Zacks Small-Cap Research

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Hamilton Thorne Ltd. (V.HTL -TSXV)

V.HTL: Initiating Coverage

With a discount rate of 9%, a terminal growth rate of 1.5% and 79 million fully diluted shares, our DCF model values Hamilton Thorne at $45 million or $0.57 /share.

Current Price	$0.23
Valuation	**$0.57**

OUTLOOK

Hamilton Thorne (TSX: HTL.V) is headquartered in Beverly, MA. The company designs and develops laser devices and image analysis systems for assisted reproduction as well as for research applications in developmental biology.

The company's quality control and production facilities are ISO certified and FDA registered GMP facilities. The firm has sales coverage through distributors in several global regions including Africa, Asia, Europe, the Middle East, the Americas and Oceania.

Based on the firm's financial and operational progress in the past two years, we believe there has been significant de-risking. We believe the shares trade cheaper than fair value.

SUMMARY DATA

52-Week High	**0.48**
52-Week Low	**0.17**
One-Year Return (%)	**N/A**
Beta	**1.5**
Average Daily Volume (sh)	**99,800**
Shares Outstanding (mil)	**70**
Market Capitalization ($mil)	**16**
Short Interest Ratio (days)	**N/A**
Institutional Ownership (%)	**19.4**
Insider Ownership (%)	**47.7**
Annual Cash Dividend	**N/A**
Dividend Yield (%)	**N/A**
5-Yr. Historical Growth Rates	
Sales (%)	**N/A**
Earnings Per Share (%)	**N/A**
Dividend (%)	**N/A**
P/E using TTM EPS	**N/A**
P/E using 2015 Estimate	**N/A**
P/E using 2016 Estimate	**N/A**
Zacks Rank	**N/A**

Risk Level	**N/A**
Type of Stock	**Large-Growth**
Industry	**Medical Equipment**

ZACKS ESTIMATES

Revenue
(in millions of $)

	Q1 (Mar)	Q2 (Jun)	Q3 (Sep)	Q4 (Dec)	Year (Dec)
2015	$2.1A	$2.23A	$2.07A	$2.63A	$9.03A
2016	$2.25E	$2.33E	$2.6E	$2.67E	$9.85E
2017					$10.73E
2018					$11.7E

Price/Sales Ratio (Industry = 2.5x)

	Q1 (Mar)	Q2 (Jun)	Q3 (Sep)	Q4 (Dec)	Year (Dec)
2015	$0.002A	$0.005A	$0.003A	$0.01A	$0.02A
2016	$0.003E	$0.01E	$0.005E	$0.01E	$0.02E
2017					$0.02E
2018					$0.02E

Zacks Projected EPS Growth Rate - Next 5 Years % **N/A**

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SNAPSHOT



- Hamilton Thorne (TSX: HTL.V), headquartered in Beverly, MA designs and develops laser devices and image analysis systems for assisted reproduction and developmental biology research applications.

- Currently, the company develops miniature lasers that attach to standard inverted microscopes for use in scientific applications and in vitro fertilization (IVF) procedures. The firm has five lasers that have been introduced: the legacy systems are the ZILOS-tk® and XYClone® while the newer systems are the XYRCOS® and LYKOS® as well as the Stiletto®. Hamilton Thorne's devices are used in fertility clinics for performing IVF procedures as well as in microsurgical procedures with stem cells and living cells in research laboratories.

- The company's image analysis systems are used to improve outcomes in human IVF clinics and in animal breeding facilities and provide high-end toxicology analyses. Hamilton Thorne also sells consumables, software and services.

- Hamilton Thorne's growing worldwide customer base consists of pharmaceutical companies, biotechnology companies, fertility clinics, university research centers, animal breeding companies, and other commercial and academic research establishments, including Harvard, MIT, Yale, McGill, Oxford, Cambridge, the Smithsonian Institution, Charles River Labs, Covance, ABS Global, Sexing Technologies, Merck, Novartis, Pfizer, and Dow Chemical.

- The company sells its products directly and through distributors to customers in the human fertility and animal breeding sectors worldwide.

- Traditionally, the firm has generated increasing revenues from a diversified offering of products to address the wider umbrella under Assisted Reproductive Technologies (ART). The ART market's growth is supported by strong demographic drivers such as increasing maternal age of first pregnancy and increasing wealth in emerging markets.

- Hamilton Thorne is planning to grow the company via a combination of product innovation, selective acquisitions of complimentary products and strategic execution.

- The firm's portfolio benefits from both product (multiple products) and geographic (more than sixty countries in developed and emerging markets) diversification.

- The company generated roughly $9 million in revenue and more than $1 million positive cash flow from operations in 2015.

- In April 2015, the Company purchased the Oosight® product line from Perkin Elmer. The Oosight system allows the user to visualize and quantify structures within an unfertilized egg that are not visible with conventional microscopy. The acquisition was accretive to earnings in 2015.

- With ~$4.3 million cash on hand and expectations of continued positive cash flow, HTL.V is well poised to accelerate its acquisition program in the near term.

INVESTMENT THESIS

Hamilton Thorne (TSX: HTL.V) is headquartered in Beverly, MA. The company designs and develops laser devices and image analysis systems for assisted reproduction as well as for research applications in developmental biology.

Hamilton Thorne's marketed products are comprised of miniaturized lasers that attach to standard microscopes and are used for research, animal breeding and human clinical markets as well as image analysis systems, which are used in animal and human fertility, toxicology testing, breeding and research markets. Hamilton Thorne markets state-of-the-art innovative products for all phases of assisted reproductive procedures including fertility related testing, sperm and egg analysis and laser-assisted fertility procedures. The company's devices are used in in-vitro fertilization (IVF) clinics for performing microsurgical procedures on embryos prior to implantation. In animal breeding, Hamilton's products are used in sperm analysis for food production and for research with endangered species and other animals. In the developmental biology research market, Hamilton Thorne's laser systems are used in stem cell derivation, regenerative medical research and genetic engineering of animal models.

The devices are approved for sale in Europe (and other territories accepting CE Mark), the U.S., China, Canada as well as a number of other markets. The company's quality control and production facilities are ISO certified and FDA registered GMP facilities. The firm has sales coverage through distributors in several global regions including Africa, Asia, Europe, the Middle East, the Americas and Oceania.

