

EQUITY RESEARCH COVERAGE

HARRIS & HARRIS GROUP: COMPELLING VALUE IN NANOTECH

[NASDAQ: TINY \$3.57]

Research^{2.0}

Boston | New York | Paris

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HIGHLIGHTS

- The past year was eventful for Harris & Harris Group (H&H), with the company experiencing five liquidity events and completing four new equity investments and four venture debt deals. **The increased level of activity at H&H comes at a time when nanotechnology is entering a new phase of evolution – one that promises a significant acceleration in nano-enabled product commercialization activity and wealth creation.**
- **2011 was a year of nano-enabled breakthroughs and H&H portfolio companies were at the forefront of several of them.** Last year witnessed the first U.S. commercial passenger flight powered by biofuel (Solazyme), the sale of the first quantum computer (D-Wave Systems), the introduction of powerful LED arrays (Bridgelux), and the promise of new vaccines and therapies to battle cancer and other life-threatening diseases (BioVex). **We see 2011 as a prelude of much bigger things to come in small technology.**
- Two H&H portfolio companies – Solazyme (SZYM) and NeoPhotonics (NPTN) – completed successful IPOs last year while two others were acquired – BioVex by Amgen and Innovalight by DuPont. **These liquidity events showcase the capabilities of H&H's investment process to identify promising nanotech companies that can generate significant value over time.**
- Studying H&H's current portfolio, **we see prospects for additional liquidity events in the months ahead.** Late-stage portfolio companies Bridgelux and Metabolon – both profiled last year in previously published Research 2.0 reports on H&H – appear to us as likely candidates for public offerings within the next 12-18 months. **Other mid- and early-stage portfolio companies are attractive acquisition candidates.**
- In this report, we take a closer look at two of the four new H&H portfolio companies: HzO and Senova Systems. **HzO is pioneering a nanocoatings technology for electronic devices and other applications. There is a large, untapped market opportunity for HzO to offer consumers protection for their electronics against water and moisture damage.** ZAGG is an investor in the company and its marketing prowess and established presence in the consumer electronics market makes for a potent partnership with HzO. **Senova Systems is bringing an innovative, nano-enabled technology for measuring pH to the market that has the ability to be very disruptive.**
- **Nanotechnology is flying below many investors' radar screens presently.** We can see this in the way H&H's stock is trading currently, which is at a discount to the latest reported NAV of \$4.38. From our vantage point, having done research in nanotechnology for over a decade, **the years just ahead look far more promising in terms of investment opportunities and expected returns in nanotechnology than at any time during the previous ten years.**
- Our fundamental analysis of H&H portfolio companies suggests that the company is currently understating the intrinsic value of its portfolio by at least 50%. Historically, the stock has traded at a premium of 2x NAV. **We estimate H&H's intrinsic value at around \$12 per share, which is a significant premium to where the shares are trading today. Our analysis suggests there is compelling value in TINY today. For investors seeking exposure to nanotechnology, H&H represents a unique and compelling investment opportunity.**

“The problems of chemistry and biology can be greatly helped if... doing things on an atomic level is ultimately developed – a development which I think cannot be avoided.”

–Richard P. Feynman, 1959

Exponential growth is one of the defining characteristics of how technology evolves. Technology is inherently an accelerating process. Whereas in the past it took several decades or centuries for technology to progress, today we experience major transformations in just a few years’ time. When analyzing nanotechnology and investment opportunities associated with it, we believe it is very important to keep this fact in mind, especially given how most humans perceive change.

Humans are prone to view change as advancing in a linear progression. Things tomorrow are expected to be pretty much like they are today. This sets up an intriguing dynamic for investing in technology. The mismatch between how technology evolves and how humans perceive change lays the foundation for surprise. To those not following the evolution of technology closely, it can seem as if a game-changing technology seemingly came out of nowhere. In truth, the dynamics powering the technology have been building and growing exponentially over time.

The accelerating pace of discovery and innovation often leads to the emergence of converging areas of knowledge, capability, and investment. Nanotechnology is a prime example of this dynamic. It arose from the confluence of discoveries in physics, chemistry, biology, and engineering around the year 2000, although Caltech physicist Richard P. Feynman laid the foundation for thinking about nanotechnology and its potential at the end of the 1950s.¹

The U.S. National Nanotechnology Initiative (NNI) was launched in the year 2000 to promote the development and commercialization of nanotechnology in the United States. The crea-

tion of the NNI in the U.S., in turn, inspired sustained R&D programs in the field in many countries around the world, including China, Korea, Japan, Taiwan and members of the European Community. Between 2001 and 2004, over 60 countries established nanotechnology R&D programs at a national level. A new wave of R&D investments emerged in 2006, led by Russia, Brazil, India and several countries in the Middle East.

