH Solution: A 12V (10 cell) pack of AA rechargeables. This easy-to-hide pack is rated for 12V at 1800mAh (1.8Ah). Since the load (2.92A) is higher than the 1-hour capacity, you’ll want to conservatively de-rate this by 25% for an adjusted capacity of 1350mAh. Useful running time will be approximately: $1350\text{mAh} / 2920\text{mA} = 0.46$ hours = 27 minutes
SLA Solution: A common 2.5Ah SLA battery is 1.4 inches thick, easily concealed under the table top. We must de-rate the published capacity by half, for an adjusted rating of 1.25Ah. Useful running time ends up at: $1250\text{mAh} / 2920\text{mA} = 0.43$ hours = 25 minutes

The NiMH pack will be substantially more expensive than the SLA battery, but it is much easier to damage an SLA by failing to turn off the load and recharge before 23 minutes has passed. It doesn’t take long before SLA replacement costs overtake the price of a much more forgiving NiMH pack. I would use NiMH if at all possible.



1000W of Lighting on a Revolve

Marine batteries can deliver the hours of running time sometimes required for a large theatrical set piece. Wireless control has become a well-accepted and routine way to control complex lighting on a revolve or portable set piece without the high cost and channel limitations of an electromechanical commutator.

Selected light source: Five circuits of four 50W MR16 lamps, totaling 1000W at 12V
Power draw: $1000\text{W} / 12\text{V} = 83\text{A}$
Required running time: 60 minutes
Suggested Battery: De-rating by half is required, so we need a 160Ah battery. A very good but expensive single battery for this job is an AGM Mastervolt 12/160. An alternative would be multiple smaller batteries in parallel, creating a battery bank. (In any case, safety comes first. Limit maximum current through your system with a fuse or circuit breaker at the battery terminals. Always use wire sizes suitable for the power your fuse will pass.)




One True Wrench

We looked at a multitude of lighting wrenches in order to crown one the best

Want to start a fight with a group of electricians? Ask them which wrench is the best. An electrician's wrench is the most important tool they own, and inspires fierce devotion.

But to truly find the best wrench I, along with members of the Fredonia State Student Chapter of the United States Institute for Theatre Technology, took a number of the top lighting wrenches and put them through their paces for a couple months at school and at the Theatre of Youth Company in Buffalo, NY. We looked at such criteria as features, durability, affordability, versatility and speed. We subjected each to a time trial using an old and new instrument, with

an experienced electrician and new electrician using the wrenches on some basic functions in order to see just how they compared. After each trial and some discussion we gave each a ranking from 0-5 on our "Lumens" scale.

For more a detailed comparison chart of all the features on the wrenches (including some we couldn't include here) head over to bit.ly/lightingwrenches. If you want to watch your favorite wrench at work check out the YouTube videos of the tests at bit.ly/sdwrenchtrials. Finally, tell us what your favorite wrench is at our poll: bit.ly/sdwrenchpoll. 

Stanley 8" Adjustable Wrench (C-Wrench)

MSRP: \$10.92

The old-school choice and industry standard. We reviewed the 8-inch Stanley Tools Adjustable Wrench. (The 6-inch version sometimes lacks the torque you need to loosen tight bolts and won't fit some yoke bolts, and the 12-inch version is just too big and can't fit into tight places.) When buying an adjustable wrench, don't get a cheap one. They'll bind when you adjust them and slow down a hang or focus.

PROS — There are very few bolts the adjustable can't fit. One of only two wrenches on the list that is open ended so

you can really get those hard-to-reach bolts. You can get a good one inexpensively.



CONS — No ratcheting feature, and having to adjust the jaw for every bolt takes more time than wrenches that have the bolt size built in. (Though most experienced electricians can adjust the wrench in a second or less.)

SCORE — 4.5 Lumens

Stage Junk Standard, Ultimate and Ratcheting Ultimate Focus Tools

MSRP: \$40 - \$100

The three varieties have similar pros and cons, the Standard and Ultimate just have fewer features.

PROS — More features than any other wrench. Works on lights, road boxes, shackles and lots of other stage hardware. The handle slots are deep and great for loosening handles on outdoor lighting that has been exposed to weather. Built-in support for both the older and newer tilt handles on a light. It's also designed to loosen the knobs on an ETC Source 4.

