

Take Two: Finisar and Opnext

Like Finisar, Opnext possesses crucial optical technologies and agendas, has proven to be well run and farsighted, and has a reasonable shot at doubling its market cap by the end of the decade.

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Who isn't making ROADMs? Or 10 gigabit per second (10G) transceivers? If you tried to answer those questions in Anaheim during the last week of March, you might have begun beating your brow during the first day and running out of names after listing yourself, your mother, and Mickey and Goofy at nearby Disneyland.

For three full days I scurried from the exhibit conclave of the Optical Fiber Communications (OFC) conference to the Marriot meeting rooms across the street to the press quarters upstairs in the convention center to the forums downstairs and back to the exhibit floor in a congested local loop saturated with gigahertz hype and closed-door spec-sheet trysts. Through it all, I managed to avoid getting lost or incurring scheduling collisions.

How did I do it? *By careful preplanning.* But then I learned from the experts I was on the wrong track. Optical networks don't preplan their paths any more. They go with the flow, using the reconfigurability of ROADMs. We cast off the burden of crafting schedules and fixing appointments and get flexible instead. **Verizon** (VZ) has, enriching bubble-era startup **CoAdna Photonics** in the process. As the sole supplier of wavelength selective switches (WSSs) for the **Tellabs** (TLABS) 7100 Optical Transport System, CoAdna is in turn providing all of the optical switching modules for Verizon's network upgrade, thereby leaping into an early lead over second-place **JDSU** (JDSU) in sales of these critical components of all-optical, wavelength routed networks.

ROADM rage

Short for reconfigurable optical add-drop multiplexers—none of us knew either until a year or so ago—ROADMs come in three varieties. The most flexible of these exploit WSS modules such as the ones CoAdna sells to Tellabs. These third-generation optical switches are just now emerging, following the success of first-generation wavelength blockers and second-generation planar lightwave circuits.

Wavelength blockers use either microelectromechanical systems (MEMS) or liquid crystals (LCs) to block dropped channels and attenuate the remaining channels passing through a network node in order to bring signal power into balance before new wavelengths are added. Until recently, wavelength blockers claimed the bulk of

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POSTED MAY 9 ON THE TELECOSM FORUM: "Why JDSU Is *Not* for You"

To find out why *GTR* Analyst Charlie Burger is keeping an eye on the components giant but turning his attention to the more promising pure plays and innovative niche upstarts, register today on www.Gildertech.com/board/ using your *GTR* subscriber password.

Don't become a SubOptium Investor

A year ago March, then-private **Optium** (OPTM) acquired Australian-based **Engana** with its LCoS switching technology, and after Optium's IPO last fall, it finally looked as though investors would be able to profit from the budding WSS (wavelength selective switch) market. A well-known technology used in rear-projection televisions and adapted by Engana for optical switching, LCoS (liquid-crystal-on-silicon) structures feature an LC layer on top of a CMOS backplane containing DRAM cells, which are electrically controlled to create custom grating structures on the fly. Optium outsources the highly-manufacturable LCoS process but makes its own modules and circuit boards.

Conventional LC structures can be made to block, attenuate, or redirect light by changing the polarization state of the crystal in a process that is limited to one pixel per channel. By contrast, grating-based LCoS steers light beams using a few thousand pixels per lambda, potentially increasing the device's functionality. For instance, using a single, chip Optium can mix and match channel spacings, combine beam steering and splitting to configure a broadcast network, and correct for dispersion at each wavelength—all dynamically via Engana's proprietary software platform. Optical switches based on traditional LC technology, such as CoAdna's WSS, must add components to perform these tasks.

But Engana's high-level of functionality doesn't come free. For any LC device, thickness increases with the number of channels, and since LCoS requires more pixels to begin with, it turns out to be a bulky device about three times as thick as its LC rivals. This will limit Optium to the nine add-drop ports it already offers as competing vendors using both MEMS- and LC-based modules, under pressure from systems houses and carriers, increase their port counts well beyond that.

With its purchase of Israeli startup **Kaillight Photonics**, Optium has also acquired duo-binary modulation technology that is being incorporated into tunable transponders currently under development. But unlike Kodeos, recently acquired by Finisar, Kaillight is focused more immediately on the nearly-nonexistent 40G market with products that reportedly may run as high as \$40 thousand a piece. Though this race-track bit-rate—which actually reduces

connectivity by limiting the number of wavelengths per fiber and by requiring hero experiments avoid optoelectronic conversions—was much talked about at OFC, the high cost and transmission challenges may limit long-reach deployments to spotty links at Verizon, AT&T, and NTT for the next few years, if ever. High speed makes sense for router-to-router interconnects, but Optium doesn't need Kaillight for that.

