Optomechanix

Photonics West 2018 in San Fransisco report

Best Ideas at the Show

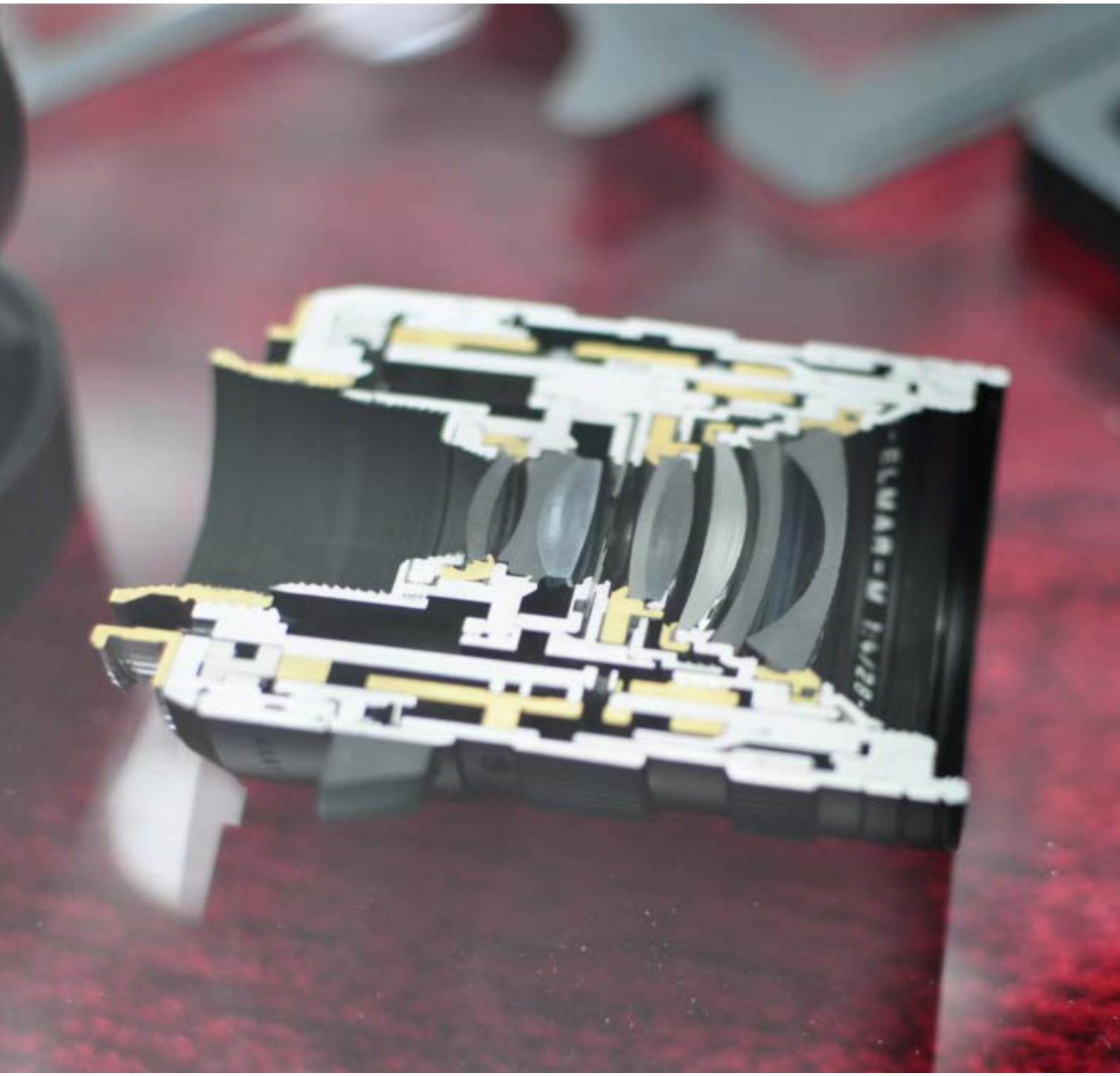
SFO museum

How to Build a Scanning Confocal Microscope

How to succeed in Your Business the Romantic Way

Night Sky Photography, the art of Majid Ghohroudi

Jan-Mar 2018



Technical journal of OMiD, Opto-Mechanical Institute of Design

The entry of Moscone trade center in San Francisco at 3rd, and Howard street, and exhibition floor.

Contents

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OSA The Optical Society | 100 Since 1916

Member of OSA
Optical Society of America

OMD

Opto
Mechanical
Institute of
Design

SPIE.

Member of SPIE
The international Society for
Optical Engineering

This issue Dedicated to:

Antoine De Saint Exupery (1900-1944) was a pioneering French aviator, writer, journalist, and poet who's children book "The little Prince" has been very influential around the world. Just like Shel Silverstein, Exupery's book is far more meaningful for adults. The most beneficial role of a book like that is having read it at childhood, one has his/her whole whole life thinking about what it meant.

Engineering without love, puts technology into the wrong use. May be it was aviation that liberated him from the shackles of limited minds, and showed him to think bigger in life. It is more likely though he had learned the art of channeling more love from those around him.

His plane vanished without a trace in July 1944, during WWII.

A scene from 2015 animation: "The Little Prince" directed by Mark Osborne hit box office at $97.6 Million

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info@optomechanix.org
Chief Editor: Ali Afshari
Publicity Coordinator: Smaneh Karimabadi

Optomechanix is a quarterly journal of Opto-Mechanical Institute of Design (OMiD), with technical articles for practical, hands-on audience. This magazine is privately founded, and is free of charge.

Cover page photo: Cross section of a Leica Elmar 28-36-50 lens, f/4 in M-mount at OMiD museum.
Inside page photo: Entrance to the Moscone center, and inside the exhibition hall.

Attending Photonics West Show 2018

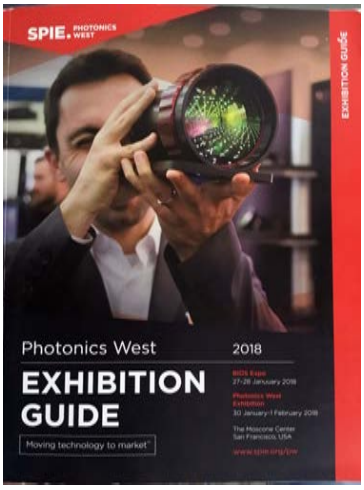
Photonics West show is my favorite optics show second to Laser Munich. I began my company by attending PW back in 1994, and I congratulate SPIE for putting this show together, and growing the show to how big it is today: The exhibition floor was fully packed this year with 4,900 R&D presentations, 1,250 exhibiting companies, and 23,000 attendees! Photonics West was originally held in San Jose convention center but as the show grew, it could no longer keep the show in San Jose, and it had to relocate to Moscone center in San Francisco. As a city, San Francisco has far more attraction

Registering for the show, technical program, or short courses took much less if you were already a SPIE memeber.

to tourists, but for people who live in the vicinity, it's a city that you'll have a hard time finding parking for your car. Parking fees at the parking garage right next to Moscone center is $35 for an entire day, and if you had planned attending both the Biomedical show (Sat, and Sun), and Photonics West (Tue, Wed, Thu), parking would have been costly. There were plenty of good restaurants, and coffee shops, and overall, I think if you were a tourist, San Francisco would have left you a great memory with its vibrant night life.

Photonics West offers a complete educational opportunity for the visitors by offering short courses if someone wants to enter a new field. There is a book store that contains many of online books SPIE offers so someone could see the book before purchasing it. There is also an opportunity for authors to speak directly with the publisher to have their book pub-

Picking up your badge, you also received a free ehibitor's guide, and show layout map.



lished, or sold through SPIE. Every exhibition floor has tutorials for some breakthrough products, and of course, poster shows, and seminars that are held throughout the week.

I was interested to learn more about the Fluorescence microscopy products for the next issue of Optomechanix (we'll have an elaborate discussion on microscopy), and I found the show floor to be extremely helpful to find what I was looking for. There was also a good sized job fair held for students, and professionals looking for new opportunities.
The visitor guide (above left) was well organized by alphabetical order with show layout (center), and late booth registrants were added by an 8-page insertion. This is what I really like about the openness of SPIE shows that welcome late comers. The full color daily newspaper with articles, and events summary (above right) were handed out at the show entrance was a pleasant addition to the show experience.

Ali Afshari
CEO, OMiD

The short courses are very useful for those who need new experience in newly assigned field of interest.

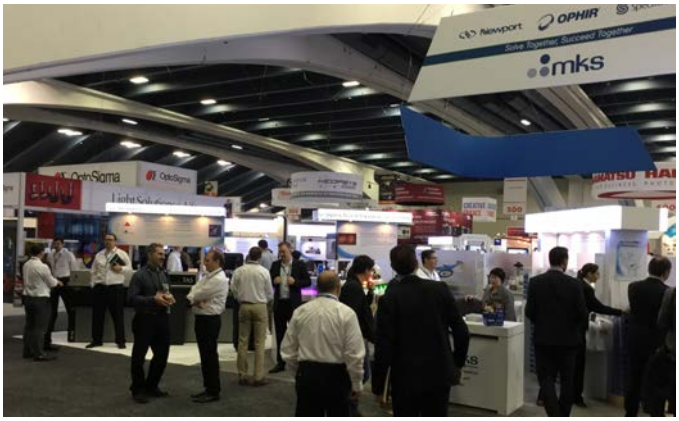
Short course books are part of the course cost but the leftover copies are sold for $35.