CONS — It can't get some hard-to-reach places on a light. If the yoke is positioned over (or even just too close to) the C-Clamp bolt sometimes the focus tools just won't fit and you need to get another wrench. Some bolts that are cut into the middle of the wrench make it hard to get enough leverage for really tight bolts.

SCORE

Standard Focus Tool: 4 Lumens

Ultimate Focus Tool: Same features as Standard Focus Tool, plus pin splitter and lamp check. It has a high price tag, but if you subtract the cost of a pin splitter or lamp check it's not that unreasonable. Almost as fast as the ratcheting version. 4.5 Lumens.



Ratcheting Ultimate Focus Tool: Same features as Ultimate Focus Tool, plus ratcheting head. A \$15 adapter that lets it hold 3/8-inch sockets is available. 4.5 Lumens.

Apollo BTS Wrench

MSRP: \$79

Apollo dared to ask to ask the question "How do you improve upon a crescent wrench?", and this is their answer. It's a standard 8-inch adjustable wrench—but it has several outlines for standard lighting bolts cut into the end of the wrench. The center is also cut out and can be used for several miscellaneous functions, like loosening a road case lock.

PROS — All the pros of the 8-inch adjustable wrench, including being open-ended. The ability to change to a new bolt without adjusting the wrench makes the focus or hang go quicker. The best part is that proceeds from the sale of this wrench go to the Behind the Scenes Charity that helps entertainment pro-

fessionals and their families who are in need.

CONS — The part of the wrench that tightens the c-clamp to the pipe is not deep enough. When loosening a light that may have been put on too tight or is sticking the bolt easily falls out of the wrench. It's much more expensive than a standard adjustable wrench.



SCORE — 3.5 Lumens



New Star on Stage




The Light Source 100 Watt LED fixtures give a smooth, even spread of light with all the energy and maintenance efficiencies that LED's have to offer. Fully DMX dimmable, pendant lights are perfect for house lighting and are available in a variety of beam spreads. The new recessed luminaires fit into a horizontal ceiling or can be obtained for sloped ceilings up to 36%. Both the pendant and the recessed luminaires are available in four carefully calibrated color temperatures (3,000 K to 5,600 K), and have an output of up to 7,800 lumens.

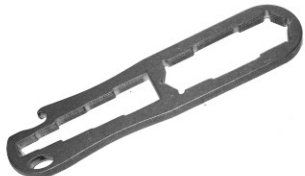



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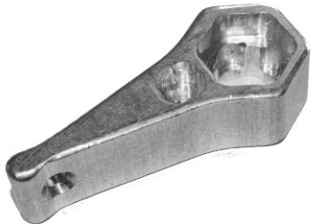
New LED
Recessed
Luminaire

Altman Multi-Purpose Stagehand Wrench		MSRP:	\$11
<p>One of the oldest wrenches in the list, sometimes referred to as the “Star Wrench” because of its shape. It has two different size handles it can adjust and many of the common lighting bolts.</p> <p>▲ PROS — Works well with older instruments, and has one of the best designs to loosen or tighten a handle on a traditional PAR 64. It’s great for a hang or work on the ground and at \$11 it’s worth having in a toolbox.</p>	<p>▼ CONS — It is limited on what it can do. You will need another wrench when tightening in order to work quickly. It’s a bit bulky and it’s hard to use in tight spaces.</p> <p>SCORE — 3.5 Lumens</p>		

Stage Junk Ultimate Flat Tool		MSRP:	\$20
<p>The most surprising wrench in our survey. This wrench can be used for not only bolts but also handles and other miscellaneous hardware. Because it is flat you need to develop a method of keeping the wrench in place. For me it’s was simply putting my thumb behind the wrench to keep it steady.</p> <p>▲ PROS — Works on almost any bolt, nut or handle. It has lots of uses outside lighting—I have even seen a couple in use in our scene shop. It is one of the few wrenches on this list with a bottle opener. For the features you get, it’s a great price.</p>	<p>▼ CONS — Because it’s flat it can sometimes be hard to get leverage on really tight bolts. One person in the group bent their Ultimate Flat tool trying to loosen a stuck yoke bolt.</p> <p>SCORE — 4 Lumens</p>		