With its penchant for higher-priced, lower-volume modules and subsystems, it's probably good that Optium operates as a fabless vendor with the ability to draw from various processes and from facilities already humming with business. The company claims its in-house design, assembly, and test operations set it apart, including a high-degree of automation. But vertically integrated competitors claim the same advances for themselves. More important for Finisar, its fab-based model is ideal for its rapidly rising, high-volume markets of next-generation products.

Optium doesn't compete with Finisar in the enterprise space, and appears to have done no work on the latest pluggable, parallel standard to which Cisco is migrating. Its strongest offerings appear to be in the older serial interface standard still popular for long-reach, fixed and tunable WDM transmission. In this market, it is Finisar that is becoming a new threat to Optium through its Kodeos acquisition. Optium does, however, offer 10G pluggable transceivers in the newer, serial standard that Finisar has mastered over past few years.

If Optium matches the composite 30 percent rise it expects in its end markets and attains its operating goals, then in two years the company would be reporting an annual run-rate of some \$25 million of earnings or 90 cents per share after taxes for 22 percent per year earnings growth. The recent \$17 stock price is already 19 times this "mid-point" projection, and we see no compelling technology advantages that would spur upsides to this scenario. True, Optium continues to refine its tunable offerings and plans to introduce more compact tunable modules in the future. But there are almost as many tunable laser technologies as there are vendors of these products, clouding the investment picture here as well.

ROADM sales but are now being rapidly eclipsed by the newer generation switches, beginning with planar technologies, which integrate a multiplexer and blocker on a single chip. (Multiplexers/demultiplexers combine and separate wavelengths in wavelength division multiplexed (WDM) networks, and planar devices use arrayed waveguide gratings to perform these functions.)

While planar products benefit from integration and are economical in volume production, they are limited to one drop or one add port per chip, and the dropped/added wavelengths are fixed. By contrast, a single WSS module, based on MEMS or liquid crystal technology, can be dynamically tuned to drop or add any combination of wavelengths to as many as nine ports today and up to several dozen ports in the future. Market forecaster Ovum-RHK sees sales of WSS modules rising from \$11 million last year to \$71 million in 2010, despite their significantly higher cost, while sales of blockers hold steady at \$15 million and sales of components for planar products hang in the \$40s millions.

Unlike traditional add/drop multiplexers, which convert wavelengths to electronics in order to switch

them, WSSs redirect wavelengths in real time without the cost and latency of optoelectronic conversions. Carriers navigate user-friendly graphical interfaces on their computer screens to remotely upgrade services without truck rolls and without reengineering their networks. Propelling WSSs into the marketplace are emerging online applications such as streaming video, interactive gaming, and downloads of large files, together causing unpredictable spikes in network traffic that can be accommodated elegantly and economically through dynamic provisioning of bandwidth. Because they are significantly cheaper, planar products will continue to infiltrate access and edge networks where the added flexibility of WSS modules isn't required. Cisco (CSCO), the leading seller of ROADM systems with over half the market, currently has four thousand planar-based systems in place and believes that 80 percent of its customers' sites still require these switches.

CoAdna took off seven years ago with \$6 million in seed money and never looked back. Using LC technology, the vertically integrated vendor offers 10-port switches and has already demonstrated a 16-port device.

Also private is **Capella**, whose 10-port MEMS-based WSS was just qualified by **Telcordia**; the startup took in a comfortable \$20 million of additional funds in March.

Unfortunately, none of the ROADM technologies or companies have shown themselves clearly ascendant, and the two main publicly-traded plays, **Optium** (OPTM) and JDSU, are more likely to flatten your financial prospects. But in addition to stimulating optical-switch sales, the digital media and peer-to-peer traffic surging onto global networks is also driving 10G optics into enterprise, metro, and regional networks, creating upside opportunities for another group of paradigmatic technologies and companies with much greater potential for investors. Standouts here are tele-cosmic transceiver houses **Finisar** (FNSR) and **Opnext** (OPXT), our featured companies this month.

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Finisar for Your Future

Buoyed by new product introductions and two critical acquisitions, Finisar exuded confidence about its 10G future as we met in Anaheim. A month earlier, the company reported its first upside surprise in this market as sales of 10G long-reach transceivers helped boost metro/telecom revenue by 44 percent sequentially during the January quarter and by more than double over the year-ago quarter.

Finisar rose to the top of the enterprise market through its lead in pluggable optics. Until recently, telecom wasn't interested in pluggable transceivers. Now CEO Jerry Rawls is piling up design wins for his new 10G pluggables that give systems houses greater flexibility in designing metro line cards compared to the traditional method of soldering in components. Sales of 10G Ethernet transceivers into metro markets are expected to rise 44 percent per year for the next three years, and Rawls sees even greater upsides for 10G in his traditional enterprise space.