Exhibitor gides are available free of charge, contained ads, complete exhibitor's information, and exhibit map.

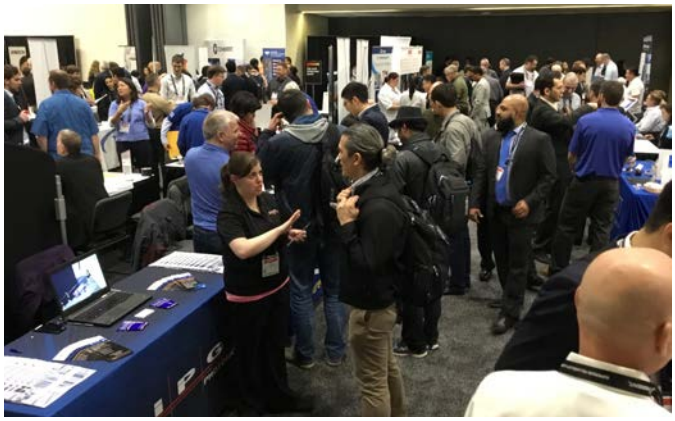
SPIE publishes its own texbooks in cooperation with authors, or resells them like a book store.

SPIE has published these very popular series of handbooks for microscopy, Spectroscopy, Adaptive Optics, etc

Science toys for children was a good spot to grab gifts on the way back from the show, and conference.

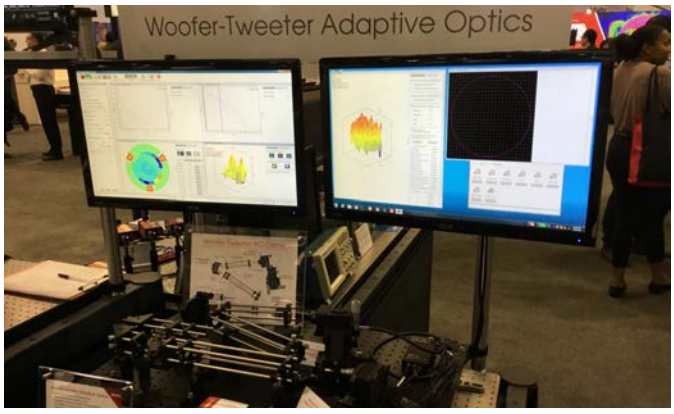


Exhibition floor was packed with attendees mostly from the bay area and southern California. Other attendees flew from across United States, Asia, and Europe to be at the show.



Above left, the entry escalator to the show was overwhelming with a huge crowd waiting at the entry that opened at 10 am. Meanwhile, the overflow of the table-top exhibitors who occupied the front portion of the exhibition floor, enjoyed a huge number of visitors before the main show started to accept visitors.

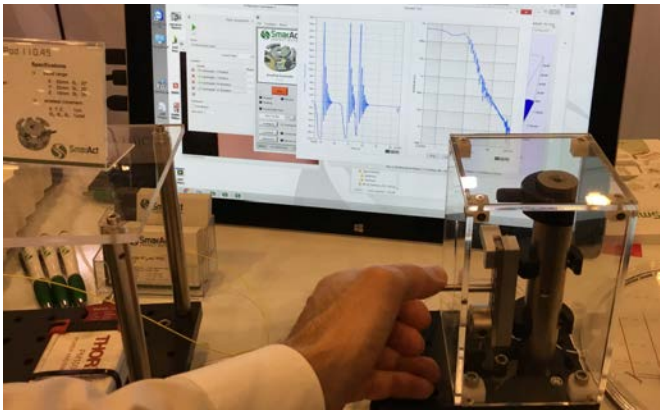
Above right, job fair with stands from exhibitors, and non exhibiting companies. Tuesday afternoon, Laser Focus world magazine had an exhibitor party starting right after the show. At 8 pm, SPIE held a party for members at Hilton hotel (left). It was a 20 min walk from the show but the San Francisco view from the top floor was spectacular.

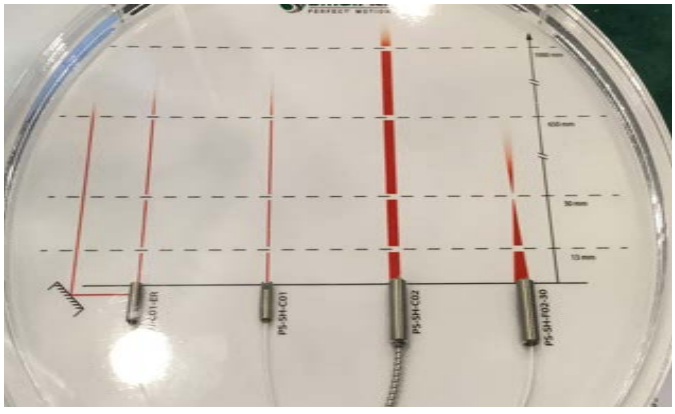


Thorlabs has produced a variety of phase masks for optical use (left). Dual adaptive optics to correct for abberations independentely in two stages. One could have a higher speed than the other, depending on the application (right).

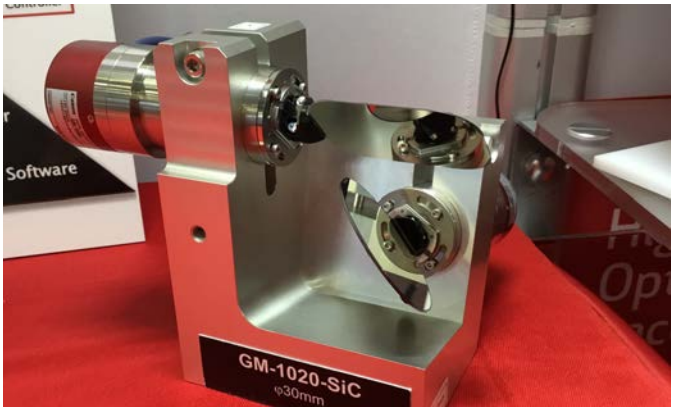
Video displayed how metalic mirrors (left) are produced in house. Right: Process of making S.S. mounts was shown from rough cutting raw material for easier material removal by CNC machine, or standard machining both sides (center).

SmarAct displayed their PicoScan: Extreme positional accuracy is acheived in submicron steps using piezo actuators and controller. email:buss@smaract.com

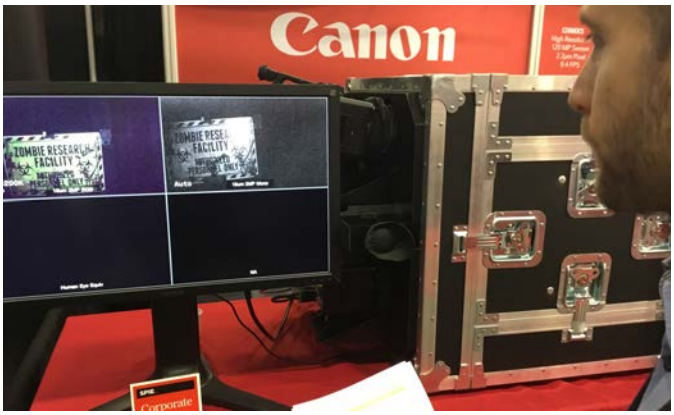




SmarAct: Ultrafast position sensors are displayed (right). By dropping a small vertical weight on a spring cusion inside a glass cage, the positional measurement is graphed in real time on the computer screen (left). buss@smaract.com



Canon company's galvo mirror drives, and drive electronics. Canon has been in business of producing galvos for 11 years. email: tiida@cusa.canon.com

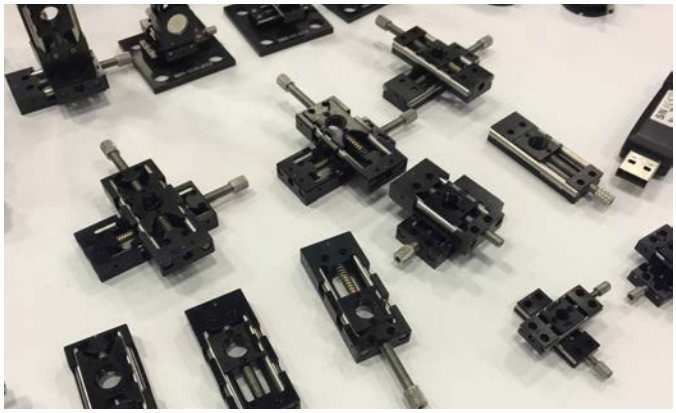


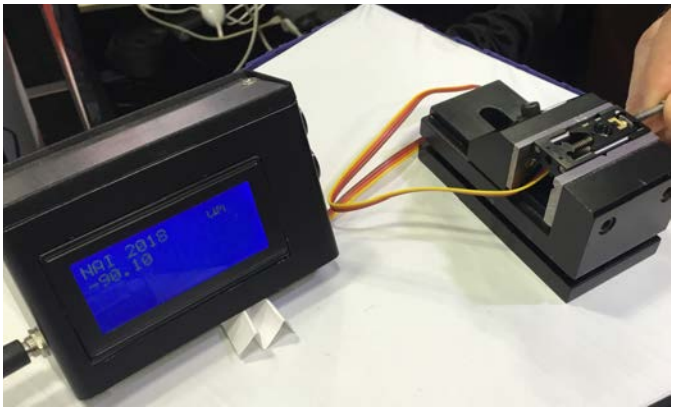
Canon was showing off its high sensitivity CMOS from its sensor division: The images on the left are taken by a high sensivity CMOS sensor (on top), compare to standard CMOS (at bottom). email:misimmons@cusa.canon.com