The commitment to nanotechnology in the U.S. has been significant over the past decade. Cumulative funding for the NNI since 2000 amounts to more than \$12 billion, placing the NNI second only to the space program in terms of civilian science and technology investment. Billions of additional dollars has flowed into nanotechnology through the private and public capital markets, while many established companies have made significant investments in nanotechnology during the past decade, including General Electric, DuPont, IBM, Intel, Lockheed Martin, L’Oreal Group, Samsung, and Canon.

The intense R&D phase witnessed over the past decade has laid the foundation for a new phase of evolution in nanotechnology – one that is not well understood or appreciated by many investors today. What lies ahead is a period of significant breakthroughs driven by advances in nanotechnology and acceleration in the pace of nano-enabled product commercialization. In the decade ahead, nanotechnology will be viewed as a General Purpose Technology (GPT), akin to other GPTs such as electricity and the Internet, and emerge as one of the key – if not *the* key – drivers of innovation and wealth creation in the global economy. By 2020, we expect mass use of nanotechnology with the final end market value of nano-enabled products worldwide rising exponentially to some \$3 trillion from an estimated \$300 billion-plus today.

Many nanotechnology breakthroughs have begun to impact the marketplace in important ways already, and many more are expected in the years ahead. In the past year alone, we’ve seen the first U.S. commercial passenger flight powered by nano-enabled jet biofuel, the sale of the

¹ See Richard P. Feynman, [“There is Plenty of Room at the Bottom: An Invitation to Enter a New Field of Physics.”](#)

first nano-enabled quantum computer, the introduction of powerful nano-enabled LED arrays, and the promise of new nano-enabled drugs to battle cancer and other life-threatening diseases. Several H&H portfolio companies have been at the forefront of the nanotech breakthroughs observed over the past year. The company's fortunes are tied closely to the accelerating pace of nano-enabled product commercialization. We see 2011 as a prelude of much bigger things to come in small technology.

NANO LIQUIDITY

Over the past decade, H&H has become one of the world's premier investors in nanotechnology. The company saw a terrific opportunity to specialize in investing in nanotechnology as the 21st century began, and since that time has built a diversified portfolio of companies developing and commercializing innovative, nano-enabled products in three key segments: Cleantech, Healthcare and Electronics.

Last year was an eventful year for H&H, with the company experiencing five liquidity events. These events were especially noteworthy, as the company had gone the prior seven years without any such events.²

One of the big liquidity events for H&H in 2011 was Solazyme's initial public offering and listing on the NASDAQ, which occurred in late May. H&H was the first institutional investor in Solazyme back in 2004. The company raised \$227 million at \$18 per share with the offering. We view Solazyme's IPO as a nanotech milestone, heralding the beginning of a new era of nanotech innovation driven by advances in synthetic nanobiology.

We have been monitoring developments closely at Solazyme since its public offering, as H&H continues to hold 2.3 million shares of the company's common stock. Given H&H's current holdings, large swings in Solazyme's market capitalization can have a meaningful impact on the company's NAV. Solazyme's shares traded up sharply following the IPO and hit a high of \$27.47 before plunging to below \$8 in a general market selloff during the summer. As the chart below shows, Solazyme has been a relatively strong performer among its peer group, although the shares are still trading considerably below the IPO price.

Solazyme's revenues have been driven primarily by various research contracts to date, but the company is ramping up commercialization efforts for its tailored algae-derived oils. Over the past six months, the company has made several announcements that are indicative of an acceleration of commercial activity, including:

• Four new agreements with various partners that will provide for enough feedstock to meet 90% of the company's 2015 tailored oil manufacturing capacity target.

• Plans to develop a 100,000 Metric Ton³ renewable oil production plant with Bunge with a target completion date in 2013.

- An agreement to the terms of a contingent multi-year supply agreement with Unilever that would involve the purchase of commercial quantities of Solazyme's renewable oils for nutritionals.
- The manufacturing facility for Solazyme Roquette Nutritionals that will be producing 3,500 Metric Tons of *Whole*



² The last liquidity event for H&H prior to 2011 was NeuroMetrix's IPO in 2004.

³ For reference, one Metric Ton is equivalent to 6.9 barrels or 290.3 gallons.

Algalin Flour at Roquette's commercial production plant in Lestrem, France.

- Expanded retail distribution for its *Algenist* personal skin care products, which now has a global retail presence in over 1,000 locations including Sephora, Space NK, QVC, and The Shopping Channel.

In addition to these announcements, United Airlines conducted the first commercial passenger flight in the U.S. (Flight #1403 from Houston to Chicago) using Solazyme's *Solajet* biofuel. Additionally, the company signed a non-binding letter of intent with United Airlines to supply 70,000 Metric Tons (around 20 million gallons) per year of renewable jet fuel starting in 2014.

The aforementioned announcements make it clear that Solazyme's nano-enabled products are in demand. The company is in the early stages of building out capacity to meet current and future demand. Solazyme executed at a high level in 2011, and sustaining an elevated level of execution will be key going forward as the company continues to build out new and existing partnerships and expand production capacity. The commercialization opportunity for Solazyme is large, with the company's target markets exceeding \$1.5 trillion.