Considering that this market contributes to just 15 percent of Finisar's total revenue, it portends a huge opportunity for the company, especially at Cisco where Finisar is a preferred supplier of transceivers for enterprise products but has only begun to qualify 10G lines. With some three quarters of the Ethernet switching market in its grasp and in the process of paring suppliers, Cisco figures to be crucial to Finisar's 10G progress.

Converting electrical signals to optical signals for fiber transmission and reception, transceiver modules integrate the optics with electronics such as laser drivers, amplifiers, and clocks. Pluggable 10G modules use either serial or parallel electronic interfaces. Finisar originally focused on serial devices, which are more

efficient, more compact, and lower power because they eliminate the electronic mux/demux required in parallel transceivers. Initially, however, systems houses were not attracted to serial solutions because the circuit boards were too difficult to architect. Cisco for one has been slow to migrate to serial modules, and Finisar now offers a portfolio of parallel electrical interfaces that includes one of the newer standards that Cisco is adopting.

For short-reach Ethernet and storage applications, Cisco has also begun to sample a new type of serial interface which is even smaller, lower power, and cheaper than current serial standards because it takes silicon out of the optical module and puts it on the board. These integrated transceivers are more compact and dissipate less heat and the new interface permits more ports per card. Finisar has already demonstrated products in this form factor with reach up to 220 meters, and other vendors have begun vying for this business as well.

Finisar finds its missing links

Missing from Finisar's product portfolio have been long-reach (greater than 80 km) transceivers and tunable modules, both required for a success run at the telecom market. The acquisitions of startups **Azna** and **Kodeos**, announced in Anaheim, should fill in those gaps nicely.

Azna/Finisar's forté is direct modulation at 10G. In WDM systems, information in the form of bits is coded onto each wavelength by modulating or changing the amplitude of the signal as it's transmitted. This can be accomplished by turning the laser on and off directly or by an external modulator that changes the amplitude of the light emitted by a continuously lit laser. Size, power, and cost of transceivers improve when lasers are directly modulated rather than externally modulated. But directly modulated lasers are dogged by chirp, which is a distortion in the optical signal caused by turning the laser on and off. At data rates of 10G and higher, chirp severely limits the distance WDM wavelengths or channels can travel over fiber before their frequency spectrums widen and they interfere with each other, a problem called chromatic dispersion.

Azna/Finisar actually takes advantage of chirp using a proprietary passive optical element to reshape and tighten the transmitted spectrum of each channel in a way that enables them to travel up to 200 km through fiber before they begin to interfere with each other. Dispersion compensating modules are no longer needed along the fiber route, adding to the advantages of transmitting with directly modulated lasers. Uncompensated reach can be further lengthened to 300 km and beyond by grooming the received signal using techniques known as forward error correction and electronic dispersion compensation (EDC). Azna has squeezed its product into the smallest standard size for pluggable,

Advanced Micro Devices	(AMD)
Altera	(ALTR)
Anadigics	(ANAD)
Broadcom	(BRCM)
Cepheid	(CPHD)
Corning	(GLW)
Energy Conversion Devices	(ENER)
Equinix	(EQIX)
EZchip	(LNOP)
Finisar	(FNSR)
Flextronics	(FLEX)
FormFactor	(FORM)
Hittite Microwave	(HITT)
Ikanos	(IKAN)
Micron	(MU)
Microvision	(MVIS)
National Semiconductor	(NSM)
NetLogic	(NETL)
Opnext	(OPXT)*
PMC-Sierra	(PMCS)
Power-One	(PWER)
Qualcomm	(QCOM)
Semiconductor	
Manufacturing International	(SMI)
Sigma Designs	(SIGM)
Semitool	(SMTL)
Sprint Nextel	(S)
Synaptics	(SYNA)
Taiwan Semiconductor	(TSM)
Texas Instruments	(TXN)
Xilinx	(XLNX)
Zoran	(ZRAN)

*Added this month

Note: The Telecom Technologies list featured in the Gilder Technology Report is not a model portfolio. It is a list of technologies that lead in their respective application. Companies appear on this list based on technical leadership, without consideration of current share price or investment timing. The presence of a company on the list is not a recommendation to buy shares at the current price. George Gilder and Gilder Technology Report staff may hold positions in some or all of the stocks listed.

Opnext (OPXT)

PARADIGM PLAY: TELECOSMIC TRANCEIVER TECHNOLOGY

MAY 8: 13.40; 52-WEEK RANGE: 11.96 – 19.95; MARKET CAP: 830.96M

Added to the list this month.