A single shot through this optical device gives you 10 simultaneous shots throughout the visible, and near IR spectrum using a specially modified Canon 5D sensor (Model 5DSR). email: jmurphy@streamtechinc.com

Specim has similar mobile camera that shoots Hyper-spectral images. email: harri.karppinen@specim.fi

Precision microscope objectives are starting to emerge from China, email: rye@shanghai-optics.com

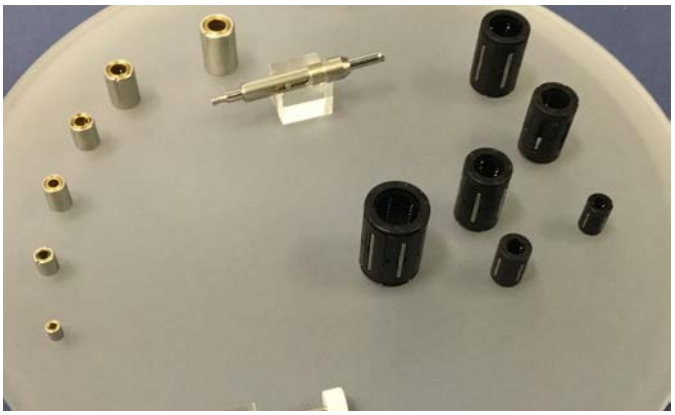




National Aperture's feedback sensor and display for monitoring sub-micron positioning on its miniature stages. email: wgrenier@naimotion.com

Compact scanning Inverted microscope by Jenoptic. The detachable module mounts on a 25x25 mm scanning stage on the base, and the sample is held on removable microscope holder on top. email: Andrei.tchernook@jenoptik.com

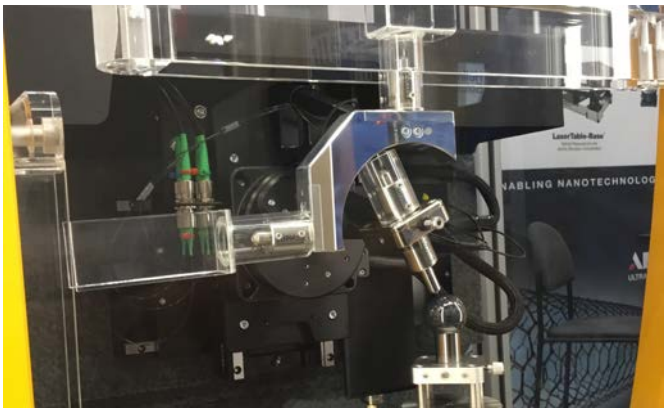
Galvos by Sino-Galvo. The company claims to have increased product quality by inspecting, and testing each device before it goes out. The diecast dual axis housing accepts scan lenses. email: john@sino-galvo.com



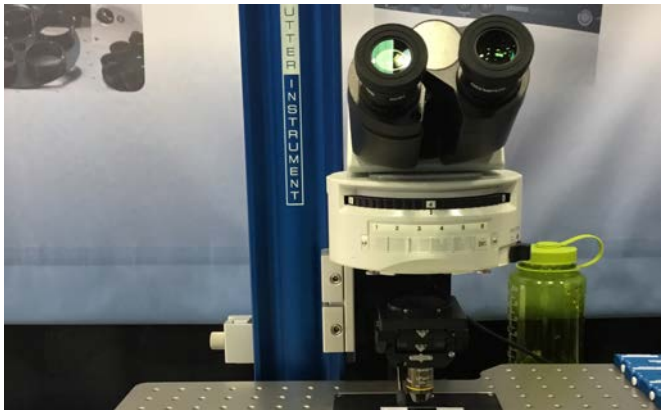
High precision linear bearings are utilized in this zoom lens assembly. The Swiss made linear bearings are the highest precicion to reduce play, while providing smooth linear translation. email: oliver.aubry@mpsag.com

Beam Expander by SwissOptic with large linear bearing assembly securing the moving optics at it center. Stainless housing for lens assembly (right) looks to be a relay optics assembly reveals the securing scheme for each element.

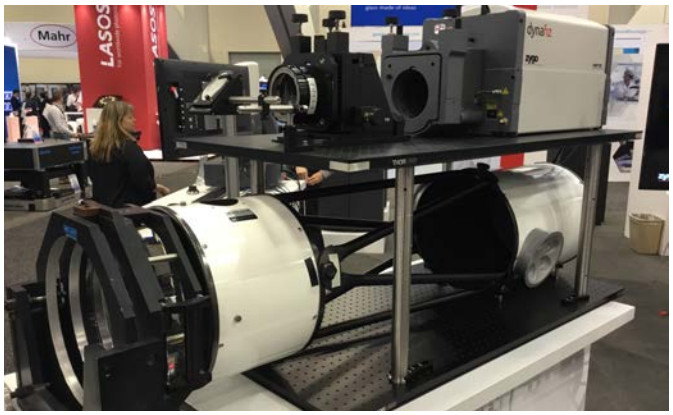
Mahr Inc. Surface and Wavefront Mertrology.
email: thomas.dickerson@mahr.com

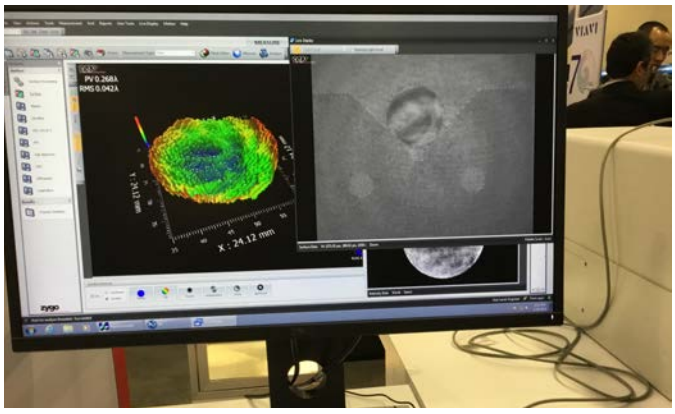


Ameritek surface contour measurement.
email: matt.zabko@ametek.com



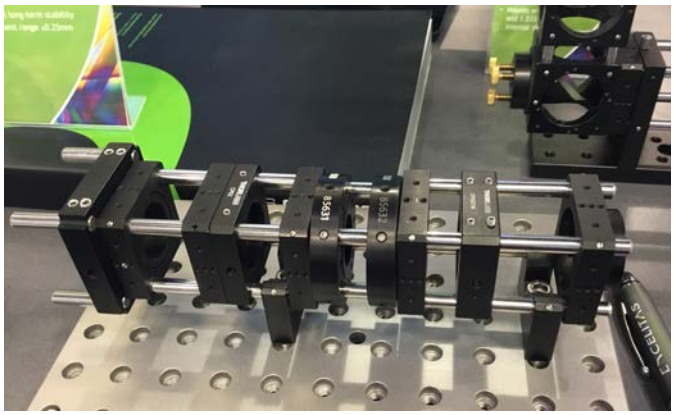
Flourescent optical micriscope stand, and accessories by shutter instrument with mortorized control (right). A good example of 2-position nosepiece turret is also shown below the microsocpe. email: ali@sutter.com





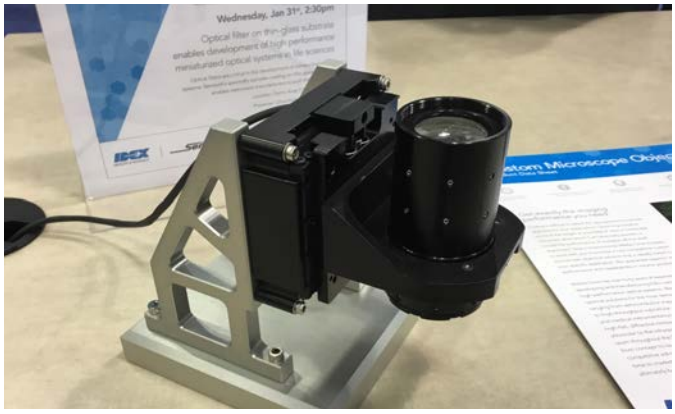
Aspherical telescope primary being tested by Zygo interferometer. Spherical Schmidt Cassegrain primary mirrors are easier to test by standard software. For paraboplic mirrors, it's more sophisticated. email: Erin.McDonnell@ametek.com

Showing off my new book at OSA , and SPIE booths. 25 years spent on a single book, I am just glad it's over. My passion for cameras never ends. You could watch a video clip about the book by looking up "leica Design 101" on Youtube.