Looking ahead, we do not expect to see significant growth in Solazyme's top line until 2013 when a lot more capacity is in place and operational. Based on management's current assessment, it will take several more years for the company to build out manufacturing capacity. As noted above, the company expects to have a 100,000 Metric Ton facility with Bunge operational sometime in 2013. That facility is expected to be able to generate \$250 million of revenue when operating at full capacity. Solazyme expects to reach its manufacturing capacity target of 500,000 Metric Tons by 2015, at which point the company will be capable of generating one billion dollars-plus of revenue, assuming average prices in excess of \$2,000 per Metric Ton.

Our valuation model for Solazyme assumes the company will hit its capacity targets in the years

ahead. The model assumes gross margins decline to 30% by 2015 and the company is able to hit its operating margin target of 25%. The company is well capitalized with around \$250 million in cash, cash equivalents and marketable securities. Based on our projections for revenues and margins, we estimate Solazyme's IV at \$20 per share in 2012.

Given the company's innovative technology, solid management team and business model, and its strategic positioning in its target markets, we see considerable scope for value creation in the future. Execution will be key. Our valuation model assumes the management team continues executing at a high level as the company builds out capacity. Barring some kind of unexpected meltdown in financial markets, we expect Solazyme to be a positive contributor to H&H's NAV in the year ahead as the stock climbs back toward our IV estimate of \$20 per share.

NeoPhotonics was another significant liquidity event for H&H in 2011. The company is a pioneer in optical communications – an industry with substantial growth prospects as networks around the world transition to high speeds and the provision of greater bandwidth. NeoPhotonics completed an IPO in early February, having raised \$82.5 million in the offering.

Following its successful public offering, the company ran into some major headwinds that caught management and market participants by surprise. Since the IPO, sales of Neo's core products have come in below management expectations and the company has had to deal with disruptions in its supply chain associated with unforeseen, catastrophic natural events. The first was the major earthquake and tsunami in Japan, which was followed several months later by severe flooding in Thailand. The disruptions to NeoPhotonics supply chain are temporary, and we expect activity to normalize going forward.

In retrospect, one could say that the timing on NeoPhotonics' IPO was not ideal given Mother Nature's plans. The company's market capitalization has declined significantly since the IPO, and the stock has been among the weakest per-

formers over that time relative to its peer group (see chart below).

There is no question it has been a difficult period for NeoPhotonics since its IPO. However, we think it would be unwise to extrapolate the past couple of quarters into the future. Optical networking has emerged as a key technology to support the increasing need for bandwidth capacity around the world. This is due fundamentally to the technology's inherent ability to efficiently carry large amounts of data at low cost per bit.

Internet traffic is a key driver of demand for optoelectronics, and it is doubling approximately every two years. Service providers are responding to this traffic growth by seeking scalable, low-cost, bandwidth-enabling solutions. Consider Verizon's launch of a 100-gigabit middle-mile network in Washington D.C. last year and recent announcement of upgrades to metro networks in at least seven U.S. cities as indicative of the longer trend that will drive growth in optical communications equipment.

NeoPhotonics is in the process of doubling capacity for production of narrow linewidth tunable lasers. These particularly tunable lasers are key components for coherent transport in telecommunications systems, which are rapidly emerging as a dominant architecture for 40 and 100 Gbps networks.

It is still early days for Neo's core PIC-based products. The roadmap for optoelectronics shows PIC technology becoming more important to support optical data transmission in the years ahead, not less. Indeed, PIC technology is a key element in the scaling up of silicon-based semiconductor technologies to meet future communications demands associated with the growth of the Internet worldwide.

Last October, NeoPhotonics completed an acquisition of privately held, Fremont, California-based Santur Corporation. The acquisition looks attractive to us. Santur is a leading designer and manufacturer of Indium Phosphide (InP)-based photonic integrated circuit (PIC) products. Santur's technology includes established telecom designs offering elegant approaches to wide tunability as well as high-speed transceivers. Santur products are designed to provide reduced size, power consumption and cost for a wide

range of networking applications in broadband networks. Santur provides Neo with a complementary PIC product that enhances its position in the market.

Neo's strategy is to combine Santur's active InP PICs with its hybrid PICS to provide customers with new products for 100G coherent systems that feature higher levels of integration,

higher performance and greater functionality. Santur will provide a modest boost to Neo's top line in the near term as the company generated \$21 mm in revenue in the first half of 2011 (versus \$105.4 mm for Neo). Although NeoPhotonics does not provide information on margins for its products, we believe the margins on Santur's InP PICs will have a positive effect on the combined enterprise going forward as production scales up.

One other important factor in the outlook for NeoPhotonics is the company's relationship with Huawei Technologies. Over the past decade, NeoPhotonics has supported the expansion of Huawei Technologies, which has become a force in the ever-expanding wireless sector. The Chinese networking and telecommunications equipment provider was one of NeoPhotonics' earliest customers and today has become the company's largest customer.