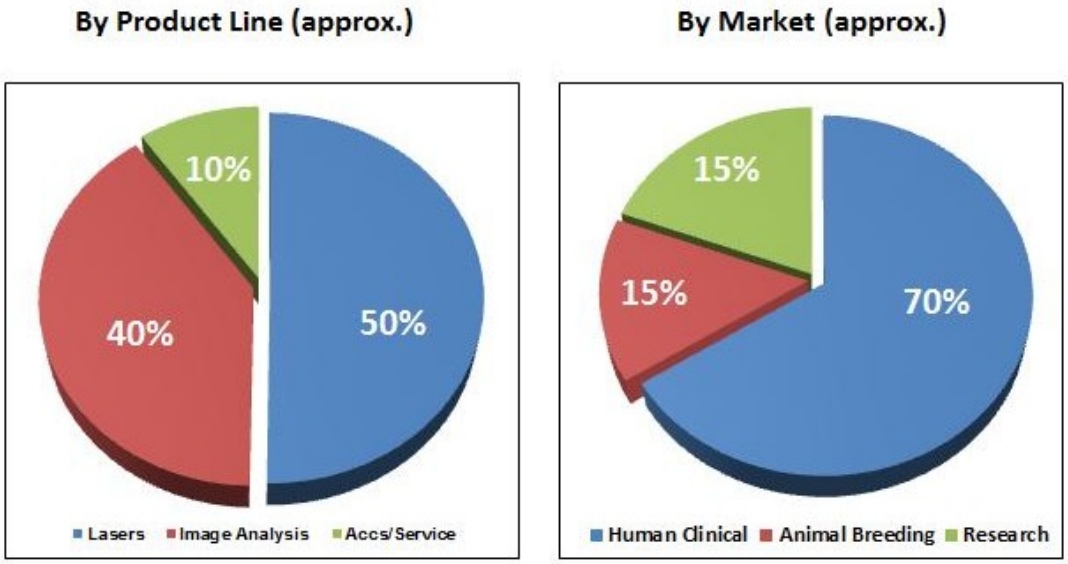
Hamilton Thorne, albeit being a small company, has shown organic revenue growth over the last few years and arrived at what appears may be a formula for long-term success. The key to their success has been the strategy to address assisted fertility procedures, which paralleled the need for such treatments due to low fertility rates and an increase in maternal age for the first pregnancy, especially in developed countries. Hamilton Thorne is a rare bird in the small cap category since it is cash flow positive. The company has demonstrated successful execution of its growth strategy and their focus continues to be in generating positive EBITDA, positive cash flow and net profit for fiscal 2016 and beyond. Management has proven the ability to generate free cash flow by controlling capital expenditures and utilizing cash resources intelligently to benefit shareholders. Going forward the company plans to expand via acquisitions which we believe will help keep R&D costs tempered and which we think will continue to result in positive cash flow generation.

For the current year (2016) and beyond, management expects an increase in R&D spend as a result of plans to invest resources in enhancing products and developing proprietary consumables. In addition, the company expects to increase sales and incentivize their distributors to build market share for their products. Further, management expects to continue to be involved in other business development activities including strategic acquisitions, all of which will result in an increase in sales and marketing expenses. Based on the firm's financial and operational progress in the past two years, we believe there has been significant de-risking. We believe the shares trade cheaper than fair value and are initiating coverage of Hamilton Thorne with a price target of $0.50/share.

INTRODUCTION

Since 2012, Hamilton Thorne has been operating in two healthcare sectors: fertility care and cellular and developmental biology research with products such as precision laser devices and advanced image analysis systems.

In general, the laser systems used in fertility and cellular biology studies are large and expensive. Hamilton Thorne's laser systems are miniaturized so that the unit fits into existing microscopes, provides high image resolution, offers improved working distance as well as controllable micromanipulation procedures. This design provides practical benefit to the medical community. Hamilton Thorne's laser systems accounts for approximately 50% of revenues, image analysis accounts for 40% and consumables and services account for the remaining 10%. While the firm does not break out revenues for all of its products, about 70% of the company's business involves human clinical procedures while animal breeding and biology research represent 15% each.



(Source: http://www.hamiltonthorne.com)

We believe that the firm possesses multiple compelling characteristics that make it an attractive investment including:

- Diversified products, good product recognition, high quality
- Steady revenue stream
- Diversified global distribution of products
- Well-positioned for growth in U.S and global markets
- Attractive growth profile

Further, the company collaborates with well-known research establishments/clinics all over the world where physicians, lab personnel and embryologists are given the opportunity to use the products distributed by Hamilton Thorne. Feedback from these leading institutions helps the company enhance their products and in adapting their treatments to current research findings and advancements. Management has mentioned in the past that clinical research establishments and other companies have shown interest in their products, which we believe represents a significant growth opportunity over the long-term.

Hamilton Thorne is well positioned to sell IVF laser technology along with its automated sperm analyzer because it is sold to the same customer base with a corresponding price range with an equivalent level of technical complexity. Its recently acquired Oosight technology complements

well with Hamilton Thorne's other products. Management has extensive experience with regulatory authorities to handle the compliance for medical devices and industrial scale manufacturing at their ISO 13485 and FDA registered GMP manufacturing facility.

MARKETED PRODUCTS

LASER SYSTEMS

Hamilton Thorne's miniature laser systems help in performing robotic microsurgery on cells. In ART procedures, manipulation of stem cells/embryos using lasers has advanced in the past decade. Lasers are routinely used in assisted hatching and their use in embryo biopsy procedures is becoming more prevalent. In order to provide consistency, reproducibility and reliability, lasers are incorporated into microscopes to facilitate the application of rapid laser pulse firing, thereby allowing precise manipulation of embryos and cells. The power and pulse lengths of these infrared lasers are optimized to avoid damage to the DNA and the embryo as well as minimize mechanical strain. These user-friendly lasers help in reducing procedure times, which in turn reduces the duration the embryo/cells are exposed to non-ambient conditions. In addition to the utility in ART procedures, this laser technology is also used in life sciences research applications such as laser ablation for cell regeneration studies as well as cloning for genetic research and regenerative medicine.

The FDA classifies lasers for IVF as Class II medical devices. As per Occupational Safety & Health Administration (OSHA) safety standards, lasers used in IVF procedures are classified as a Class 1 laser product[1]. The company's objective lenses with laser sources can be screwed into the turret of most standard inverted or upright microscopes.

Clinical Lasers



LYKOS Laser



ZILOS-tk Laser

(Source: http://www.hamiltonthorne.com/)

Clinical Lasers; The LYKOS and ZILOS-tk Class 1 lasers feature a 1460 nm, 300 mW laser and a pulse length as low as 1 microsecond. The LYKOS laser provides high image quality, improved working distance, multi-pulse software that allows rapid and repeated firing mode for fast and easy biopsy, and is compatible with all major microscope models with no laser alignment required. The laser beam is not transmitted through the eyepiece thus making it safe for the eyes. The brightness of the Red-i LED indicator spot found in the LYKOS is adjustable and visible through the microscope's eyepiece. It can be installed on any inverted microscope. This model offers the flexibility of hands-free laser firing.

[1] https://www.osha.gov/dts/osta/otm/otm_iii/otm_iii_6.html

Research Lasers



XYRCOS Laser



XYClone Laser



Stiletto Laser

(Source: http://www.hamiltonthorne.com/)

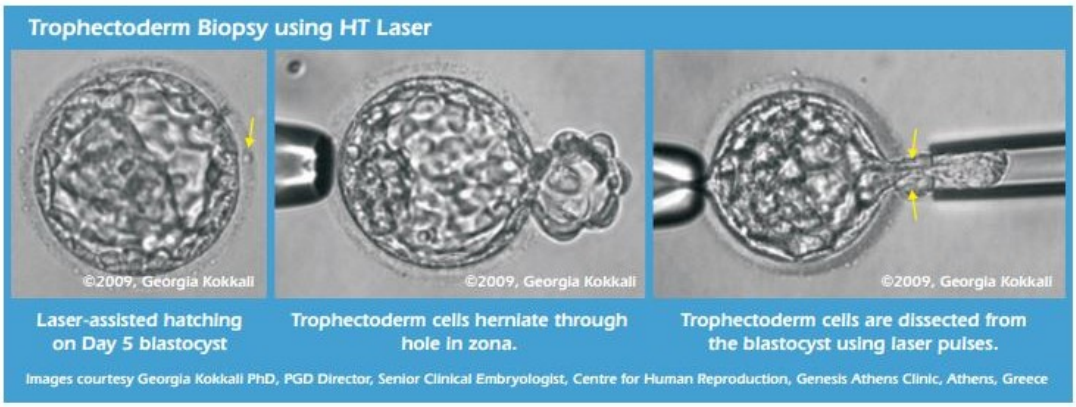
Research Lasers: The firm offers the legacy system, XYClone and the newer XYRCOS laser systems for research applications. Both these systems are a high power, Class 1, 1460 nm infrared lasers with a specially designed 40x or 20x objective lens that functions in both visible and near infrared wavelengths. The lasers attach to the microscope just like any typical objective lens and allow the use of the microscope's standard features, such as fluorescence and Hoffman imaging. These systems are used for non-contact ablation of targeted membranes or structures.