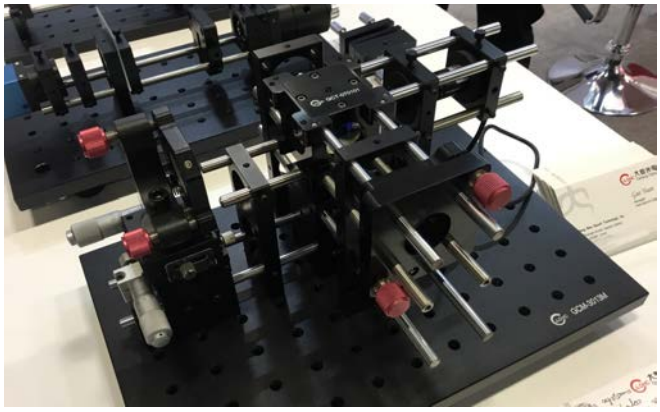


Microbench line includes this Thorlabs thread adapter to fit its cage system. email: Ruth.Wezel@excelitas.com

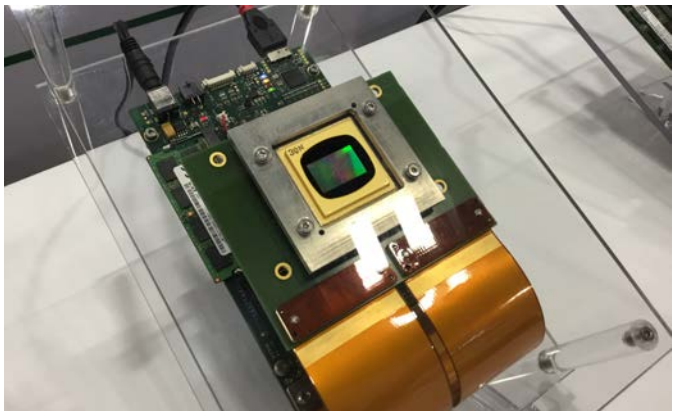
LED lamp source by Excite offers brighter light source, and longer LED life. email: Jennifer.Melo@excelitas.com



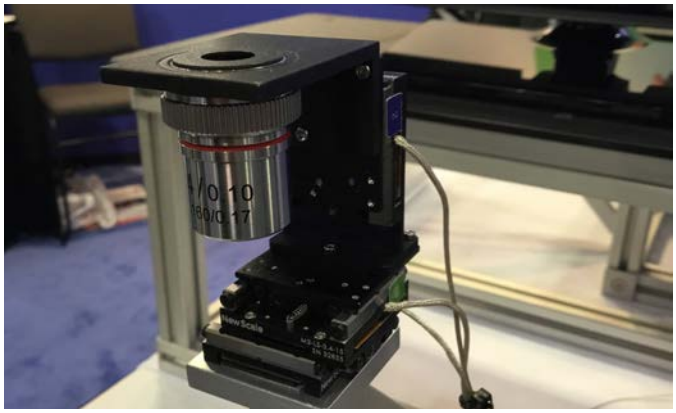
Microscope objective focuser by IDEX Health & Science email: mvrooman@idexcorp.com

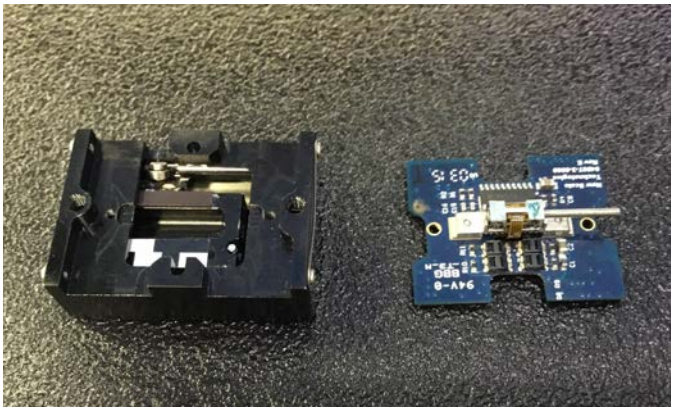


Cage system by Deheng Optical email: gaoyan@cdhcorp.com.cn



Wide range of high performance Micro Mirror Arrays by Vialux GmbH. email: info@vialux.de

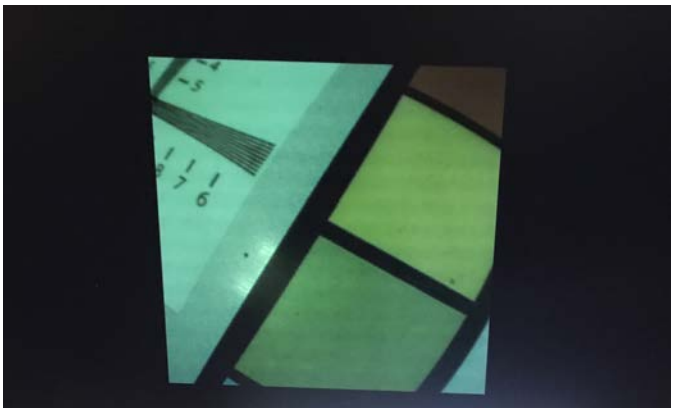




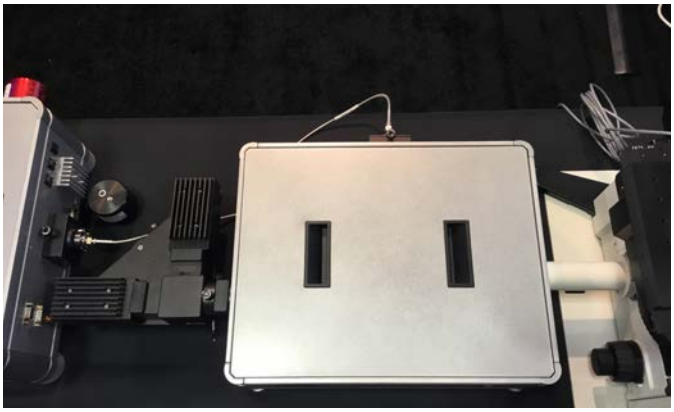
NewScale Compact piezo driven stages (right) can be mounted in XYZ configuration for, i.e., Scanning Microscopy applications (left). The company also offers Galvo-like rotary smart stages. email: hquinlivan@newscaletech.com

Optical testing software/hardware by Opto Alignment measures the rotating lens group on the left to display its lens centration properties (right). email: rog.garden@optoalignment.com

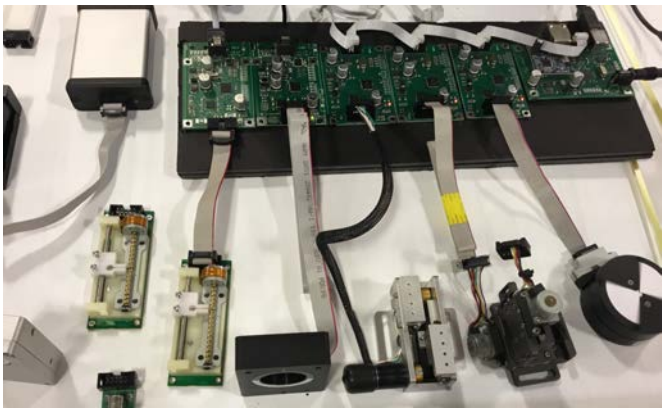
Adaptive optics demonstration by Alpao demonstrates the optical aberations produced by an optical system on the left, and correcting it by turning on the Adaptive optics (right). email: abdasselem.elhassouni@alpao.fr



Sub-minature 1.55 mm dia. CMOS camera (left) has 70 deg. field of view. This optics probe delivers 400x400 pixel image on the right. email: info@feinwerkoptik-zuend.ch



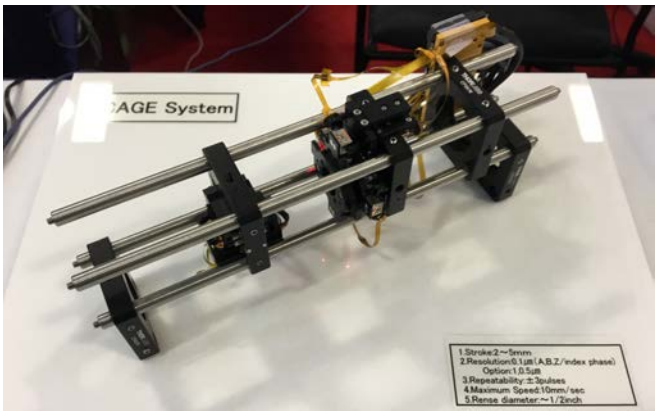
Laser Scanning confocal microscope by ISS uses STED technique for 30 nm resolution. This light tight box contains the detectors, and filters while the lasr beam enters from an outside source via an optical fiber. info@feinwerkoptik-zuend.ch