In the past couple of years, Huawei has moved from a secondary position in wireless technology



markets to top-tier status. It is a leader in 3G-infrastructure technology and an early mover in the emerging LTE technology sector. Huawei currently supplies equipment to 36 of the world's top 50 mobile operators. Last year, NeoPhotonics received the prestigious Golden-Award as an Excellent Core Partner from Huawei. The Golden Award is given only to companies that consistently deliver the highest performance and quality products to Huawei. While NeoPhotonics seeks to expand its customer base globally, we expect Huawei to continue to be an important customer for NeoPhotonics in the months ahead.

The headwinds for NeoPhotonics over the past year have been quite strong and have had a negative impact on the company's financial performance, not to mention H&H's NAV. That said, the longer-term outlook for NeoPhotonics appears much brighter than what the company experienced in 2011 and what the market is currently discounting. Communications networks around the world will continue to migrate to greater speeds and functionality. NeoPhotonics PIC-based products provide customers with the ability to achieve the increased performance required to migrate their networks from 10Gbps to 100Gbps.

As a longtime investor in NeoPhotonics, H&H is familiar with the company, its technology, the competitive landscape and trends in the industry. We expect H&H will continue to hold shares in NPTN for the time being in anticipation of an improvement in valuation. Our valuation analysis of Neo suggests that the company is currently trading well below its intrinsic value (IV). Our valuation model, which takes account of Neo's acquisition of Santur, puts the company's IV around \$9/share. We note that if Neo is able to execute at a higher level with Santur and drive margins beyond our projections, there is the potential for even greater share price appreciation.

The Solazyme and NeoPhotonics liquidity events, along with the other two liquidity events experienced in 2011 — Amgen's acquisition of BioVex and DuPont's acquisition of Innovalight — showcase the capabilities of H&H's invest-

ment process to identify promising nanotech companies with the ability to produce breakthrough products that have the potential to create significant wealth over time. Some recent developments associated with H&H portfolio companies are highlighted in the exhibit on the next page.

As mentioned early, H&H made four new investments in 2011. One of the new investments is HzO, a company that is pioneering novel nanocoatings for consumer electronics and other applications, while another was in Senova Systems, a company developing a nano-enabled pH sensor that has the potential to be highly disruptive in the marketplace. Below we take a closer look at HzO and provide an overview of Senova Systems.

HZO: NANOCOATINGS FOR ELECTRONICS AND BEYOND

As far as technology demonstrations go, this one was captivating and magical. A preview for next year's CES technology conference in Las Vegas showed off a new nanotech coating for electronic devices from Salt Lake City, Utah-based HzO, Inc. Paul Clayson, HzO's CEO, submerged a perfectly functioning smartphone into a bowl of water. There were no sparks as the smartphone sank toward the bottom of the bowl immersed in water. He then proceeded to place a call to the smartphone. Lo and behold, it rang!

The demonstration was a resounding success. It provided a glimpse of a significant and potentially rewarding market opportunity for HzO and its backers and partners, which includes Harris & Harris Group and publicly traded ZAGG, Inc. (NASDAQ: ZAGG). It also led to multiple media reports and videos showing the demonstration, which were distributed worldwide.

Water is the leading cause of lost function in electronics. Each year, there are millions of mobile phones, and many other electronics devices, reportedly damaged by water. It seems we consumers are prone to dropping our beloved smartphones and other gadgets in the pool, lake, ocean, and regrettably, even in the toilet. Many mobile phones have found their way into the

SELECTED H&H PORTFOLIO COMPANY DEVELOPMENTS

CLEANTECH

Bridgelux/Late Stage: Was named to Forbes' list of America's Most Promising Companies. The company was ranked 58th on the list of 100 privately held companies selected from 22 industries for their innovative business models and strong management teams. Forbes noted that Bridgelux's revenue grew 168% from 2008 to 2010.

Cobalt/Mid Stage: Appointed Bob Mayer as chairman of its Board of Directors and CEO. Mr. Mayer has over 30 years of experience in the chemicals and biotech sectors and will lead the company as it focuses on developing commercial facilities globally.

Contour Energy Systems/Mid Stage: Won the second annual 2011 Los Angeles Business Journal Patrick Soon-Shiong Innovation Award. The annual award acknowledges organizations and executives in southern California who foster economic competitiveness with proven leadership in innovation.

Solazyme (SZYM): Provided fuel for the first biofuel-powered U.S. commercial passenger flight: United Airlines Flight #1403 from Houston to Chicago. Also, the company signed a Letter of Intent with United Airlines to supply up to 20 million gallons per year of renewable jet fuel beginning in 2014. Additionally, Solazyme Roquette Nutritionals announced that the company would begin producing its microalgae-derived food ingredient, *Whole Algalin Flour*, at Roquette's commercial production plant in Lestrem, France, this year.