The XYRCOS laser module comes with a RED-i target locator that is integrated into the objective lens. The patented Stiletto laser combines a proprietary laser, controller software and an automated stage for rapidly scoring of adherent stem cells. Unlike mechanical separation methods, the Stiletto allows isolation of multiple stem cell colonies for ablation in a streamlined fashion. Such non-contact laser-based elimination preserves the genetic integrity of the stem cell colony while removing unwanted cells. Such a system gives an opportunity for researchers to standardize a protocol easily so that the procedure is automated and the results are uniform across all users.

Clinical Laser Applications

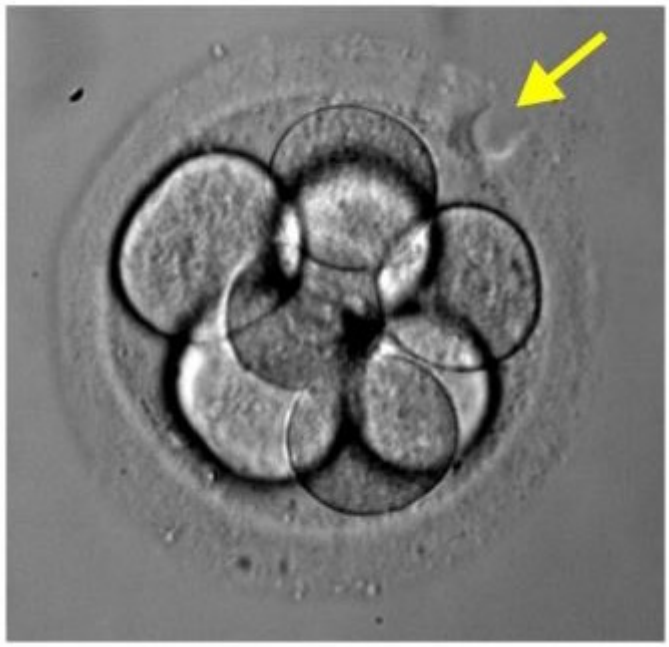
- ***Blastomere Biopsy (embryo biopsy)*** is a technique that is performed during an IVF procedure to obtain embryonic DNA for preimplantation genetic diagnosis (PGD). On the third day of an embryo's development, a single cell (blastomere) is removed and the developing embryo is then returned to the incubator for continued development.

- ***Trophectoderm Biopsy*** is an alternative method of embryo biopsy that is gaining rapid adoption, where the trophectoderm cells (extra-embryonic tissue) are removed. This method does not affect the inner cell mass, has less impact on the embryo and more cells can be obtained for analysis for improved detection. The LYKOS laser aids the trophectoderm biopsy procedure by breaching the outer layer of the embryo and dissecting these cells using the laser so that the cells may be quickly removed for biopsy, which limits the amount of time the embryo, spends outside the incubator.



(Source: www.hamiltonthorne.com)

- ***Laser-assisted Hatching (LAH):*** Assisted hatching is used to help the embryo hatch from its protective outer shell, and promote implantation in the uterine wall after embryo transfer. LAH with the LYKOS or ZILOS-tk uses a highly focused infrared laser beam to remove the outer shell in precise increments. LAH requires less handling of the embryo and is quicker than mechanical or chemical methods. Therefore, the embryo spends less time outside the incubator.



(Source: www.hamiltonthorne.com/)

Research Laser Applications

- *Transgenic Animal Production:* In the conventional procedure to produce a transgenic mouse, which lasts approximately nine months, gene targeted embryonic stems cells are injected into blastocyst of a mouse embryo. Breeding of the resulting chimeric mouse results in the transmission of the mutation required to obtain mutant mice for phenotypic studies. In the laser-assisted procedure, embryonic stem cells are injected beneath the outer shell of an early stage embryo. The resulting mice are entirely derived from the

injected embryonic stem cells. These mice can be phenotyped directly, which saves roughly six months of preparation time when compared with the conventional procedure.

- In blastomere and trophectoderm biopsy, the laser assists in the removal of targeted cells for genetic testing. The human embryonic stem cell lines serve as an important model of the genetic disorders that they carry. Laser-assisted isolation of the inner cell mass may be applied for the derivation of new stem cell lines in a xeno-free system for future clinical applications.

- The laser system speeds up the process of enucleation to a matter of seconds, without eliciting damage to the egg. In addition to facilitating the removal of nuclear material via aspiration, the laser has been used to deactivate the DNA in zebrafish eggs. The laser system ablates cellular structures for developmental biology studies on organisms such as zebrafish, C. elegans, planaria, and slipper snails.

- Laser-assisted IVF may be performed to increase breeding efficiency of laboratory animals. By opening the outer shell of oocytes with the laser, increased levels of fertilization can be realized with certain inbred mouse strains or with poor quality sperm.

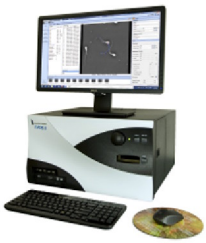
IMAGING SYSTEMS

The company also develops advanced image analysis systems, such as the Computer Aided Sperm Analysis (CASA) system and Oosight imaging system.

The CASA system measures sperm motility, concentration and motion characteristics, performs real-time morphometrics on live, motile images and records and saves video for later use. These systems provide image-based quantitative and objective analysis of the sperm to meet the needs of IVF clinics, toxicology testing and stem cell and regenerative medical research. Currently, the most popular method for evaluating sperm motility is using CASA.

The company's Oosight system allows the user to visualize and quantify structures within an unfertilized egg that are not visible with conventional microscopy.

CASA Systems



IVOS II



CEROS II



TOX IVOS II

(Source: http://www.hamiltonthorne.com/)

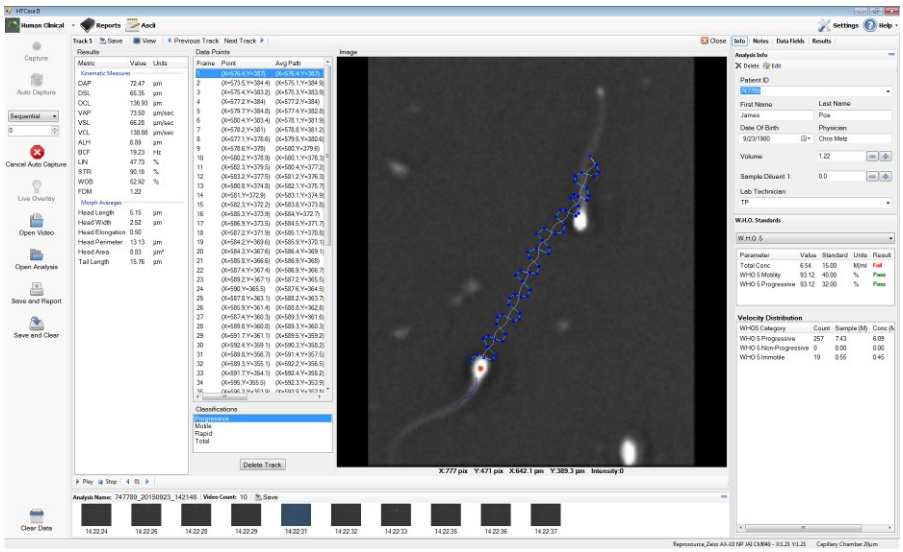
The CASA systems are comprised of an optical component and a computer installed with sperm motion analysis software. The CASA software has the capability to track cell motility, determine counts as well as analyze a cell's kinematics/functionality in a manner that is adequate for routine

clinical applications. Analysis results include sperm counts, concentration, motility, progressive motility, curvilinear velocity (VCL), straight line velocity (VSL), average path velocity (VAP), linearity (LIN), straightness (STR), amplitude of lateral head displacement (ALH) and beat cross frequency (BCF).