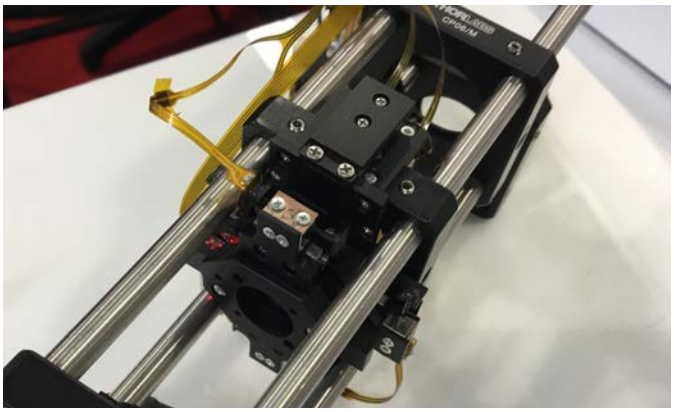


Precision miniturized positioning stages by Pacific Laser Equipment. email:sabinh@plequipment.com

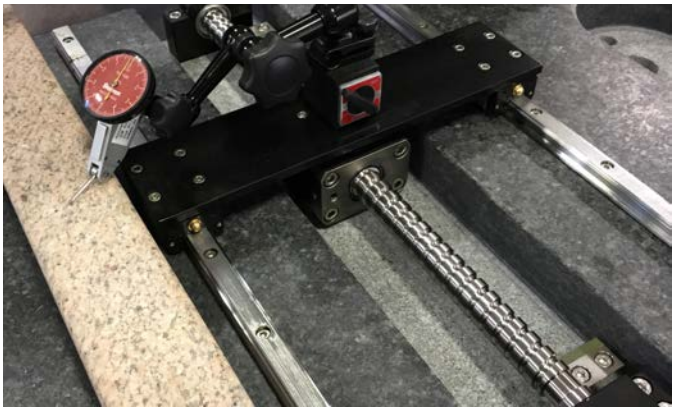
Large diameter voice coil barrel by Akribis Systems offer rapid focusing . email:Thomas.barrett@akribis-sys.com

Granite X-Y table with accurate positioning by Busch Microsystems. W.busch@busch-microsystems-consuit.de

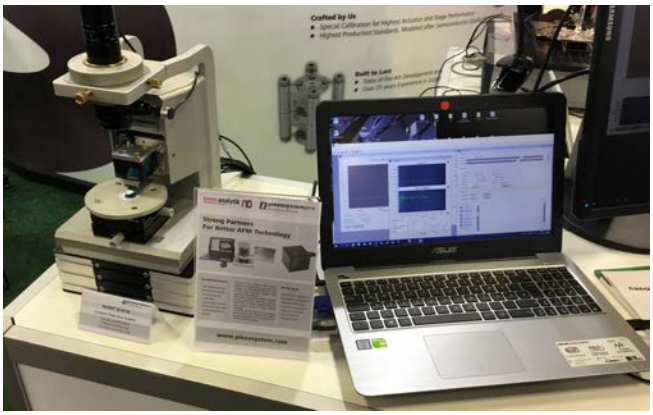




2~5 mm stroke at 0,1 micrometer positioning stages for the Microbench, and Cage system, and Optoform by Akribis. They have a huge range of piezo driven actuators to build small robotic arms. email: Thomas.barrett@akribis-sys.com

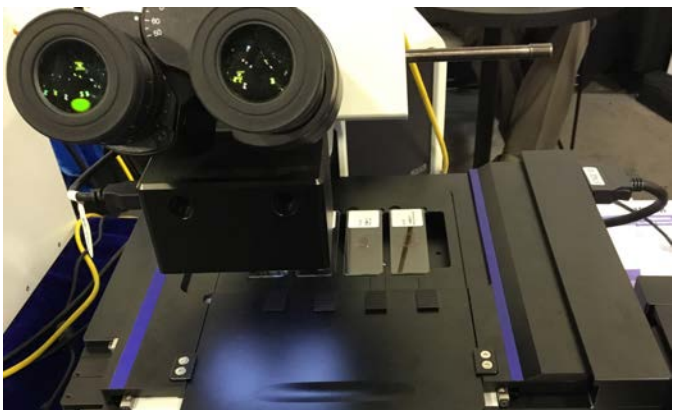


High precision granite tables, and V-block by Starret. In structural stability, nothing surpasses granite, because these are rocks that have slowly cooled down in nature, and have minimal inner tnsion. email: chrisg@tru-stone.com

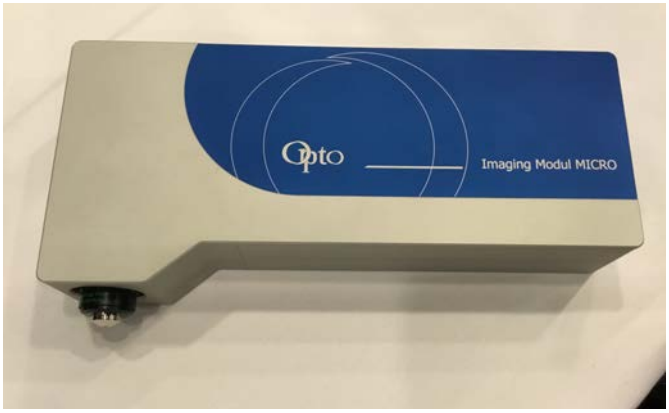


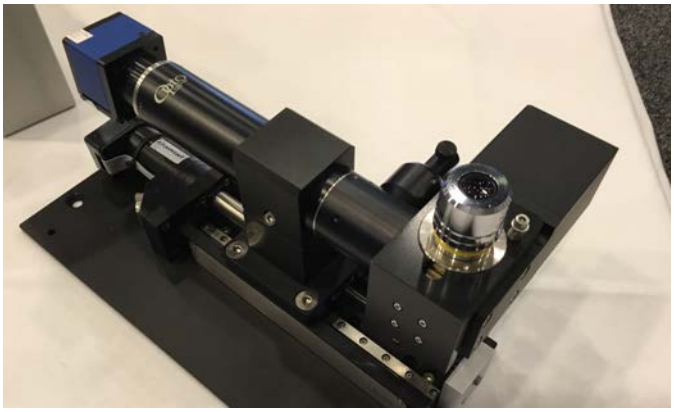
Compact sub micron drive components, and controller by Piezo Systems, Jena, are integrated to build this compact, and more affordable Nano Analytik AFM system called nanoMetronum. email:peter@piezojena.com

Piezo driven miniturized Hexapod stage Q-821 by PI-Micos for 6D nano alignment. Travel range: 6X6XX3 mm, 16.5 Degrees of tilt, and 1 nm sensor resolution. email: kirkd@pi-usa.us

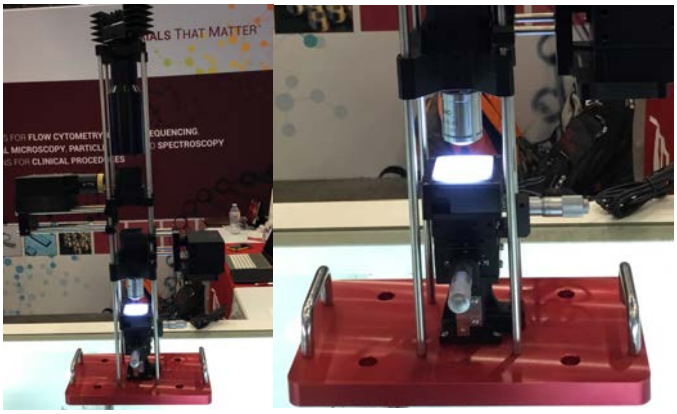


Affordable scanning Flourescent microscope with motorized platforms by Heidstar. email: yining.hu@heidstar.com



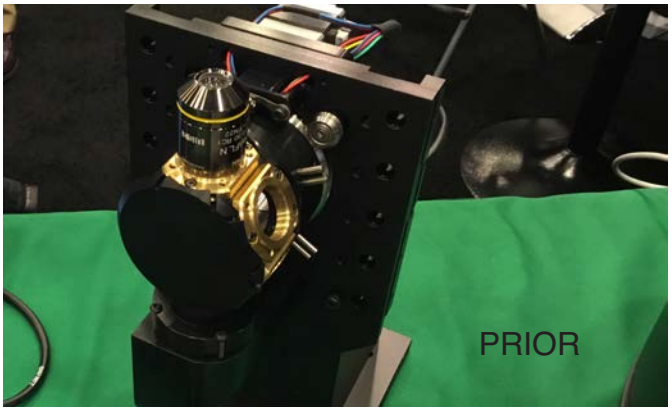


Self contained microscope modules by Opto offer compact/precision German engineering for microscopy applications at relatively low cost. email: price@opto-uk.com