Light Speed Wrench with Safety Ring		MSRP:	\$40.95
<p>▲ PROS</p> <p>All bolts it fits can be loosened or tightened with a ratcheting head. When tightening the yoke bolt you don’t have to flip a switch to change the direction of the ratchet you just turn the wrench over.</p> <p>▼ CONS</p> <p>One end is really thick and won’t get into hard-to-reach spots. We found a few pan bolts the wrench could not</p>	<p>adjust because they were too small. Can’t handle anything that is odd-sized, which means at some point you will need another wrench.</p> <p>SCORE — 3.5 Lumens</p>		

Apollo Little Focus 5 Wrench		MSRP:	\$33.95
<p>▲ PROS — It’s smaller and thinner than many of the other wrenches and can easily hide in your pocket or bag. Gets into more places than thicker wrenches. Great for hanging a light or quick adjustment.</p> <p>▼ CONS — The Little Focus 5 is larger and longer than most of the more compact wrenches—allowing it to get more leverage on hard-stuck bolts—but it’s still not enough for the lights we used in our tests. The middle of the wrench is used for the</p>	<p>pan bolt and when focusing instruments we found this to be awkward, as it gives you the least amount of leverage while using this wrench.</p> <p>SCORE — 2.5 Lumens</p>		

The Light Source Mega Combo Wrench		MSRP:	\$9
<p>This is another small entry into this category. It’s compact and easily fits into a pocket. Unlike any of the other wrenches it comes in a multiple bright colors.</p> <p>▲ PROS</p> <p>It’s small and easily fits in your pocket. Great for a quick hang.</p> <p>▼ CONS</p> <p>Though it fits in your pocket, it’s thick enough to where you wouldn’t want to carry it all the time. The thickness also keeps it</p>	<p>from getting to bolts in hard-to-reach areas. Its small size also prevents you getting the leverage you need on some bolts and it only works the common lighting bolts. You will need another wrench for focus or strike.</p> <p>SCORE — 3 Lumens</p>		

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Creating pop art animations for a production—no drawing skills necessary

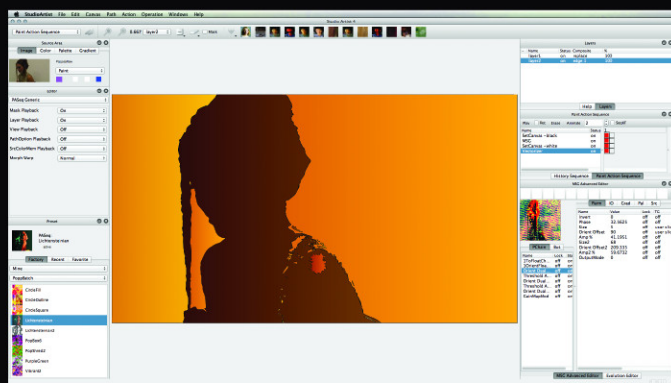
L'*Incoronazione di Poppea* is a stunning musical drama from the late-Renaissance/early-Baroque period. Set in the Roman empire it follows the intrigues of Poppea as her affair with emperor Nero evolves from simple tryst to her crowning as Empress of Rome. Our production at West Edge Opera set the show in an alternate-history 1962 where Nero and Poppea were conceived as JFK and Marilyn Monroe leaving their respective Jackie and Joe in the dust. 1962 is also the year pop art exploded on the world stage with Andy Warhol's first major gallery show, introducing the larger world to Campbell's Soup cans, among other classics. This was the wonderful and fertile ground in which I was tasked to design video projections.

from a program called Studio Artist by Synthetik Software.