The Integrated Visual Optical System (IVOS) integrates the optical system within the unit, thus eliminating the need for an external microscope. The CEROS Sperm Analyzer uses an external negative phase contrast microscope for image visualization. The newer IVOS II platform features a streamlined, ergonomic design, high resolution digital camera, new software interface and enhanced mechanical performance. The CEROS II platform also features a high resolution digital camera and new software interface. The systems utilize phase contrast optics, an imaging frequency of sixty images per second as well as several user-adjustable settings to control more aspects of cell detection and static/non-progressive/progressive sperm motility differentiation.

Unlike microscopes with continuous fluorescent light, the IVOS has stroboscopic light source; this is beneficial when utilizing the IDENT fluorescent option, which allows motile sperm analysis under fluorescent illumination without adverse effect on sperm motility. With the VIADENT option, the IVOS permits the analysis of motility and viability on a live sample by combining analysis under phase contrast and fluorescent illumination sources. The TOX IVOS II system for sperm analysis has been validated in reproductive toxicology labs and is configured specifically for analyzing the intricacies of rat sperm.

The Dimensions II Strict morphology (human only), HT Morph (multi-species) and DNA Frag software are options available for either CASA II platform. The IDENT and VIADENT options require additional hardware and are available on the IVOS platform only.



(Source: http://www.hamiltonthorne.com/)

The ART process involves harvesting sperm and eggs, using in-vitro fertilization procedures to create viable embryos, monitoring embryo development, testing for genetic disease and transferring best quality embryos with the goal of achieving a successful pregnancy. The Oosight® imaging system is used to help determine which harvested oocytes are at a high risk for producing embryos with abnormal chromosomes. This method is noninvasive, quantitative and reproducible and determines whether oocytes undergoing cryopreservation have abnormal structural integrity and are viable.

An additional tool is the CIVA™ imaging software which captures images and video from any connected microscopic workstation in the laboratory.

Imaging Applications

- ***IMSI (Intracytoplasmic Morphologically Selected Sperm Injection)***

Couples who struggle with compromised sperm parameters may undergo a treatment called intracytoplasmic sperm injection (ICSI). More recently, a new technique called intracytoplasmic morphologically selected sperm injection (IMSI), wherein a morphologically better quality, normal sperm is selected under high magnification to be used in the ICSI. This treatment is believed to have the potential to improve reproductive outcomes among couples undergoing an ART procedure. The IMSI-Strict software combines the motile sperm organelle morphology examination (MSOME) and Kruger strict criteria (for analyzing sperm morphology) in one analysis.

- ***Sperm Analysis***
  - ***Fertility Testing:*** The CASA system is used to measure sperm concentration, total sperm count, percent motility, percent progressive motility and morphology.
  - ***Reproductive Toxicology:*** The TOX IVOS II system is used to study male reproductive toxicology in rat models and the CEROS II system is used in fish models.
  - ***Animal Breeding:*** The animal breeding market is comprised of breeding boar for food, equine, wildlife, as well as companion animal breeding.
  - ***Biological Research:*** Sperm analyzers are used in a variety of medical and veterinary research applications.

INTELLECTUAL PROPERTY

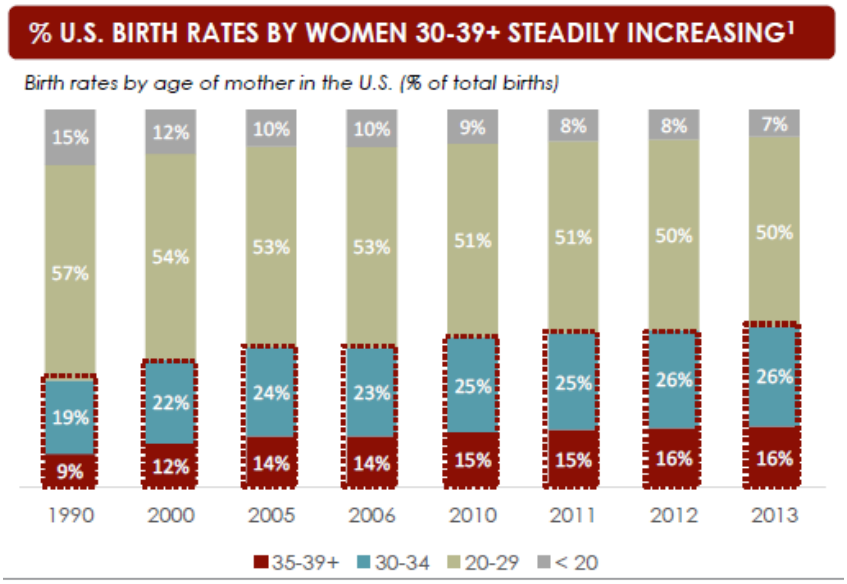
The table below shows the patent details for Hamilton Thorne's products. The firm has been issued six U.S. patents. There are several other patents, issued and pending in different parts of the globe. The commercial window for the products begin to expire from 2026 in the U.S.