ELECTRONICS/SEMICONDUCTORS

D-Wave Systems/Mid Stage: Lockheed Martin installed D-Wave's quantum computer at the University of Southern California's Information Sciences Institute. This represents the first commercial installation in history of a quantum computer. Additionally, D-Wave's Geordie Rose was named Canadian Innovator of the year for 2011.

Molecular Imprints/Late Stage: Was awarded a contract to provide advanced lithography equipment and wafer patterning services in support of the Global 450mm Consortium (G450c) Initiative.

The purchase includes a multi-year wafer patterning services contract and the option for additional 450mm nanoimprint systems.

NeoPhotonics (NPTN): Received the prestigious Golden Award as an Excellent Core Partner from Huawei Technologies, one of the world's leading providers of telecommunications network solutions.

SiOnyx /Mid Stage: Was awarded a \$3 million Department of Defense contract to help develop next-generation laser targeting systems.

HEALTHCARE

Metabolon/Late Stage: Announced they received laboratory accreditation from the College of American Pathologists (CAP). The CAP Laboratory Accreditation Program is the premier globally recognized program for laboratory accreditation and the only one of its kind that utilizes practicing laboratory professionals as inspectors.

washing machine having not been removed from a pant or shirt pocket while some devices have found their way into the family dog's water bowl. Additionally, inadvertent damage occurs to electronic devices from rain, humidity, sweat and accidental spills.

HzOs sees a large, untapped market opportunity to offer consumers protection for their electronics against water and moisture damage. ZAGG's marketing prowess and established presence in the consumer market makes for a potent partnership in the space, which is discussed further below.

BACKGROUND AND MARKET OPPORTUNITY

Waterproofing has been used for outdoor and marine electronics for some time and also for military, aerospace, and automotive applications. In the past, waterproofing has traditionally been thought of as a high cost specialty option and thus hasn't found its way into the mass market. HzO has developed and is further refining a novel process that brings nanoscale coatings technology to the mass consumer electronics market. The company's nanotech coatings offer consumers a low-cost and reliable "WaterBlock" for their electronic devices.

The genesis of HzO's technology is with the Northeast Maritime Institute (NMI), an educational institution that trains ship's pilots. A tragic incident on the water that prevented an NMI student from communicating with his shipmates while overboard and cost him his life prompted the owner of NMI to hire an engineer to search for a solution. Sid Martin innovated a solution that included a molecular coatings technology that would allow electronic devices to continue working while submerged in water.⁴

The NMI technology got a significant boost in the summer of 2009 when ZAGG's CEO saw a TV news story on the NMI innovation and began discussions with NMI to commercialize the technology. That summer, ZAGG announced

that they had acquired a majority interest in the worldwide rights to the original NMI technology. For readers who are not familiar with ZAGG, the company is an on-line and retail marketing juggernaut that offers consumers a patented form of protection for electronic devices. ZAGG's flagship product is the invisibleSHIELD™ which guards electronic devices from scratches and nicks and is sold on-line and in retail stores like Best Buy, Target and many others. Over 7 million invisibleSHIELD™ products have been sold to date. ZAGG saw a compelling value proposition for ZAGG with the NMI technology as the company could combine the two technologies to provide consumers with a total solution for protecting their beloved consumer electronic devices – inside and out – without altering the functionality of either product.

After acquiring majority interest, ZAGG created HzO as a separate entity, assigned the NMI technology to the new company and asked Scott Gordon to head the effort to move the technology to market. In November, 2010, ZAGG completed its initial deal with NMI. Paul Clayton was introduced to ZAGG through professional connections. Paul had just sold his previous industrial products company that offered industrial slurry nano-coatings to OEM customers in the automotive OEM and aftermarket, aerospace, gas and oil and medical industries. Paul had just transitioned the company to new leadership when ZAGG approached him about their new technology.

After obtaining outside, third-party testing validation of the original NMI technology, Paul joined forces with ZAGG to raise outside capital to fund the autonomous operations of HzO and signed on as CEO to guide the operations of the newly launched venture. Harris and Harris led the Series B round (Series A was the original ZAGG investment to acquire the NMI technology) which closed in mid-August last year. Paul's background was uniquely suited to lead the company. Not only did he have direct experience with nano-coatings and development of OEM business models, but also with corporate investment and finance as well as in government. His experience will no doubt help

⁴ Mr. Martin and the technology were featured on NBC's *Today*. You can view the segment here: <http://www.msnbc.msn.com/id/21134540/vp/25947052/#25947052>

guide possible HzO introductions to private business and military and government opportunities like first responder needs for communications equipment that cannot be damaged by water.

While HzO is an autonomous business and its focus on integrating WaterBlock technology at the OEM level is very different from the direct consumer focus at ZAGG, we see the ZAGG-HzO combination as a win-win. The partnership allows ZAGG to leverage its well-established global consumer marketing platform, corporate relationships and on-line marketing capabilities to create consumer demand for HzO technology, thus enabling HzO to ramp up its business with OEMs faster and more efficiently.