Power-One (PWER)

PARADIGM PLAY: DIGITAL POWER MANAGEMENT CHIPS

MAY 8: 3.82; 52-WEEK RANGE: 3.82 – 8.15; MARKET CAP: 331.6M

Could more go wrong with a company during a single quarter than went wrong with Power-One last winter? Sales to key North American customers fell near the end of the period, signaling the start of an inventory correction. Also falling more rapidly were prices of Power's traditional products, such as ac-to-dc converters or "bricks," as competition heated up. More stable are the prices of the newly acquired custom lines from Magnetek, but the benefits were more than offset by lower gross margins and hefty integration costs. Meanwhile, Power lost control of its motor controls business, which was wracked by abnormally high expediting costs (the significance of which somehow escaped "local" management). Climbing also were legal expenses in the Z-One patent infringement suit against Artesyn.

With all of these problems, it is no surprise that gross margin ran out of gas at 19% on its attempted climb toward the forecast mid- to high 20s, which we now learn may take another year to reach. The sole reason we've suffered along with this company for years is the chance to profit from its decisive lead in digital-power technology. Though Power continued to book Z-One wins in the quarter, with the mix still going increasingly toward higher-volume tier-1 customers, management now tells us that the adoption rate of Z-One "has been stymied" by the Artesyn suit, and they will no longer quantify new wins. This reawakens our worst fear that Magnetek is becoming a fatal distraction to digital development, a potential problem we thought had been overcome a few months ago, when we became more positive on the company.

Clearly coping without a unified business plan in the wake of its acquisition fumble, Power is taking the Band Aid approach to wellness using all the standard patches, such as consolidating, streamlining administration, and leveraging volume purchases. But the company will continue to lose money through this year, rendering increasingly unlikely its goal to repay the substantial acquisition-related debt with a combination of cash flows and attractive refinancing. With cash and investments down to a meager third of accounts payable and current credits, management may need to resort to a public offering, a bleak prospect at the current stock price of \$3.82.

Thus, the enterprise value of 0.8x the revenue run-rate may not be the bargain it appears at first blush. Wall Street isn't always irrational.

Like jinxed Joe Btfsplk from Li'l Abner with the permanent rain cloud hovering over his head, Power-One routinely encounters setback after setback, one misfortune followed by two more. If you can sleep Prilosec-free after placing your money under an eternal rain cloud, more Power to you. May you wake up one day to a digital rainbow. Otherwise, move on to clearer skies, to the many companies with upside potential as great or greater than Power's, but minus the muck and mire.

Sigma Designs (SIGM)

PARADIGM PLAY: LIFE AFTER TV MEDIA PROCESSOR LEADER

MAY 8: 27.61; 52-WEEK RANGE: 7.99 – 32.57; MARKET CAP: 632.35M

Though the new Sigma CFO, Mark Kent, made no promises, signs are hopeful that he will be able to cling to his company's original operating model. Excluding non-cash and stock-based charges and one-time fees, gross margin has been oscillating around the target 50% over the last two quarters despite volume discounting, and operating overhead has held steady at 30% of revenue over the period.

Not expected to repeat is last summer's gross margin freefall from 52% to 46%. At the time, Sigma was ramping a radically new chip platform that required customers to make a paradigm shift from software- to hardware-centric systems. To jumpstart sales, Sigma priced its new product aggressively. Production volume surged and manufacturing efficiencies quickly improved at contract fab Taiwan Semi. Since future generation chipsets will be based on the current platform, ramp-ups should be much less disruptive.

As Mark reengineers Sigma's makeshift accounting, controls, and systems, his expenses will climb yet further, and current profitability will hold only if revenue continues to rise rapidly. Market and product trends were not updated on the late-April conference call, and we stand by our latest opinion of Sigma's potential as we await details on the new business plan. Marketing chief Ken Lowe still expects the IPTV market to accelerate through the year based on activity he is seeing, and he touted the recent win at Korea Telecom as another sign of Sigma's dominance.

Still ambiguous is the tax prognosis. Accumulated losses for federal income taxes purposes will easily take Sigma through fiscal year 2008 ending early next January if the company is allowed to use the entire amount reported in its latest filing. With the tax rate already approaching 5% of

adjusted income, we arbitrarily choose that for this year's rate. The worst case scenario—a 35% U.S. rate or about 25% of adjusted income—will likely not hit next year either if Mark is able to draw on all past losses. To be conservative, we assume a tax bite of 20% for next year.

Thus, if Sigma's IPTV revenues rise with the market this year and revenue from other sources increases a modest 25%, Mark will report a \$57m quarter next January for a \$228m run-rate. With the anticipated operating margin of 20% and a liberal estimate of 32m of diluted shares, earnings reach \$1.35 after taxes, up 30% from this January's run-rate of \$1.04. Continue the same story another year while boosting shares to 35m and taxes to 20%, and annualized earnings rise another 44% to a quarterly run-rate of \$1.95 in January 2009. If investors award Sigma a growth valuation of 30 times earnings, the share price would reach the upper \$50s next year.