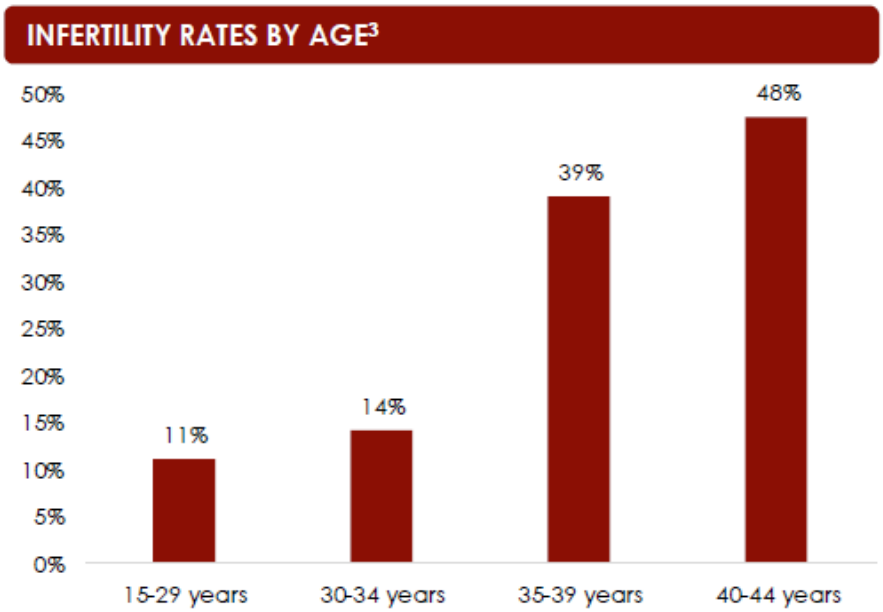
COUNTRY	REFERENCE#	TYPEFILED	SERIAL#	ISSUED	PATENT#	STATUS
MICROSCOPE TURRET MOUNTED LASER EPI-ILLUMINATION PORT (ZLite)						
UNITED STATES	251305/051	FCA 10/15/2002	10/271,708	4/15/2008	7,358,116	ISSUED
METHOD FOR CALCULATING AND DISPLAYING THE ISOTHERMAL CONTOURS PRODUCED BY A LASER (Isotherm Ring)						
UNITED STATES	251305/TBA	DIV 6/5/2003	10/635,672	7/4/2006	7,072,377	ISSUED
LASER ASSEMBLY FOR USE WITH A MICROSCOPE (Multi Wavelength Assembly)						
UNITED STATES	251305/064	CIP 6/15/2007	11/764,064	5/10/2016	9,395,532	ISSUING
DEVICE AND METHOD OF MAINTAINING SPERM MOTILITY IN A CAPILLARY-LOADED CHAMBER (Proprietary Slide)						
UNITED STATES	251305/071	CON 12/8/2008	12/330,228	10/5/2010	7,807,452	ISSUED
MODULAR OBJECTIVE ASSEMBLY (LYKOS)						
UNITED STATES	251305/074	FCA 11/8/2009	12/615,036	4/16/2013	8,422,128	ISSUED
CANADA	251305/082	DCA 11/8/2009	2742847	PUBLISHED		
CHINA	251305/084	DCA 11/8/2009	200980154055.5	9/24/2014	ZL200980154055.5	ISSUED
GERMANY	251305/080	DCA 11/8/2009	09752847.9	2/1/2013	2370848	ISSUED
FRANCE	251305/069	DCA 11/8/2009	09752847.9	2/1/2013	2370848	ISSUED
UNITED KINGDOM	251305/081	DCA 11/8/2009	09752847.9	2/1/2013	2370848	ISSUED
JAPAN	251305/089	DCA 11/8/2009	2011-535729	5/30/2014	5591179	ISSUED
OPTICAL INDICATOR FOR MICROSCOPIC LASER BEAM MANIPULATION (RED-I)						
UNITED STATES	251305/072	FCA 6/8/2009	12/481,383	4/3/2012	8,148,604	ISSUED
JAPAN	251305/079	DCA 6/10/2009	2011-513852	1/24/2014	5481539	ISSUED
CHINA	251305/090	DCA 6/10/2009	200980131210.1	3/12/2014	ZL200980131210.1	ISSUED
EUROPEAN PATENT	251305/077	DCA 6/10/2009	09763498.4	PUBLISHED		
APPARATUS AND METHOD FOR LIVING CELL MANIPULATION (Stiletto)						
UNITED STATES	251305/076	FCA 6/13/2011	13/158,843	5/26/2015	9,040,272	ISSUED
GERMANY	251305/088	DCA 6/13/2011	112011101987.1	PUBLISHED		
UNITED KINGDOM	251305/099	DCA 6/13/2011	1300653.1	PUBLISHED		
JAPAN	251305/097	DCA 6/13/2011	2013-515414	PUBLISHED		

(Source: http://www.hamiltonthorne.com/)

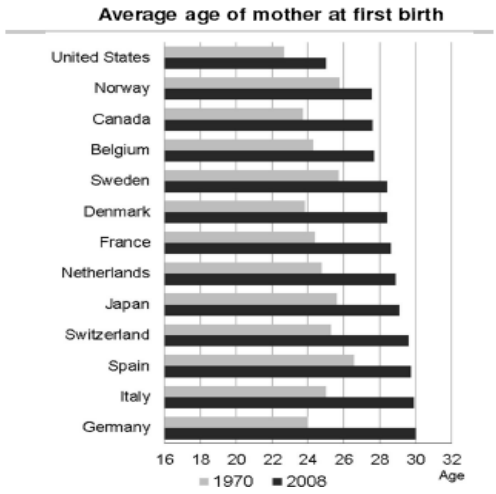
MARKET

Fertility Market: The average age when a woman bears her first child has risen over time. As per CDC, roughly 20% of women in the U.S. have their first child after thirty-five years of age. About one-third of couples where the woman is older than thirty-five years of age encounter issues related to conception. The delay associated with child bearing can be attributed to several factors including having greater emphasis on careers (in women more so than in men), financial feasibility and marrying later in life. Besides the aforementioned factors, lifestyle factors such as smoking, alcohol consumption, obesity and stress are known to affect conception and child-bearing capabilities.





(Source: Harris Williams & Co, Fertility Market Overview, 2015)



(Source: http://www.hamiltonthorne.com)

According to CDC, about 17% of women, married or otherwise, have trouble conceiving. The percentage of women, thirty years or older and who gave birth for the first time, increased from 5% in 1975 to 26% in 2010. Infertility seems to be positively correlated with age. The infertility rate increases to more than 35% for women aged thirty-five years and over.

In 2012, more than 480 ART specific fertility clinics were present in the U.S. IVF accounts for the majority of ART procedures. Current IVF treatments remain expensive (~$12,000) with relatively low success rates. Treatments over multiple cycles are often required to achieve a successful pregnancy. On average, the probability of having one or more children through an IVF procedure is ~30%. The increase in awareness of ART procedures as well as its acceptance socially has led to more couples seeking ART procedures.

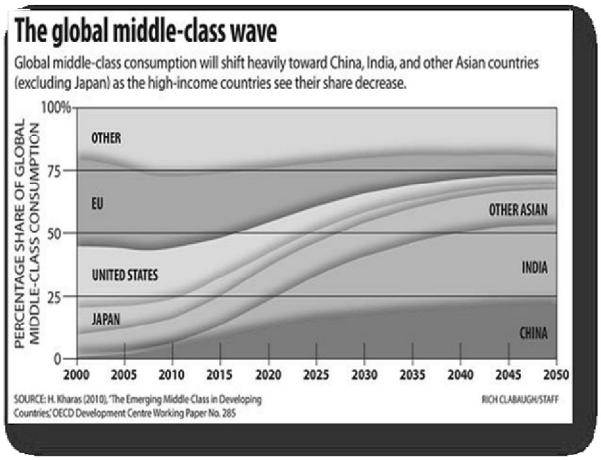
The CDC estimates that ART accounts for more than 1% of total U.S. births. At the same time, an increasing number of same-sex parents driven by greater social acceptance and improved legal rights are expanding the population for donor sperm and other fertility services. It is estimated that up to 6 million children in the U.S. are parented by same-sex parents.

Europe and North America together account for roughly 80% of the total fertility market due to widespread awareness, adoption of new technologies and favorable legal structures. As per a report by Harris and William, the U.S. fertility market is valued at roughly $4 billion, of which ART is valued at approximately $2.5 billion. This sector is forecasted to grow at a CAGR of 4% for the next couple of years due to an increase in aging couples and infertility.

According to Market Research Store, a market research firm, the global IVF market is expected to grow at a CAGR of 7.0% from 2015 to 2021and approach north of $10 billion by 2021. Several factors are expected to drive market growth such as delaying of pregnancy by women due to professional and financial constraints, changing lifestyle, fertility disorders, among many others.