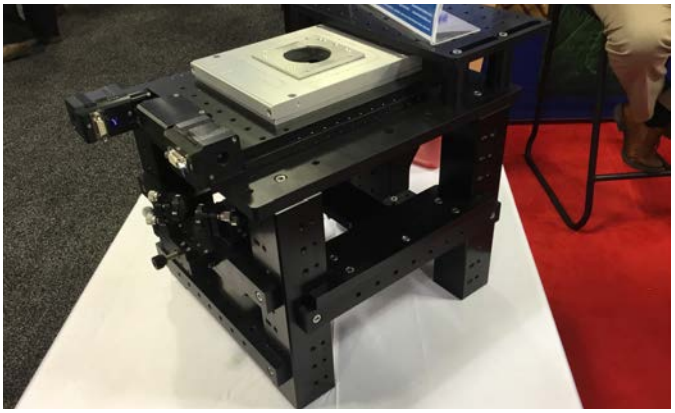
II-VI Photop has offered a new line of microscope prototyping assembly system for lifescience applications for contructing biometical devices, such as Gel Imaging platforms, and DNA sequencers & analyzers. email: Ellison.wei@ii-vi.com

Flouresence microscopy filters by HB optical. email: majing@hboptical.com

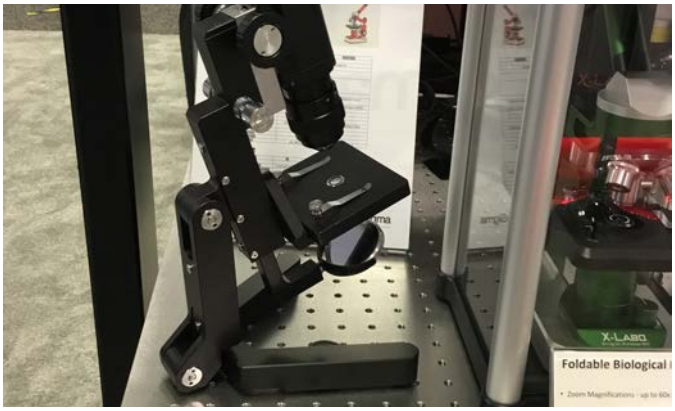


3-position microscope objective turret for more accurate centering. 2-position turrets were much more compact.

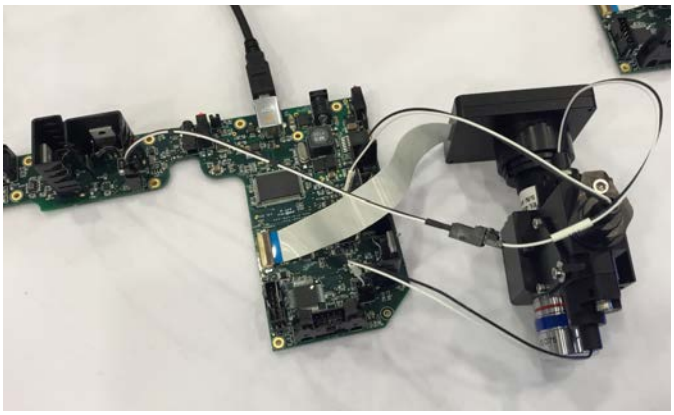
Robotic microcope slide loader at Prior booth had 200 slide capacity. The clamping lever (right) is clever to first secure the slide in the long axis against the horiz. plane, then pushing in on its left side for perfect registratin. rcernera@prior.com

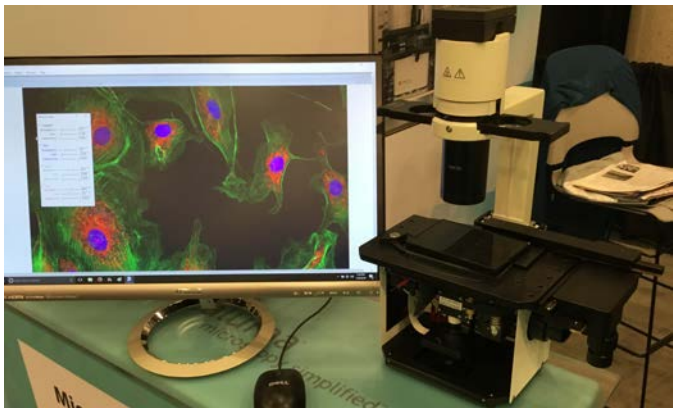


Sturdy/modular platform for inverted microscopy by MCL. email: sales@madcitylabs.com

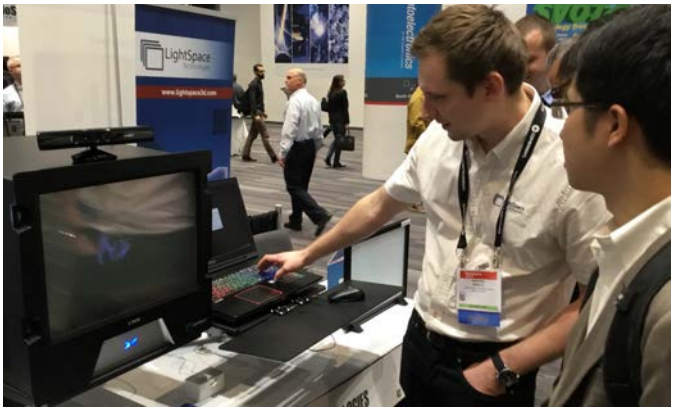


ntriging foldable microscope that lays flat on a small case by OptoSigma email: f-imamura@minato.optical.co.jp

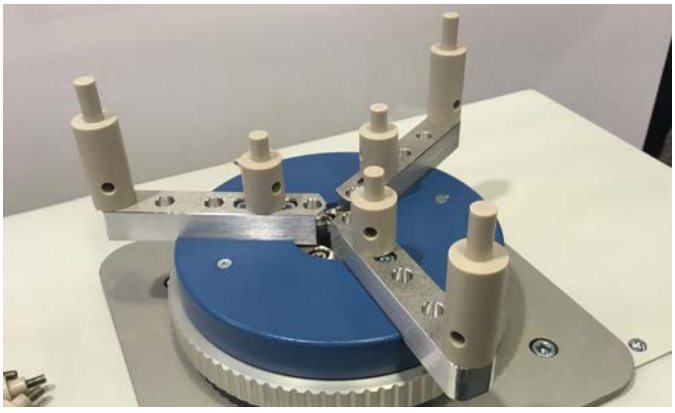




Low cost OEM Flourescent microscopy head complete with three LED sources, excitation, and transmission filters, CMOS camera, and drive electronics (left) for around $12.2K. email: eweiner@etaluma.com



20 layers of high speed LCD panels that switch on and off one at a time, create this 3D display that could rotate biological scans for easier visualization. The display size was similar size to old fashioned CRT monitors. www.lightspace3d.com



Smart chuck for lens centration for Non-Contact OptiSurf lens thickness measurement hardwar/software in Troptics booth. This cuck has relatively small capacity but much expanded by repositioning the rods (right). email: info@trioptics.com

SFO Airport Museum

One of my favorite sites to visit returning from San Francisco is its airport museum. This is such a clever idea that some airports have come up with to entertain passengers while waiting for their departure. I personally would enjoy a flight delay at an airport like this. I have seen bicycle shows, airplane, plastic ware, microscopes, telescopes, and this time around, it was coin operated machines. The Bagattele spring loaded ball lift (left, below), pioneered the pinball machine.

I think a free museum like this is magical for cities around the world to show their history and their attitude towards products. Denver airport has an excellent museum for aviation. I would expect Japan to have a museum about cameras.

The Automatic Age exhibition display at SFO airport next to United check in counter. The ongoing museum display attracts passengers to have a memorable experience when leaving San Francisco.

A Gypsy coin operated fortune teller machine (1937) reminded me of Tom Hanks' movie: "Big".

A blow and grip machine long tester (1909, right) appeared in American salons. It offered a grip test or long test for a penny. Left, Bagatelle (pioneered the mechanical ball lift for modern pinball machine), made in 1902 by Caille Brothers.

Building a Laser Scanning Microscope with Optoform

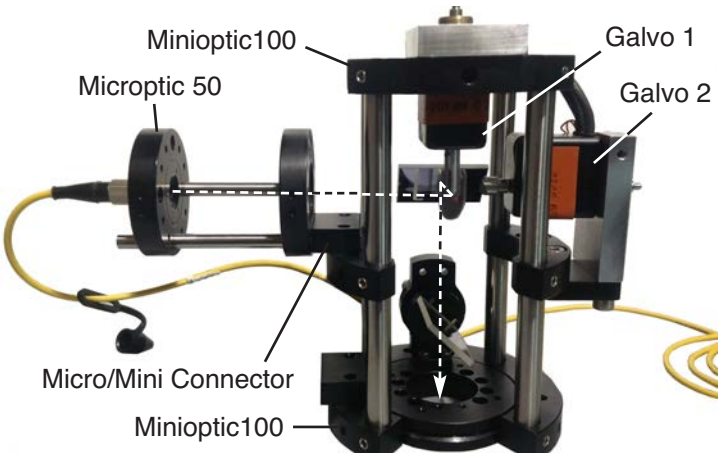
By Ali Afshari

In the last issue, we tested Microbench system for laser interferometry. In this issue, I'll show you how to build a scanning laser microscope. The scanning scheme using galvos is a complex task, and its setup in the lab takes hands on experience to implement. The incoming beam and the exit beam to the galvos is difficult to line up inside the cage system whose axis of symmetry, and optical axis have to always be the same.