Studio Artist differs from programs like Photoshop in that it uses source images to create digital artwork. The program interprets the source image and actually lays down digital "brushstrokes" and "pen lines" to create the final image rather than a single-action Photoshop-style filter. Thus, one could take a snapshot (or video) with an iPhone and recreate the image in the style of oil, charcoal, pencil or watercolor through discrete brushstrokes. And because it is a repainting of another image it is resolution independent—meaning a VGA-quality video capture (640x480) could be uprezzed to 1080p with an increase in detail. In other words, using the program frees the designer from having to worry about the lighting, color or resolution of source files. All that can be overwritten with detail added inside the program. Knowing this, I took the plunge and captured my raw footage of Poppea using a pocket-sized video recorder with rather poor image quality and heavy compression under hideous rehearsal lights.

I wanted the images of Poppea herself to be Warhol-esque silk-screens, à la the famous ones of Marilyn Monroe. This would involve layering animation effects in the final video. In Studio Artist the paint actions used to create a frame of animation are recorded and then played back via The Paint Action Sequence tool to combine a variety of user defined presets to create an entirely new look. I created the look I wanted and recorded a Paint Action Sequence that would play back, frame by frame over my low-res video, outputting animated video. The final step of each sequence was the Vectorizer tool, which converted the frame to stylized vector art so it could be outputted at the higher resolution I needed. The low image quality of my original footage was actually a bonus as the software moved fast and the output resolution was still full 1080p.

Building Paint Actions Sequences with different painting tools created different pop art looks for different scenes and characters, all of which was rotoscoped into several hours of animated video projections. Thus, someone with middling drawing skills was able to create custom animations in the style of 1962 pop art. The same could, of course, be done for Rembrandt, Van Gogh, Matisse or whatever your production requires. I did a dance piece a while back with animated Renaissance style oil paintings as projections for example. This is a far superior solution than a typical "comic book effect" or "oil painting filter" in traditional video editing software as it can be uniquely tailored to the needs of your production. **S**



The Studio Artist screen with original video footage in the upper-left, the Paint Action Sequence on the right.

The set consisted of an 18-foot-by-10-foot white pop-art inspired sculpture upstage-right and a 10-foot-by-12-foot bed with a white canopy mid stage-left. Both sculpture and canopy were projection surfaces and provided their own technical challenges in terms of alpha masking and image mapping—but while the technical hurdles were many, the real challenge came in the form of creating the animated projections.

I drew heavily from the work of Warhol and Lichtenstein for my visual research and inspiration. This meant imagery would be cartoonish at times with heavy graphic lines throughout. And we wanted the images to move. I am great with software but not exactly the best cartoonist or painter. Hiring an animator was well outside our budget so it was left to the guy who can't draw his way out of a paper bag to create moving animations. The solution came



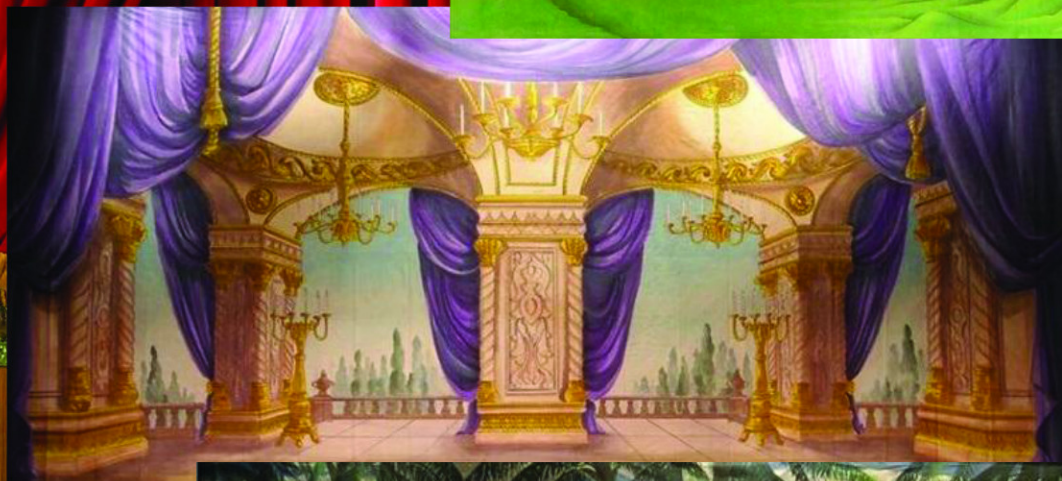
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