Globally, in developing economies, the fertility market is seeing a robust growth. Recent research has shown that growth in the Asian-Pacific belt has outpaced the growth in Western countries. This could be attributed to infertility arising from infections such as STDs as well as an increase in male infertility diagnoses in developing countries. Accelerating demand for IVF is expected in emerging markets as wealth and the size of the middle class grows. Further, the laws surrounding the fertility treatments in these regions are liberal, thus making these regions an attractive target for these services. Additionally, the growing awareness in reproductive health and increasing access to fertility treatment options are driving growth in this area.

As China's one-child policy was scrapped since January 1, 2016 fertility clinics got a boost in the number of clients attempting to use IVF procedures. Women who had only one child under the old policy and are over the age of 35 are using the opportunity to have more children through ART procedures. However, stringent regulations are enforced in the Chinese IVF market; gender selection is forbidden, birth licenses and marriage certificates are required, and advanced procedures are prohibited. The tight control by the Chinese government has resulted in the IVF business booming in Thailand, Vietnam, Australia and the U.S. as affluent Chinese couples are willing to travel abroad for such procedures. Therefore, the rising demand for fertility treatments by Chinese couples is good news for global IVF clinics. With ~60% of Hamilton Thorne's revenues coming in from ex-U.S. sales, the global presence helps the company capitalize on the growing demand of IVF procedures in emerging markets.



(Source: http://www.hamiltonthorne.com/)

Regenerative Medicine and Developmental Biology Research Market: Regenerative medicine is an arm of tissue engineering where cells are either regenerated, engineered or replaced in order to heal damaged tissues and organs. It offers hope for people who have conditions such as musculoskeletal, cardiovascular, neurological and orthopedic disorders that are beyond repair. Transparency Market Research values the annual regenerative medicine market at roughly $6.5 billion. Additionally, Hamilton Thorne's target market encompasses more than 25,000 research establishments involved in developmental biology and cancer research.

Animal Breeding Market: There is an unprecedented increase in the demand for animal products including meat, and dairy in the U.S. as well as in global regions. Technologies that improve large-scale production efficiency, the quality of breeds and profitability are drivers of the animal genetics market. Research and Markets estimates this sector to grow at a CAGR of ~8% from 2014 to 2020. Hamilton Thorne's sperm analysis systems used in animal breeding applications make up for roughly 15% of the firm's business and stands to gain from this expanding market.



(Source: http://www.hamiltonthorne.com)

COMPETITORS

The infertility market is rapidly evolving. Competition across various markets is variable depending on the local demand and cost factors. The major competitors who have already gained a foothold in the developed economies include CooperSurgical, VitroLife, Cook, and Irvine Scientific, among many others, all of whom have products in the IVF landscape. The big players have substantially greater financial resources as well as larger established marketing teams, sales channels, distribution networks and support services. For instance, Vitrolife had expanded its market share to approximately 15% by broadening their product portfolio and focusing on marketing efforts.

While we think the competition could prove challenging to Hamilton Thorne, we also believe that the company offers novel devices that provide competitive differentiation. The first 1.48µm, non-contact laser to receive the FDA approval for clinical use in assisted hatching was the ZILOS-tk in 2004, followed by the Octax Laser Shot™ (MTG) in 2006 and the Saturn Active Laser System (Research Instruments) in 2008. Although assisted hatching has not been studied comparing different laser systems, Hamilton Thorne's lasers offer some characteristics that might be advantageous to specific applications. For example, Research Instruments' lasers are compatible with selected microscopes while Hamilton Thorne's are compatible with all major brands of microscopes. Hamilton Thorne's line of laser systems have a built-in collimated red indicator beam that provides a focused red light that aids in firing the laser while looking through the microscope eyepiece. ZILOS-tk and LYKOS lasers indicate the safe zones surrounding the embryo using patented software displaying color-coded rings (Isotherm rings) for different temperatures around the perforation where the operation can be performed without causing any harm to the embryo. The Stiletto laser with controller software and an automated stage provides high speed scoring and separation of adherent cells in culture. The firm's CASA software runs on their proprietary IVOS and its CEROS hardware platforms and calculates cell counts, cell concentrations, tracks and analyzes cell motion and provides data specific to individual applications. The IVOS is the only CASA system that has an integrated optical system within the unit[2]. The IVOS sperm analyzer is equipped with an automated, built-in, heated stage for precise temperature control and sample positioning[3]. With a breakthrough technology backed by patents

[2] Pai's Textbook of Intrauterine Insemination, CH3
[3] Equine Reproduction, Angus O. McKinnon, Edward L. Squires, Wendy E. Vaala, Dickson D. Varner

and strong market demand, Hamilton Thorne should be able to grow their revenue in the coming years.

In the fragmented U.S. IVF market, M&A deals are active. In August 2015, Longitude Venture Partners and NovaQuest Pharma Opportunities Fund acquired California Cryobank Inc., which provides fertility, cellular therapy, and other fertility related services. In order to maintain a competitive advantage, Hamilton Thorne is constantly on the lookout for new outlets for growth in emerging markets and in overcoming the regional disparities in insurance coverage for such procedures.

Additionally, the company is also on the lookout for strategic investments in companies offering complementary products. The company recently (April 2015) completed a relatively small and simple deal in their first acquisition of Oosight product line from Perkin Elmer. This acquisition has been accretive to earnings for fiscal year 2015. The company is currently having active discussions and is likely to do acquisitions in complementary areas such as cell culturing, consumables, cryopreservation, diagnostics, image analysis and labware, which may be profitable and provide revenues in the $2-$5 million range[4].

Hamilton Thorne has adopted the route to effectively target market niches where IVF and research is still growing. The company's products hold defendable patents in several regions globally. As the firm continues to acquire and further expand its business in the U.S. and global regions there is a possibility of seeing new complementary products being added to their portfolio.

REIMBURSEMENT

In general, generous coverage from government or third party insurance reduces the out-of-pocket expense for couples seeking IVF procedures. Reimbursement coverage varies widely in global regions. Israel, the E.U., Latin America and Africa have expanded reimbursement rates as health awareness and access to infertility treatment has become more widespread. In some European countries, ART comes under a standard insurance-covered benefit, while in the U.S. it is affordable only by the affluent. Therefore, a general trend seen in European countries is that the utilization of ART procedures is twice that of the U.S. and probably could be attributed partly to insurance coverage.

In the U.S., several states have passed laws stating that insurance companies need to provide limited or comprehensive coverage for couples seeking infertility treatment. The states that have mandated insurance that covers at least one IVF cycle are Arkansas, Connecticut, Hawaii, Illinois, Maryland, Massachusetts, New Jersey, and Rhode Island. Despite the few states that have mandated insurance coverage for IVF, it is restrictive and is not available to everyone[5]. This is because of the discrepancies in the legislation between the states based on the definition of infertility, the type of insurance plans under each mandate, and the treatments that are covered. Studies have shown an increase in the number of couples who opted for infertility treatment in states that mandated insurance for IVF procedures. We believe that the availability of mandated comprehensive insurance coverage could drive changes in utilization of such services in the U.S. and other global regions. Having said that, reimbursement alone is insufficient to assess the opportunity in the fertility space. This is because these couples have a strong desire to have children and are willing to pay out-of-pocket.