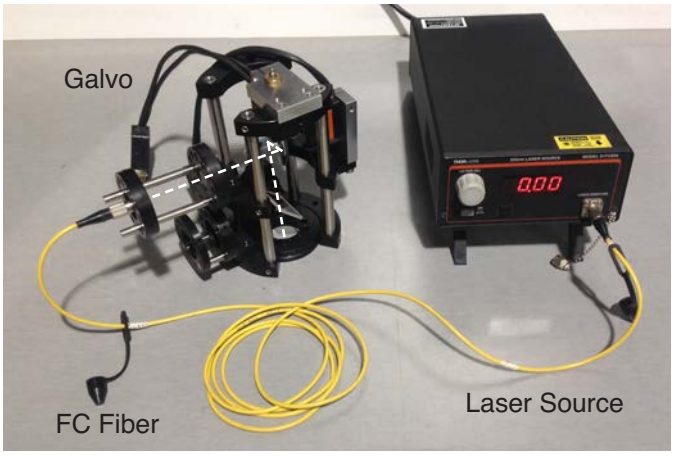
To resolve this, let's forget the incoming beam because it can originate from a fiber laser. We'll install the 2nd galvanometer first, and line it up with axis of symmetry (below, right).

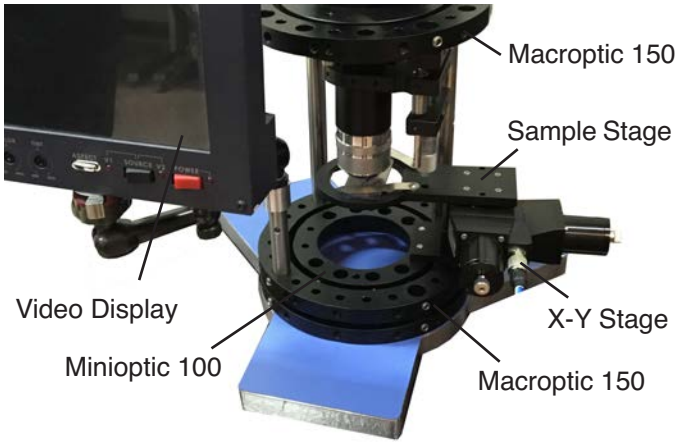
The second step is to install the first galvo which sits completely off axis inside the 100 mm Minioptic cage system. The first galvo mirror is held orthogonal with respect to the second galvo so this will point the optical axis perpendicular to the Micoptic assembly. To line up the optical axis to this beam, we can use a Mini/Micro corner connector. Using only one screw, the Microptic plate can be swiveled to the right to line up with the first galvo. The fiber optics plate, and the collimating achromat can then be installed in the Microptic to input the laser beam (first image, below, left).

The result is a compact on axis scan beam that can be installed on top of the trinocular observation head (below, right). The F-Theta lens can also be added at the center of Minioptic mount right before it enters the viewfinder optics.



Constructing a two-axis galvo package is possible with Optoform's high level of flexibility in combining larger and smaller mounts. There are no other rigid systems available that offer larger cage components as large as 150 mm in diameter.





The X-Y scanning microscope stage (right) is constructed with PI/Micos stages, and 150 mm Macroptic mounts that also provide the linear bearing plates for Z-Axis. Optoform has been a hidden gem for many microscopy applications.

How to Succeed with Your Product the Romantic Way!

By Ali Afshari

The best seller book: “Power of Now” by Eckhart Tolle has great teachings for today’s busy lifestyle. Many people who read these books have a hard time applying them in real life. First of all, as human beings, if we have difficulty accepting new ideas in the library of our minds, perhaps it’s because the bookshelf is simply full. I recently watched a short video on Instagram that someone showed me, and I realized this is how most of our minds are being fed every day with pure entertainment instead of useful ideas. Let’s just talk about this word innovation as I have discussed in the introduction of my book: “Leica Design 101”:

What’s Essential is Hidden From the Eyes

… I think it was in a scientific gathering, that someone once asked Stephen Hawking: “Do we have any knowledge of what went on prior to Big Bang?” (The point where he considers the origin of time). There is a verse in holy Koran that has an answer for this: Allah says: “Kon Fayakoon”, meaning: “I tell it to be, and it becomes”. Scholar’s interpretation of it to date is, what he creates in the unseen realm, manifests itself in the material world. A clever analogy to this would be like when typing something on your computer screen, and the binary numbers and instructional codes that are generated inside its microprocessor. What if someone tells you the image you see on the screen isn’t actually the real thing, but those zeros and ones are. If you’d turn your monitor off, and back on again, you’ll still be able to see the words on the screen, but if someone unplugs the power to the microprocessor, you’ll lose everything. The physical world, and what the heart is able to see have such relationship. “It’s only with the heart that one can see rightly”, from the book: “The Little Prince” by Antoine De Saint Exupery.

Right after the passing of my mom, I noticed that I was temporarily in such an empowered state without any impediments to feel her within the hug space with my wife. Anyone who has found true love in his or her life, may consider trying this. I showed my nephew who lost his father, how he could still reach him through hugging me, and he was able to vividly feel the presence. I have been thinking what if everything we are able to create in this material world, we have already fashioned in the spiritual realm? What if all invention, all design, and all creativity originates from the spiritual authority? As spiritual beings we should be interested to know where do ideas really come from. Why is it that whenever we see something so beautiful, so genuine, and so deeply rooted, something is heart-felt, which is vague to describe?

It’s so essential to have knowledge of the self; Your boss at IBM, or NASA isn’t interested in your soul. You are on your own to seek it, but it is by connecting with the source, that all sincere wishes are answered. It is said in Koran that if all oceans turned into ink, and if all trees turned into pen, they will come short in writing God’s words. One obvious interpretation of this is that not all God’s words are written in Koran or in any other revelation. God’s words are written everywhere. As Rumi puts it in the opening of his masterpiece: “Masnavi”, as translated by Robert Bly, and Colman Barks, the reed flute is a hollow tube with seven holes, so are human beings. I’ll paralell this with The Little Prince story because he is also stuck here for life. Our separation is somewhat similar:

Listen to the story as told by this reed, for being separated.
Ever since I was cut from the reed bed, I have made this crying sound.
Anyone apart from someone he loves, understands what I say.
Anyone pulled from a source, longs to go back.
At any gathering I am there, mingling in the laughing, and grieving,
a friend to each, but only few will hear the secrets hidden,
within the notes, no ears for that.

Spirit from the body, no concealing that mixing.
But it’s not given us to see the soul.
The reed flute is fire, not wind. Be that empty.
Hear the love fire tangled in the reed notes, as bewilderment melts into wine.
The reed is a friend to all who want the fabric torn and drawn away.

The reed is hurt and salve combining.
Intimacy and longing for intimacy, one song.
A disastrous surrender and a fine love, together.
The one who secretly hears this is senseless.
The tongue has one customer, the ear.
Days full of wanting, let them go without worrying that they do.
When the mouthpiece of reed mates with the lips of creator, I would contribute a verse.

Sometimes you'll have to let go to succeed

How to make your product succeed is by considering it to be your rose (from the book: "The Little Prince"). I was having lunch with my friend Armin Luft, president of Laser 2000 in Munich Germany, and this topic came up: "How can you predict the success of a product?". Just like my teacher, Joseph Cossman, he believed a good product is what is in good demand, and shows you green light for marketing. I said as an inventor, I couldn't do that. An Invention is like that flower, and you can't treat it as just any idea that you see at a show. You become responsible for your rose. Business ideas are the same. His idea was his flower, and he worked to make it succeed.

When you are inspired with a new idea, you become responsible for it. When I showed my Optoform line to the bosses at Newport, and Melles Griott, they were only willing to offer me as much as it would have cost for its patent. This is how many new ideas are price tagged by buyers but that's not how much they are really worth. It took 10 years of hard work for it to get accepted, and some more years to succeed. Be patient with your product, and it is correct that sometimes you have to wait for the red light to turn green, but walking the Photonics West show this year, I saw so many new innovative products, and while listening to their stories, I remembered my own story: I started my business with just $3,000. If I were to start one today with that product, I would say it would need at least a million for just the first year. How did I do it with so little money? I did it with the help I received from others.

My machinist was Armik Amirkanian (an Armenian), my Lawyer was Paul Ware* (an Afro-American), my patent draftsman was Mel Gonzales (a Hispanic), my photographer to produce my first catalog was Chester Maharaj (an Indian), my first salesman was Ali Sanagooy (an Iranian), and a lot of technical help came from my Vietnamese friend Coung Dang, and my first advertising agent was Patti Smith from Smith Miller More. I can't tell you how fun it is looking back to those years, and the fulfilling relationship I developed with those who helped me succeed. Sue Davis lead SPIE to what it is today, and the most gratifying memory is while showing off my product on a table-top SPIE had offered me at half price, I felt I had the same voice as the big guys. We were all invited to sit together at their exhibitor breakfast to share our ideas for the next show, and to make new friends.