HzO's technology is arriving on the market at a time when consumers are seeking additional protection for their devices. We often hear how people are addicted to their electronic gadgets. However, addiction does not appear to accurately capture consumer's relationships with smartphones, iPads and the like. Researchers are discovering that users of advanced mobile computing devices such as Apple's iPhone are not addicted to them – they are *in love* with them.⁵

Protection for a loved one becomes an interesting value proposition during a time of rising penetration for smartphones and tablets. Especially when the love interest is expensive. Apple has sold over 250 million iOS devices and Google reports that more than 200 million Android devices have been activated around the world. All signs point to rising penetration for these products in the U.S. and overseas in the months and years ahead. However, these smartphones are sold at a price point often three to four times higher than their cellphone ancestors.

⁵ Author and researcher Martin Lindstrom has done tests using functional magnetic resonance imaging (fMRI) and found that people don't demonstrate the classic brain-based signs of addiction of their iPhones. Instead, they *love* their iPhones. See *New York Times* Op Ed: <http://www.nytimes.com/2011/10/01/opinion/you-love-your-iphone-literally.html>.

Device failure – particularly from events like water damage that are not covered under any warranty – results in additional unplanned budget expenditures for consumers. In addition, the more critical and personal data a consumer stores on a device, the higher the frustration if data is lost from device damage. As the love affair with their electronic gadgets continues to grow worldwide, HzO sees a golden opportunity today to provide consumers protection from future water damage, thus reducing consumer cost and frustration.

The market opportunity for HzO in consumer electronics is large and global in scope. As stated earlier, consumer electronics is an untapped market. Every year, over one million phones are damaged by water. One million consumers significantly understates the potential market opportunity for HzO's nanotechnology since there are likely tens of millions of users, if not over a hundred million, that would be favorably disposed to paying several dollars more for an electronic device that offers protection against water and moisture damage. A social media survey conducted by HzO showed that 82% of respondents have already experienced water damage to an electronic device and over 80% of respondents would pay up to \$99 extra for a smart phone already costing over \$600 to protect the device from water damage.

In addition, HzO's nanocoatings can be applied to almost any surface to provide protection against water, weather, and corrosion thereby expanding the scope of its total market opportunity. HzO's technology repels oils, synthetic fluids, many hazardous materials, dust and dirt. The company sees applications in a wide variety of industries including textiles, transportation, clean energy and basic industry. We believe there is a multi-billion dollar market opportunity for HzO to capture significant market share over the next 3-5 years as it penetrates the consumer electronics market and expands into other attractive markets.

TECHNOLOGY AND BUSINESS MODEL

HzO deposits its novel coatings formulation using proprietary vacuum application methods. HzO has scaled their application process

through development of high volume, cost efficient application equipment. The coating technology has exceptional water repellence and anti-corrosion properties. For competitive reasons, the company is reluctant to reveal the chemistry underlying the technology. We know that the coating is transparent and can be applied via vacuum deposition equipment to a variety of surfaces including plastic, metal, paper and glass. HzO's unique vapor coating method works on finished manufactured products as well as products in production; however, HzO is not pursuing the aftermarket application business. Electronic components inside a device using HzO's method are coated to provide protection from water and moisture even when immersed.

We know that through HzO's proprietary innovations, they have created a system that coats electronics rapidly with very low labor involved. We know that the HzO formula does not use highly toxic source materials and that source materials are in plentiful supply to accommodate applications to millions of devices daily. We know that the HzO technology does not require specialized surface preparation before application.

A core piece of HzO's initial business model is establishing relationships with major global consumer electronics manufacturers. On December 23, 2011, Li Ka-Shing's Horizon Ventures announced a \$3 mm investment in HzO. Horizon Ventures will assist the company with making introductions to all of the major Asian handset manufacturers. HzO is currently in OEM discussions with major consumer electronics manufacturers around the world. We presume any future OEM agreements will include a standard licensing fee and unit royalties for the use of HzO's technology. There is limited visibility right now on HzO's OEM strategy, but we expect more information to be forthcoming in the near future.

We also expect the company to pursue multiple market segments across the spectrum of other applications in the months ahead. For the time being, the focus is on consumer electronics.

COMPETITION AND RISKS

Waterproofing for electronics has been around for some time and used in military, aerospace, medical and automotive applications. That said, it has been traditionally thought of as a high-cost specialty option and more of a geek technology rather than mass consumer technology. Nano-Tex made a splash in the consumer market several years ago with its nanocoatings technology for apparel and home furnishings. The company was an early pioneer in repellent and stain protection for clothing and recently announced a new wrinkle free technology that provides a high level of wrinkle resistance while preserving fabric strength and integrity. Over the years, Nano-Tex has partnered with established consumer apparel and home furnishing brands such as Adidas, Perry Ellis, and JC Penney.