John Wiley & Sons, Jul 5, 2011

[4] As per firm provided estimates

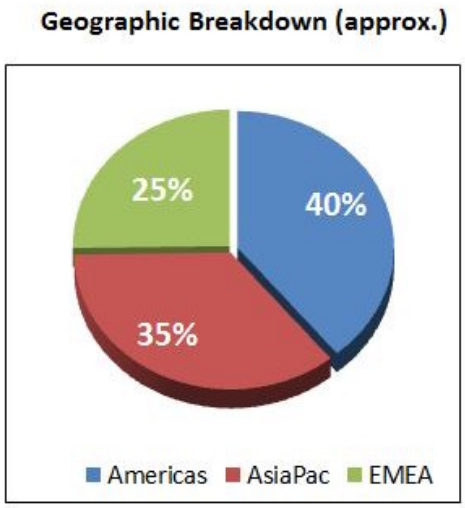
[5] Fertility and Sterility, Vol. 95, No. 3, March 1, 2011

FINANCIAL ANALYSIS

Hamilton Thorne has a cash balance of roughly $4.3M as of December 31, 2015 and has positive operating cash flow. Currently, the company has about $3.5 million in long-term debt with interest at an annual interest rate of 4%. The firm has raised financing using equity and debt to finance their acquisition strategy, accelerate product development, support working capital needs and in some instances to reduce existing debt.

Despite currency headwinds from a stronger U.S. dollar tempering growth, the firm's revenue increased by 4% to $9.03 million in 2015 as compared the prior year. The company's revenue stems from diversified geographic regions. Roughly 40% of the business is concentrated in North America, 35% in Asia/Pacific region and the remaining 25% in Europe, the Middle East and African countries. The company's reach into sixty countries is primarily through a network of distributors who are responsible for 80% of revenues. The remaining 20% comes from direct sale of new products and applications. Net income increased 20% to over $1 million in 2015. The company has shown solid revenue growth year-over-year since 2013 and has been profitable with an EPS $0.02 in 2015.
Hamilton Thorne's net income and cash flow will continue to benefit from over $26 million of income tax Net Operating Losses (NOL's) incurred during its development phase, reducing the Company's effective tax rate from 40% for the next several years.

Since the major portion of the firm's manufacturing expenses are related to final assembly and quality control (testing), CapEx, primarily capitalized development costs are estimated to amount to between $700,000 and $800,000 for 2016. We have modeled Hamilton Thorne's revenue to grow quickly based on historical trends and expected growth in IVF market[6]. In the past three years, for all quarters and for the full years 2013, 2014 and 2015 the company reported positive cash flows. We anticipate this trend to continue and expect Hamilton Thorne to generate positive net income going forward. We estimate that the cash balance of $4.3 million as of Q4 2015 is sufficient to fund its acquisition strategy and continue the company's operations as long as they are cash flow positive.



(Source: http://www.hamiltonthorne.com)

[6] See Valuation section for details

LEADERSHIP TEAM

David Wolf
Chief Executive Officer and President
David Wolf is a senior level executive with over 20 years of success in solving complex business issues and building shareholder value in both public and private companies. Previously, Mr. Wolf was a member of the founding management team of Elcom International, Inc. (NASDAQ), where he played a key role in growing the business to $800 million in revenues in four years and orchestrating Elcom's successful IPO. As President of Elcom Systems, he transformed an internal development organization into a full-fledged software development, marketing and services company that successfully implemented electronic commerce systems for companies around the world. Prior to Elcom, Mr. Wolf was Chief Operating Officer of JWP Information Services, a subsidiary of JWP Inc. (NYSE) where he built the operational infrastructure to support its growth from $250 million to $1.4 billion in sales , and President and COO of NEECO, Inc. (NASDAQ), a $250 million business IT distribution and services business purchased by JWP.

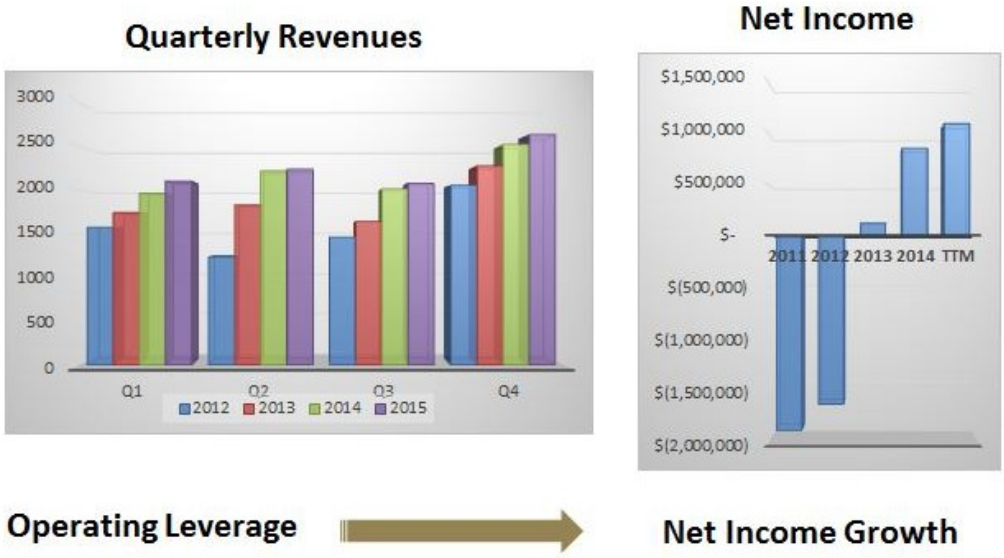
Diarmaid Douglas-Hamilton
Chief Technology Officer, Senior Vice President of Research & Development and Co-founder
Diarmaid Douglas-Hamilton was formerly Principal Scientist and Project Director at Avco Everett Laboratories, and Technical Director at Eaton Corp. He is a physicist with broad specialties in optics and lasers, holding multiple patents in assorted fields. Mr. Douglas-Hamilton has extensive experience in effectively managing large and small research and development projects.

Michael Bruns
Vice President of Finance and Chief Financial Officer
Michael Bruns brings over 25 years of financial management experience in mid-sized organizations, most recently serving as CFO of Dover Saddlery Inc. (NASDAQ: DOVR) where he played a key role in Dover's successful $27 million IPO in 2005. In his role as CFO of Hamilton Thorne, Mr. Bruns will be responsible for the Company's financial management and control functions, as well as providing strategic support in the business planning, and corporate development of the Company. Prior to joining Dover, Mr. Bruns served as Vice President of Finance for CPS Direct, a communications marketing company and was the Controller for Northeast Mobile Communications, a specialty retailer.

Keith F. Edwards
Senior Vice President and General Manager
Keith F. Edwards is responsible for operational excellence in the sales, marketing, production, HR and QA/RA functions. Recently he was President of Biocoat, Inc. where he managed sales growth of 117% over 5 years. Mr. Edwards's experience in the IVF and orthopedic medical device markets include successful product launches, go to market strategies for innovations and a consistent focus on sales channel development. He is also the management representative for regulatory affairs and the Hamilton Thorne Quality Management System.

Thomas Kenny
VP Engineering
Thomas Kenny is a New England leader in the engineering and electronic fields, with multiple important products to his credit, including the ZILOS-tk and XYClone. Mr. Kenny has been with the Company since its inception and is a central figure in Hamilton Thorne's technical capabilities. In addition to his development duties, Mr. Kenny speaks at product symposia around the world.

VALUATION/RECOMMENDATION



(Source: http://www.hamiltonthorne.com)

It is estimated that there are roughly 400 businesses involved in ART services (fertility clinics, donor banks, and reproductive endocrinologists) in the U.S. This is a ~$3 billion industry with 4% CAGR in the U.S. IVF and other interventional procedures fall under the higher end of the pricing spectrum. The 4% growth rate could be attributed to an expanding middle class that is postponing family planning due to an increased focus on careers. Market Research Reports expects the global IVF market to grow at a CAGR of about 12% and since ~ 60% of Hamilton Thorne's sales are from distributors in over 60 countries worldwide, we anticipate a greater than 4% growth in Hamilton Thorne's revenue. We also think sales of the firm's products could be bolstered by the rising prevalence of obesity, which could fuel future demand for fertility treatments.