If, as iSuppli forecasts, global IPTV subscribers rise from last year's 4m to 103m in 2011, and if the HD DVD and home wireless networks markets take off, then our story will come in low even if Sigma loses its near-monopoly in set-top boxes within the next year. Despite the difficulties in producing a chip that pulls together all the video, audio, graphics, security, peripherals, and memory control to enable multistream IPTV; despite the equally enormous effort needed to integrate the software; and despite the long product development cycles, competition is coming. The market is too large and too long to expect otherwise. Of greater concern to us is what seems to be a delay in Sigma's next-generation chip. The company must continue to feverishly innovate in media processor technology or lose its leadership role.

Zoran (ZLAN)

PARADIGM PLAY: DSPS FOR DIGITAL CAMERAS & DVDs

MAY 8: 19.75; 52-WEEK RANGE: 13.45 – 28.63; MARKET CAP: 976.6M

In addition to its options review, Zoran reported a sequential freefall in hardware revenue of 30% during the December quarter. Though the fourth quarter is traditionally Zoran's weakest as it cycles a bit ahead of the consumer market, last year's results were off 15% from the year-ago quarter. That's not the momentum we expect in a growth company. Blame was pinned on price erosion in the DVD market and delays in launches of new digital TVs. But we suspect a distracting options review had a lot to do with it. (Am I going to jail next year?)

It turns out no one's going to jail or even

getting a wrist slap. The company is rebounding nicely toward its former growth path, and the stock has appreciated more than 40% over the past three months. Zoran continues to ascend into budding digital media markets for cameras, handsets, televisions, DVDs, and printer imaging. In particular, its COACH (camera on a chip) digital camera processors shipped in record numbers during the March quarter. Last year Zoran increased by half its already leading share of this market while the market itself grew about 13%. Based on design wins, management expects to continue building share from just over a quarter currently to nearly a third of the market by year end.

Zoran is answering the call for faster click-to-click time between shots, quicker ready mode when camera is turned on, and better image capture quality under poor lighting conditions. Typically in the past, these features were found only on high-end cameras. Zoran is helping to make them standard and affordable in low- and mid-range products. Expected to be in cameras by the second half of this year is the next-generation COACH 10 processor with advanced image processing and high-def video recording. On the integration road map for future generation chips are anti-blur, auto-dynamic range adjust, and wireless connectivity.

Zoran has begun moving its COACH technology into mobile phones with a chipset that includes the digital baseband processor and GPS functionality. Taking advantage of the product's superior image capture capabilities for both still and movie shots, a tier-1 supplier plans to introduce, later this year, high-end phones that use the chipset. Zoran expects revenue to begin in earnest from multiple phone makers next year. Today the product can process 2 to 5 megapixels with plans to increase that to 12 megapixels. Greater resolution helps to make up for poor optics inherent in small devices by enabling greater digital zoom capabilities and better picture quality in poor lighting.

Elsewhere, sales of color laser printers are also expected to begin in earnest this year, and Zoran offers the only merchant product on a single chip that embeds a high-performance CPU for processing page description languages and that supports complete color functionality for combined fax, copier, printer, scanner capabilities at up to 20 pages per minute. For HDTVs, Zoran is integrating more and more of the system architecture on its chip, which supports all the developing standards around the world. In the U.S., digital capability is now mandated for

all sets smaller than 25", and Zoran can handle the multiple resolutions these models come in. On the DVD front, management expects meaningful sales of blue laser, high definition players to start late next year, and in preparation they are working with tier-1 suppliers to develop a processor they believe will lead the industry in integration and cost. Expect announcements before the end of this year.

Whew. Is there any consumer market without Zoran inside?

Perhaps the company's greatest success over the past few years has been in expanding and diversifying sales out of DVDs, which had been supplying over three quarters of company revenues, into digital cameras (37% of revenue during the March quarter), digital TV (16%), and imaging (20%), leaving DVDs with just a quarter of the revenue pie. By leveraging its basic technologies across many markets, Zoran is better able to withstand product cycles and has positioned itself for greater growth in the coming digital media world. It has also given the company a strong balance sheet boasting a quarter of a million dollars in cash and investments net all liabilities.

But there are negatives to being all over the place. Crucially, it's hard to pin down Zoran's technology and its true standing in each of multiple products and multiple markets, many swarming with formidable foes, including the likes of TI, Broadcom, STMicro, and Trident. Zoran, however, is a 20-year veteran silicon merchant itself with accumulating experience entering new markets. Most recently, it claims to that its new multimedia coprocessor for handsets, about to be introduced into a tier-1 product, will beat TI on features and cost.