Traditional coatings approaches to waterproofing – silicones, epoxies, acrylics etc. – are heat, UV or moisture cured after spraying or dipping. These processes often involve significant solvent evolution with associated environmental issues. They are also prone to “shadowing” and do not penetrate underneath components readily. HzO's well-designed vapor system addresses all these deficiencies and can achieve the same or better result.

There are a host of companies in the U.S. and overseas that provide waterproofing technology for various applications. Many of these companies, such as SCS in the U.S. and P2i in the United Kingdom, have historically been focused on military applications, or applications outside of mass consumer electronics, and use vastly different chemistry compositions than HzO. Another company in the nanotech space that is emerging and could be viewed as a direct competitor to HzO is Ross Nanotechnology.

Ross Nanotechnology has developed a technology called “NeverWet™” that is a “super hydrophobic” spray-on coating that can be applied to clothing and many other things, including electronic devices. The “NeverWet™” coating repels water and heavy oils with the in-

tent to stop water from reaching the electronics inside a device.⁶ This method is a new process that enhances mechanical sealing methods such as plugs, gaskets, etc.

While impressive, we view HzO nanocoatings technology as superior for consumer electronics since it can be applied to the internal circuitry of the device and thus offer inside as well as outside protection. From what we can tell, HzO also appears to be further down the commercialization path than Ross Nanotechnology. That said, the “NeverWet™” coating looks like it has potential in the market and is certainly a technology to keep an eye on in the future.

An overview of the competitive landscape for nanocoatings technology indicates that HzO has a potential first mover advantage that could help establish a key position in the market for consumer electronic devices. Execution, as always, is paramount. One of the major challenges we see for HzO in the months ahead is the company’s ability to secure relationships with OEMs and then scale up to meet a potentially large and rapidly growing demand in the global consumer electronics market. HzO is still working on establishing relationships with OEMs and has not yet demonstrated an ability to be able to work with and serve large consumer electronics manufacturers.

Another potential risk we see is associated with retail pricing. If OEM’s choose to price water-blocked devices at price points that consumers find too high, it could slow broad adoption of HzO technology. HzO will need to work with ZAGG on identifying price points that stimulate consumer demand and are profitable and sustainable. We expect ZAGG’s experience and presence in the marketplace to be invaluable to HzO and lower the company’s overall execution risk profile.

⁶ For a demonstration of the NeverWet™ technology, see: http://www.youtube.com/watch?feature=player_embedded&v=7is6r6zXFDc

HzO SUMMARY

HzO is an early-stage company that has a terrific opportunity to bring its innovative nanocoatings technology to the mass consumer marketplace. The technology works brilliantly on electronic devices and has the potential to fulfill an unmet need in that space. There is also an opportunity for HzO to expand into other high volume markets in the future as the business scales up. The year ahead promises to be a busy one for HzO as the company establishes OEM relationships with consumer electronics manufacturers and begins to ramp up production. We will be monitoring developments closely in the months ahead with an eye toward building a valuation model and assessing HzO’s intrinsic value.

SENOVA SYSTEMS: DISRUPTION AHEAD

Senova Systems is a new addition to the H&H portfolio that falls within the healthcare segment along with two other H&H portfolio companies, Ancora and Enumeral. The company is based in Sunnyvale, CA and led by Lee Leonard, an accomplished CEO of several start-up biotechnology firms. Senova is working to commercialize a nano-enabled technology for measuring pH. Senova possesses an exclusive license to the pH sensing technology invented by Richard G. Compton and Gregory G. Wildgoose at Oxford University, both of whom currently are on the company’s Scientific Advisory Board.

It may not be widely appreciated by the average consumer, but the measurement of pH is a critical control parameter in virtually every process industry in the world today, including food and beverages, water and waste treatment, petrochemicals and pharmaceuticals. pH is a measure of the acidity or basicity of an aqueous solution. If you own a pool, you are no doubt familiar with measuring the pH of the water. The measurement of pH is important in medicine, agriculture, biology, chemistry, civil engineering, environmental science, forestry, food science, oceanography, and many other applications.

The existing market for pH measuring equipment worldwide is estimated at nearly one billion dollars. The current technology used to

measure pH is over seventy years old and based on early 20th-century vacuum tube amplifier technology that is cumbersome to calibrate and requires a college degree to operate. Senova is seeking to bring pH measurement into the 21st century with their proprietary digital sensor technology. The company's pH sensing technology is simple to deploy and operate, and has the capability of being very disruptive in existing markets as well as enabling a host of new applications in a variety of markets and industries. The latter is no doubt an exciting prospect for Senova's management team and investors. The company seeks initially to target opportunities in the life sciences, which are low hanging fruit, and then expand into other markets.

From the analysis we have done thus far, there is no shortage of business opportunities for Senova and its pH sensing technology in the foreseeable future. It is a market that seems ripe for disruption. We expect commercial activity to ramp up and accelerate in the months ahead and will be monitoring Senova's progress closely.