Management expects that growth in the sales of clinical lasers will be positively influenced by the continued adoption of assistive reproductive procedures as well as by strong growth in emerging markets. Further, since the company has diversified its product offerings, there is a wider customer base. We think such a strategy has the added advantage of smoothing out revenues over time.

Hamilton Thorne plans to introduce new hardware and software to its CASA platform, which should help drive sales of its image analysis systems at a higher rate than its laser systems. The company also plans to market the recently acquired Oosight product. Hamilton Thorne uses both direct and distribution approach to sales. The company's sales to three major distributors account for roughly 10% of all revenues. Q4 2015 marked the twelfth straight quarter (since early 2013) of sequential revenue growth.

Currently Hamilton Thorne is operating in more than 60 countries. We like management's strategy, which is to diversify their current product range further so they can pursue expansion into new markets. Last year's (2015) addition of Oosight Imaging system was complementary to their laser offerings and could help in generating incremental sales by leveraging the firm's established, world-wide distribution channels. Considering IVF is a rapidly-growing area and that there is increased adoption of IVF procedures in emerging markets we think there is potential for Hamilton Thorne to grow its sales internationally.

Based on the aforementioned factors and growth trends, we forecast revenue of ~$10 million in fiscal 2016. We think this momentum could continue in the coming years and model revenue to double by 2020. The organic revenue growth thus far has resulted in gross margin widening to ~65% from 59% in 2012. Simultaneously there has been an expansion of operating margins from 5% in 2013 to about 14% in 2015.

The federal legislation allows 20 years of net operating loss carryforwards which are applied to offset current/future taxable income. As of December 31, 2015, the company had a net operating loss carryforward of approximately

$33 million, which begin to expire beginning 2020. Therefore, the company's taxable income continues to be offset by the accumulated deficit.

The firm's financial reserves are primarily used for business development. Management has been successful in controlling expenditures in the past. The firm does manufacture some of the components and subassemblies in its production process. Instead of committing to domestic manufacturing infrastructure which would put pressure on financial resources, the company contracts out the manufacturing to third parties. Hence, it enjoys low CapEx, which allows for lower depreciation expense, less capital tied up in fixed assets and, potentially, higher net income. Should management require capital in the near term, we believe they have the ability to raise additional financing, considering they have been very successful in acquiring funds in the past.

We are comparing HTL.V's P/S to comparable companies such as Vitrolife and Research Instruments. In December 2015 CooperSurgical strengthened its position in the ART market by acquiring Research Instruments, a provider of high quality products developed specifically for micromanipulation and management of the IVF processes, for $51 million at 3x revenue multiple. We believe that Hamilton Thorne is very comparable to Research Instruments in terms of product offering and as such should command a similar multiple or higher if it were acquired.

	Mcap	Revenue	Multiple
Vitrolife	$6,900	$722	10
Research Instruments	$51	$17	3

With a discount rate of 9%, a terminal growth rate of 1.5% and 79 million fully diluted shares, our DCF model values the company at $45 million or $0.57 /share. This implies significant upside from the current trading price of $0.22/share (3/25/2016). The shares currently trade at a 1.8x revenue multiple, which is very conservative when compared to Vitrolife that trades at 10x revenue multiple. Based on the firm's financial and operational progress in the past two years, we believe there has been significant de-risking. We believe the shares trade cheaper than fair value.

Insiders own approximately 48% of Hamilton Thorne's outstanding shares. As a result, only half of the total 70 million can be actively traded. Despite the firm showing growth prospects, a strong balance sheet, and a stellar leadership team, there may be limited trading liquidity in the stock due to the limited float. An increase in the number of outstanding shares will help in increasing the stock's liquidity.

Risks

Model-based assumptions are prone to large variations: Our projected revenue growth from the sales of Hamilton Thorne's products from the current year and beyond is largely best-guesses based on growth in the fertility sector. Revenue could underperform relative to our model if the customer base does not grow at our assumed forecast or is less correlated to revenue growth than what we are assuming. Achieving our price objective includes competitive, reimbursement and financial risks.

FINANCIAL MODEL

HAMILTON THORNE LTD.

Hamilton Thorne Ltd.	2015 A	2016 Q1 E	2016 Q2 E	2016 Q3 E	2016 Q4 E	2016 E	2017 E	2018 E	2019 E
Revenues	**$9.03**	**$2.25**	**$2.33**	**$2.60**	**$2.67**	**$9.85**	**$10.73**	**$11.70**	**$12.75**
YOY Growth	*4%*	*7%*	*4%*	*25%*	*1%*	*9%*	*9%*	*9%*	*9%*
COGS	$3.27	$0.84	$0.81	$0.94	$0.83	$3.42	$3.76	$4.09	$4.46
Gross Income	**$5.76**	**$1.41**	**$1.52**	**$1.66**	**$1.84**	**$6.43**	**$6.98**	**$7.60**	**$8.29**
Gross Margin	*64%*	*63%*	*65%*	*64%*	*69%*	*65%*	*65%*	*65%*	*65%*
R&D	**$0.97**	**$0.24**	**$0.22**	**$0.26**	**$0.34**	**$1.05**	**$1.21**	**$1.39**	**$1.60**
% R&D	*11%*	*11%*	*10%*	*10%*	*13%*	*11%*	*11%*	*12%*	*13%*
S&M	**$2.08**	**$0.57**	**$0.53**	**$0.60**	**$0.57**	**$2.27**	**$2.40**	**$2.60**	**$2.70**
%S&M	*23%*	*25%*	*23%*	*23%*	*21%*	*23%*	*22%*	*22%*	*21%*
G&A	**$1.43**	**$0.40**	**$0.39**	**$0.47**	**$0.32**	**$1.58**	**$1.64**	**$1.78**	**$1.90**
% G&A	*16%*	*18%*	*17%*	*18%*	*12%*	*16%*	*15%*	*15%*	*15%*
Operating Income	**$1.28**	**$0.20**	**$0.38**	**$0.33**	**$0.62**	**$1.53**	**$1.73**	**$1.83**	**$2.09**
Operating Margin	*14%*	*9%*	*16%*	*13%*	*23%*	*16%*	*16%*	*16%*	*16%*
Other Expenses	-$0.23	0	0	0	0	0	0	0	0
Taxes	-$0.02	$0.004	$0.007	$0.006	$0.011	$0.028	$0.031	$0.033	$0.038
Tax Rate	*1.8%*	*1.8%*	*1.8%*	*1.8%*	*1.8%*	*1.8%*	*1.8%*	*1.8%*	*1.8%*
Net Income	**$1.03**	**$0.20**	**$0.37**	**$0.32**	**$0.61**	**$1.56**	**$1.76**	**$1.87**	**$2.13**
Net Margin	*11%*	*9%*	*16%*	*12%*	*23%*	*16%*	*16%*	*16%*	*17%*
EPS	**$0.02**	**$0.003**	**$0.01**	**$0.005**	**$0.01**	**$0.02**	**$0.02**	**$0.02**	**$0.03**
Shares	63	64	66	68	69	67	75	82	85

Source: Zacks Investment Research *Anita Dushyanth, PhD*

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HISTORICAL STOCK PRICE



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