If revenue and margins continue to recover as we expect, Zoran should be able to earn about a dollar per share this year, excluding options and other non-cash charges as well as expenses related to the investigation. Included are soaring costs for tape-outs (\$1m each, including mask sets and engineering wafers) as the company transitions to 80 nm geometries. The shift should continue through the year and help set Zoran up for a major expansion through the rest of the decade as its products rise with the digital tide. Trading around \$20, the stock has fully recovered from its options discount based on this year's earnings potential. But if revenue rises a not unreasonable 30% annually thereafter, the stock could easily double by 2009 as earnings top \$2.

— Charlie Burger

long-reach 10G serial transmission. This includes limited tunability, with full C-band tunability coming. The company of 58 employees was already profitable on revenue of \$6.7 million when it was acquired, and Finisar will continue to sell the original packaged lasers as well as incorporate them into its transceiver modules.

Also selling products when acquired by Finisar was Kodeos, which offers full C-band tunable transponders (transceivers with added functionality) transmitting 10G signals up to 160 km using a proprietary version of duo-binary modulation to mitigate the effects of chromatic dispersion. Kodeos is also working on other advanced modulation schemes. But so far, duo-binary wins on cost, and they have seen a lot of interest for the product in metro and metro access markets.

Kodeos is also developing an electronic dispersion compensation technology called maximum likelihood sequence estimation—a loop-back mechanism that allows you to use digital electronic techniques to recover a signal that has suffered degradation. The Viterbi algorithm for equalization outperforms analog approaches. While Kodeos/Finisar believes it leads in extended reach transmission, on the receive side they are battling head-to-head with **CoreOptics**, a German-based startup which they think enjoys a “half-year lead” in electronic dispersion compensation technology. CoreOptics’s C-band tunable 10G transponder is being deployed at **AT&T** (T) and Verizon through **Siemens** (SI).

Everyone's tuning in

The largest suppliers of tunable lasers today are privately-held **Santur** and **Intel** (INTC) through its acquisition of New Focus’s laser unit five years ago this month. Intel improved on New Focus’s external cavity design by replacing the moving parts with a thermal tuner that effectively varies cavity “length” by tweaking the speed of light. Santur, which supplies tunable lasers to Kodeos, integrates an array of DFB (distributed feedback) lasers on a chip and fine-tunes each thermally or electrically. DFB lasers are the long-trusted, fixed-wavelength light sources for telecom’s standard transmission windows or bands. Both Intel’s and Santur’s tunable lasers are full-band tunable. But, then, whose isn’t?

In November, **NeoPhotonics** acquired Paxera with its acousto-optic technology, which tunes by sending sound waves through a lithium niobate crystal to create various grating structures that in turn alter the “length” of the external cavity. With Paxera awaiting qualification of its first product, **Bookham** (BKHM) got busy at OFC by announcing a compact, distributed Bragg reflector (DBR) design that monolithically integrates laser and modulator, and the company expects further integration using its indium phosphide (InP) technology. In return for the smaller package, which eliminates a discrete lithium niobate modulator, Bookham relies on the more difficult InP process and adds the challenge

of growing intricate multigrating structures, which then require more complex controls than DFBs.

JDSU is following down Bookham Boulevard with its own InP-DBR research, likely based on technology acquired along with Agility several years ago. A product is not expected before late next year, but the company expects to do Bookham one better and perhaps become the first to achieve a pluggable tunable module. But for metro and regional networks, Azna beats them all with its much simpler and less expensive self-modulated solution, already offering limited tunability in the latest pluggable standard with the promise of full-band tunability to follow and then greater reach after successful incorporation of Kodeos technology. Let us hope so.

Of much more concern to Finisar from the JDSU camp is its recent purchase of **Picolight**, Finisar’s main competitor in VCSEL (vertical cavity surface emitting laser) technology. The acquisition brings JDSU into the VCSEL datacom market for the first time and adds a gallium-arsenide VCSEL fab in Colorado to the company’s InP, planar lightwave, and lithium-niobate modulator fabs, all in the U.S. In addition to the traditional 850 nm transmission wavelength that VCSELs monopolize, Picolight adds to JDSU’s extensive portfolio advanced 1310-nm VCSELs with 1 km reach for datacom and storage centers. Armed with Picolight, management intends attack and conquer the new serial standard for short-reach, 10G Ethernet the Finisar has just begun introducing and where Cisco has set its sights for next year.