OUTLOOK AND INVESTMENT SUMMARY

The past year was eventful for H&H with five liquidity events, four new equity investments and four new venture debt deals. Additionally, several portfolio companies achieved significant product milestones and breakthroughs. Looking at the company's current portfolio, we see prospects for additional liquidity events in the months ahead. Late-stage portfolio companies Bridgelux and Metabolon – both profiled last year in previously published Research 2.0 reports on H&H – appear to us as likely candidates for public offerings within the next 12-18 months.⁷

H&H has twelve portfolio companies currently classified as mid-stage investments that are progressing and could become candidates for acquisitions and/or IPOs down the road. These include Cobalt, Contour Energy Systems, AB-

⁷ See the Harris & Harris Group reports on the Research 2.0 website: <http://www.research2zero.com/sample-research.html>

SMaterials and Nanosys in the Cleantech sector, Mersana, Ensemble and Champions Oncology in Healthcare, and SiOnyx, D-Wave Systems, Nantero, Cambrios and Kovio in Electronics. Additionally, H&H has eight portfolio companies classified as early stage. Among the early stage investments are Laser Light Engines, Produced Water Absorbents and Ultera in Cleantech, Ancora, Enumeral and Senova Systems in Healthcare and Adesto and HzO in Electronics. These investments will continue to be nurtured by H&H as they migrate their businesses toward product commercialization.

H&H is mindful of the structural changes we are seeing in the public and private capital markets. The company is adapting their investment process accordingly. Changes in the public capital markets are increasing the time from investment to IPO to close to ten years. These changes are requiring companies to be more mature with greater revenue before filing an S-1. Also, once public, the major investors in deals today are hedge funds. Hedge funds typically have short holding periods relative to other investors. They are prone to chase momentum and focus on next quarter's earnings rather than intrinsic value over the longer term.

The main implication of these structural changes for H&H is that the company needs to be even more patient as an investor. Increased patience requires the company to make sure it has ample capital in reserve for later rounds of investment. It also needs to have strategies for portfolio companies that permit them to control their fate at an earlier stage by finding some route to revenue generation. H&H will also have to factor in periods of heightened volatility in stock prices associated with portfolio companies that go public, as we are seeing today with its investments in Solazyme and NeoPhotonics.

On the upside, H&H's permanent capital gives the company an advantage to be patient and, with respect to portfolio companies that are publicly traded, take advantage of the increased volatility in public markets. Additionally, venture debt deals help H&H offset the long time frames associated with venture investing by providing shorter, more consistent returns on a

portion of the company's invested capital. Investing in venture debt deals also helps offset expenses as well.

Regarding structural changes in private capital markets, one of the most important is the contraction now underway in the venture capital industry. Many VCs are at the end of their fund life and have not been successful raising additional capital. Additionally, many VCs no longer have capital for investments that need additional capital and have not yet had a liquidity event.

To adapt, H&H is concentrating on doing more deals with high net worth individuals and family offices as well as the most successful VCs that have staying power. The company is also seeking to invest along with investors of a similar size to help ensure the economic incentives are similar for all participants involved in a deal. Additionally, H&H is focusing its efforts on a smaller number of deals, and in deals in which it will own a greater percentage of the company. This will help drive expected investment returns higher by giving H&H a larger amount of the overall pie if the deal is successful.

Though structural changes in public and private capital markets have made things more challenging, the current investment environment is attractive for those with capital. H&H has additional funds to put to work and the company will be searching for management teams and investors that can think outside the classic venture capital investment model. H&H will be looking for opportunities where, with a small amount of invested capital, the company can begin to control its own future. The company is seeking investment situations where nanotechnology-driven innovations provide an option value on a

large market opportunity, akin to Metabolon in molecular diagnostics and Produced Water Absorbents in hydraulic fracturing. H&H is also looking for managements and investors that share this same vision.

Our on-going analysis of nanotechnology suggests it is flying below many investors' radar screens presently. We can see this in the way H&H's stock is trading currently, which is at a discount to the latest reported NAV of \$4.38. We've been researching nanotechnology for over a decade. From our vantage point, the years ahead look far more promising in terms of investment opportunities and expected returns in nanotechnology than at any time during the previous ten years.

Our fundamental analysis of H&H portfolio companies suggests that the company is currently understating the intrinsic value of its portfolio by at least 50%. Historically, the stock has traded at a premium of 2x NAV. We estimate H&H's intrinsic value at around \$12 per share, which is a significant premium to where the shares are trading today. Our analysis suggests there is compelling value in TINY today.

Nobel-laureate Richard P. Feynman is no longer with us, but he correctly foresaw that nanotechnology would become a driving force of technological change in the 21st century. Although recent advances in nanotechnology have been stunning, the truth is we are still in the early stages of evolution. Major nanotech breakthroughs and innovations lie ahead. For investors seeking exposure to nanotechnology today, H&H represents a unique and compelling investment opportunity.

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