While I was in San Francisco attending the show this year, I heard over the radio the voice of a convict that after receiving his verdict for 75 years in prison, he asked the judge: "Could I have three minutes alone with my demons?" As Khalil Gibran says in the letters to his soul mate, Mary Haskell: "When I hear about a crime in the newspapers, I somehow feel responsible for it". I felt the same way about this man. I think this is the most truthful statement said in a criminal court in decades. While the west has endeavored in its advancement of science, Eastern teachings offer much deeper insight in saving mankind from suffering. I think this is part of a master plan for us to be in need of one another in our civilization as a whole. There is a verse in holy Koran that has a helpful answer for this man: "Your desires are the fruit of your conduct"; Correct your conduct, and your desires will leave you alone. We are the architect of our own demons.

Titch Nhat Hanh, talks about mindfulness in his book: "The art of communicating", and talks about surfing the internet while protecting ourselves from toxic content. It's for lack of mindfulness that man becomes a prisoner of his/her desires. To succeed in business, one needs to have mindfulness, and the secret path to have a rich, and happy life is through giving, and receiving from others. I remember in my first few years in business, I had completely run out of funds but I still wished to be exhibiting at a show like Photonics West. A week before the show, during a visit to Bay area, I met a lady from a low income family whose son needed a computer. It was there, and then that I decided to give her boy one of my own. I came up with this story that a German company had given me a computer to display their product at the show but I really didn't have any other use for it. I said I could only use it at this show, and they could have it since they lived here. This was the silliest story I could come up with but to someone in need, no stories sound silly.

I gave the boy the best looking computer I had. The rest went like magic: My car had broken down but a lady rented me a car on her credit card so I could drive from Southern California to San Jose. When I arrived at the show, SPIE management greeted me with open arms, and gave me a table at a good location at the show, and without asking, they said they'll just be sending me a bill later! A friend of mine saw me there, and invited me to stay at his house, so I had to cancel my never booked hotel reservation. Needless to say, my sales sky rocketed that year. On the way back, my brother invited us to dinner at a fancy restaurant, and I didn't even have to pay for my salesman's after the show dinner!

One of my favorite books in business is "The magic of thinking big", by David Shwartz. When we think big in business, we'd better embrace the success of many others, or we might just end up looking at city lights from a high rise building with no one left around us. Without the help of Armik, Chester, Paul, Mel, Ali, Coung, Patti, and that boy, and many others that crossed my path, I would have had so little joy, and my life would have been far less meaningful. I now have great stories to share with my students while being a frequent lecturer at various universities. I remember once answering someone who kept asking questions after one of my talks with this line: "Who is asking the question?!" This originated from an ancient Eastern teaching, and I think it was the answer he was really looking for.

When you have strong desire to succeed in your product, don't listen to anybody who tells you it can't be done. Do it. Do it with honesty, and full commitment. You'll live with passion, and have a happy life.

*You could look up my documentary "Paul Ware, a Life in Patents" on youtube if you would like to learn more.

Replenishing a 100-year-old brass microscope for OMiD museum. Various cylindrical steel blocks were mounted on a lathe chuck, and inserted inside each tubing. With the aid of a soft hammer, the original smooth tubular finish of the telescope was preserved. Each tube was polished by Scotch Brite - the machinists' magic way of bringing shine out of any metal. The un cemented doublet was fun to disassemble, and see the early years of telescope making technology.

Museums with Optical Instruments

Tehran Museum of Photography (Akskhaneh Shahr)

Tehran, Bahar Shiraz, Tel 098-21-8884-8993, Amihooshang Lellahi
Vintage cameras, large format cameras, photographic books library, vintage negative archives, and art gallery.

Astronomy Museum

Tehran, Chizar, Tel 098-21-2229-3280 Mrs Nayeri

Telescopes, books on astronomy, Web: sactehran.ir

Museum of Cinema

Tehran, Zaferanieh, Tel 098-21-2270-5005 Mrs Azin

Vintage cinematographic cameras, still cameras, director's collection of personal belongings, and photographs, books.

Golestan Museum

Tehran, 15 Khordad Square, Tel 098-21-331-1335

Vintage timepieces, Telescopea, Microsocpe, and Autometer. Art gallery of royal paintings, and national treasures.

Museum of Innovation

Tehran, Imam khomeini St, Tel 098-21-6672-4694, Mr. Norouzi

Demonstration of vintage technologies, and Astronomy

Museum of Time

Tehran, Zaferanieh, Tel 098-21-2241-7336 Mrs Zeinab Nazari
Vintage timepieces, and clocks, Vintage brass telescopes, books.

The art of Majid Ghohroudi

Majid Ghohroudi is an avid biker, and mountain climber. He has been an astronomy fan all his life, and has been an active teacher in astronomy for many years, arranging field trips, and workshops for the youth.

What he started to do with his Canon 5D's sensor, and star tracking tripod was a long journey from beautiful night scenery to highly sophisticated calculations of the moon, and planets lining up with historical architectural monuments, and mountain peaks. He plans many years ahead for his shots. Many of his images has appeared in Astronomy magazine, and his earth's rising across the top of the world made it to NASA's "picture of the day" web page.

Why would someone go through so much hard work to capture an image that could easily be created in Photoshop? I think it's a journey that no one could understand unless one would personally experience it.

Majid Ghohroudi receives his prize from the judges (left), and poses with his bike next to cabin on mount Tochal's peak.

Mount Damavand's Shadow on Horizon

His photo of mount Damavand's shadow on the horizon appeared on NASA's web page as picture of the day. It was taken at 4,000 feet above sea level (mount Tochal's peak) at sunset on April 6, 2017. Mount Damavand's peak (5,610 meters, the highest mountain peak in Middle East) is at the center of this eight single frames panoramic shot. Majid Ghohroudi recalls: "I could only move a finder at freezing temperatures up there that morning. It was camera's motor drive that did the rest."

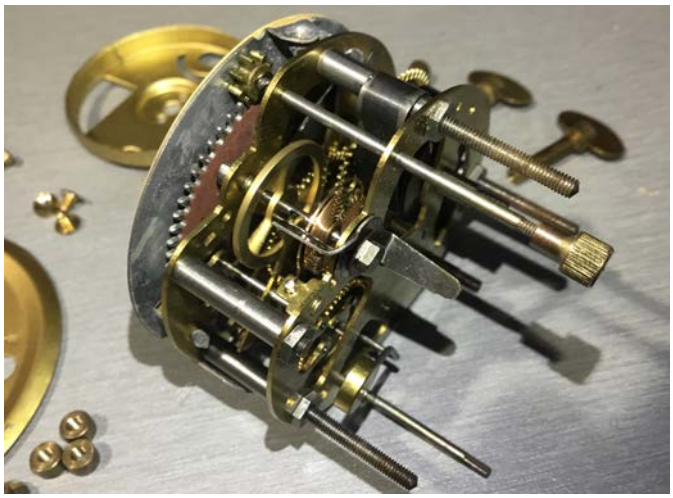
Website: www,ghohroudi.com, where you could see all his images. Majid is a close participant at OMiD museum, and I have never seen any one so devoted to astronomical photography.

Examining a Nikkor fisheye for his next star shoot. The entire optical inventory of OMiD museum is at his disposal. Right, a time exposure of Niasar observation dome, and facility. Niasar observatory has a number of telescopes.

Some of the images taken at Maranjab desert (right), and Zorastrian Temple in Niasar (left) reveal his pin point precision, and pre-planning to make his outstanding shots. Below, storm from Salt Lake, Iran central desert.

At IUT (Isfahan University of Technology) with physics students. IUT is one of the largest universities I have visited. It contains two mountains! In a typical seminar like this one on “Succeeding in your product the romantic way”, female students always outnumber the boys. I met so many talented students who have developed their own product goals, and have hope to create successful designs.

With sociologist professor, writer Amir Rafipur (left) at OMiD. Visitors from Sepehr Astronomical Society of Kashan: They have weekly educational sessions for the youth, and access to Niasar observatory for scheduled sky observations (opposite page). This small observatory has been putting out spectroscopic data, and other research about galaxies.



Restoration of an antique clock from 1930’s for OMiD museum was both challenging, and fun. The porcelain housing was designed, and fabricated in Germany while the movement was Swiss made. Everything sounded so easy although the mechanical alignment between porcelain, and the precision clock’s assembly was not entirely an easy accomplishment.

Events Calendar

January 2018

Photonics West, Bios

US, San Francisco 01/27-02/01

February

Photonics Russia

Russia, 2/27-3/02

March

Photonics China / OFC

Shanghai, 3/14-16 /San Diego 03/13-15

April

Analytica

Munich, Germany, 4/ 10-13

May

CLEO

US, San Jose Convention 5/15-17

June

July

Inustrial Export Russia

Yekateringburg, 07/10-12

August

Photonics San Diego

US, San Diego 8/21-23

China Optoelectronic Expo

China, Shenzhen 9/5-8

September

Photonics India

India, Bangalore 9/26-28

October

November

Medica Trade Fair

Germany, Dusseldorf 11/12-15

December