Judging by the purchase price of \$115 million in JDSU stock, or about half of Finisar’s enterprise and storage sales, it appears that Picolight was not able to mount a VCSEL business on the scale of Finisar’s, which has been vertically integrated since it purchased **Honeywell’s** (HON) VCSEL Optical Products group three years ago. Picolight claims to offer the most reliable VCSELs based on its patented oxide-trench production method. But Finisar also lays claim to the most reliable VCSELs, being one of the earliest adopter of the technology more than a decade ago following Honeywell’s pioneering work. If JDSU is able to synergize and energize Pico, Finisar could begin to feel some heat. But don’t count on it. As merely another of JDSU’s hundred and one technologies and road maps, Pico is just as likely to get lost in the maze.

No cracks in Rawls's foundation

Jerry Rawls, the energetic and farsighted CEO of Finisar, is laying the foundation for a great growth story beginning later this year and continuing through the rest of the decade. Growing pains, signaling a healthy adolescence, have developed as the company migrates its VCSEL manufacturing from Richardson, Texas, to a new fab in nearby Allen; the Allen fab will double Finisar’s capacity to produce VCSELs and photodetectors.

To lessen their risk associated with the move, cus-

tomers over-ordered short-wavelength transceivers late last year following a period of tight supplies. They have now begun to draw down their inventories, hitting Finisar with an 11 percent sequential reduction in revenues from storage and enterprise networks during the fiscal third-quarter ending January, with a follow-on hit during the April quarter from storage customers, including Cisco.

The advanced ordering indicates a vote of confidence for Finisar as it appears that most customers of VCSEL-based products are sticking with the company during the fab transition, which continues smoothly and promises higher margins in the future. (Another customer attraction is Finisar's patented digital diagnostics, which monitors laser performance during operation.) Modernization of the Malaysian assembly plant, also progressing, will help improve margins still further, as will increased fab utilization after the inventory bulge thins out.

In a small surprise, sales of network tools rose 9 percent sequentially during January. Finisar is the largest manufacturer of test and measurement tools for Fibre Channel, but has traditionally sold these products only to big storage operators and equipment vendors. Rawls is now starting to sell directly to enterprises using his own sales force and industry partners, but fruit from this move isn't expected to begin ripening until next year when the rollout of new 8G storage networks renew interest in network test and monitoring equipment along with Finisar's new 8G optical modules.

Though the company has not reported out full financials since the July quarter because of its internal stock options investigation, we estimate that gross margin is flirting with 40 percent and that operational margin has not slipped below last July's 9 percent and may even be higher. With the benefit of new fab and manufacturing facilities, expanding sales, and ascent of higher-margin 10G and network-tools products, it appears as though Finisar should, over the next year or two, attain its long-term goal of 15 to 20 percent operating margin, all tax free as a result of years of accumulated losses.

Short-term, Finisar will need to absorb added legal expenses to handle appeals contesting its recent patent infringement award of \$104 million in the **DirectTV** (DTV) case and the added costs of the options investigation. Longer-term, we suspect the options review will result in higher administrative costs due to tighter internal controls. Therefore, we expect margins to come in on the low end of Finisar's goal. Easy for Finisar to absorb will be the initial cash outlays to purchase Azna and Kodeos, which combined total \$11 million or just 8 percent of the company's available cash of \$136 million reported at the end of January.

If during the next two fiscal years Finisar's revenue grows with the expected ascent of the 10G market of 30 percent per year, revenue of \$708 million during the

year ending April 2009 would net \$106 million (assuming 15 percent operating margin) for earnings of 32 cents per share based on 330 million shares and a stock price in the range of \$6.40 to \$8.00 if the market values the stock at between 20 and 25 times earnings. But even if the company ascends at half that rate, the stock would rise to \$5.00 to \$6.25 based on the same margins and valuation. Overall, then, assuming the ongoing options investigation comes to a quick and uneventful conclusion and that Rawls is able to successfully integrate east coast-based Azna and Kodeos, whose combined headcount totals less than a hundred, his company's long-term prospects appear bright. Therefore, we keep Finisar on our list of telecom companies.

* * *

Opportunity Knocks at Opnext

An early innovator in 10G transmission and leveraging key telecosmic technologies you won't find at Finisar, **Opnext** (OPXT) collects more 10G revenue than Optium and Finisar combined and five times as much 10G revenue as Finisar alone. Founded September 2000 as a subsidiary of **Hitachi** (HIT) and subsequently spun-out of its fiber optic components business, the Eatontown, New Jersey, company, populated with former denizens of Bell Labs, designs and fabricates DFB lasers that emit in both the 1310 nm and 1550 nm transmission windows, with additional work ongoing in long-wavelength VCSELs, in high-performance avalanche photodiodes (central to the receive function), and in short-cavity DBRs.

At the core of virtually all-optical transmission in telecom networks, DFB semiconductor laser technology is an expertise that Finisar has bypassed, choosing instead to manufacture its 1550-nm transceivers around source lasers supplied by Opnext or one of its competitors such as **Sumitomo**. On its own and in collaboration with Hitachi, Opnext has advanced its understanding of semiconductor materials to develop new lasers with higher speeds, wider temperature ranges, smaller sizes, lower power consumption, and greater reliability. For example, the company is working with aluminum to develop uncooled DFB lasers and to integrate an external modulator with the DFB laser on the same chip.

These are critical advances for the adoption of 10G by telecom service providers coping with crowded, hot central offices. To expand system capacity they must increase the number of ports and/or the data rate of those ports. This in turn is driving the need for smaller transceivers to cram into the same space. As the size of optical modules decreases, so does their ability to dissipate heat. Both the size and heat constraints are making it more and more difficult to squeeze costly and inefficient thermoelectric coolers into transceivers. In addition, some equipment is located outdoors where

transceiver modules need to operate reliably up to an operating case temperature of 85°C. Therefore, demand is growing for lower-power uncooled lasers with higher temperature tolerance and improved efficiency. This is a tall order, because within an optical module, the laser diode is the most sensitive component to high temperatures, which can quickly degrade performance.

In addition to marketing laser diodes and photodetectors, Opnext also designs and manufactures for sale transceiver subcomponents, called transmit and receive optical subassemblies, which combine the laser diode and photodetector (in separate packages) with the appropriate electronics either for controlling the laser and converting electrical signals into optical signals or for using the photodetector to convert optical signals back to electronic signals. Optical subassemblies are sold to components houses that don't want to build transceivers from scratch. Finally, Opnext combines its fundamental knowledge in laser physics and subassembly design to maximize performance of its own transceiver modules and tunable transponders, which it sells in virtually all of the standard sizes and interfaces for both telecom and datacom.

For Opnext, financial dawn appears to be brightening into morning. Sales started rebounding from the telecom bust during the September 2003 quarter and have increased quarterly since. During fiscal years 2004 – 2006 (ending March), revenue nearly doubled from \$79 million to \$152 million while net loss dropped by almost a two thirds from \$81 million to \$31 million. In the December 2006 quarter, the latest period reported by Opnext, revenue of \$62 million was up from \$39 million during the year-ago quarter, putting sales on track to ascend by half again to \$220 million during the current fiscal year, with net *income* of perhaps \$4 or \$5 million. Growth has been driven by demand for 10G and 40G products, which surged from 39 percent of revenue in fiscal 2004 to 79 percent during the nine months ended December and to 83 percent in the December quarter itself.

In absolute dollars, research and administrative expenses have held relatively steady over the past year. With gross margin in December having increased to 35 percent from 28 percent a year earlier and with operating margin already over 5 percent based on the first

dribbles of net income, it appears that management's goal of 40 percent gross margin and 15 percent operating margin will be easily achieved within the next two years if revenue continues to rise. And with \$84 million of domestic and \$304 million of foreign net operating losses, Opnext should escape the tax penalty for several years.

Following the February IPO, Hitachi and Clarity combined owned about two thirds of Opnext's outstanding common shares of 62 million. Since then, the stock has traded in the range of \$12 to \$20. During the next two fiscal years, if Opnext's revenue ascends at the same rate as the expected growth of its end markets or 30 percent per year, revenue of \$372 million during the year ending March 2009 would net \$56 million (assuming 15 percent operating margin) for earnings of 88 cents per share based on 64 million shares and a stock price in the range of \$18 to \$22 if the ratio to earnings reaches the low to mid-20s. An upside closer to the recent 50 percent annual ascent would push earnings to \$1.16 during the same timeframe for a stock price of \$29 at a ratio of 25 times earnings.

However, unless Opnext's end markets rise faster than expected, it will be hard for the company to maintain its current rate of ascent in the face of increasing competition at 10G from the likes of Optium and more notably Finisar, which along with Opnext claims the coveted prize of preferred vendor at Cisco. In December, Cisco accounted for 41 percent of revenue (\$25 million) and **Alcatel-Lucent** (ALU) (where Opnext is also a preferred supplier) for 20 percent. Finisar's sales are much less concentrated, with the top 10 customers supplying 59 percent of total revenue with Cisco likely just under a fifth or around \$20 million during the most recent quarter. With Finisar just beginning to qualify its 10G products at Cisco, its upside potential there is almost certainly greater than Opnext's.

But like Finisar, Opnext possesses crucial optical technologies and agendas, has proven to be well run and farsighted, and has a reasonable shot at doubling its market cap by the end of the decade. Therefore, we add Opnext to our list of ascendant Telecom companies this month.

– *Charlie Burger, with George Gilder*
May 8, 2007

Got Questions?

Visit our subscriber-only discussion forum, the Telecom Lounge, with George Gilder and Nick Tredennick, on www.gildertech.com

GILDER TECHNOLOGY REPORT

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