NORTH AMERICAN EDITION
Boston® update
GP NEWS AND INFORMATION FROM BAUSCH & LOMB
VOLUME 16 • MAY 2005

Virtual Fitting of GP Lenses: A New Frontier

by Alex Cannella, RN, FCLSA

AMONG the reasons practitioners give for not fitting GP lenses is that there are too many variables and the diagnostic fitting process is too time-consuming. And indeed that may be the case if a diagnostic lens does not fit and one or more additional lenses must be tried in order to determine the best fit.

What if the practitioner was free to do the diagnostic fitting at his/her convenience? What if the GP lens diagnostic fitting process did not involve trying various lenses on eyes for evaluation before placing a lens order? What if the patient need not even be present to perform a diagnostic GP lens fitting? What if the best fitting lens could be determined quickly and that order sent electronically to the laboratory? And what if the patient lens received by the practitioner would fit each patient with a degree of accuracy that met or exceeded 90%?

Hard to believe? It's true and it's almost here. Virtual GP lens fitting using topography and a computer software fitting program will allow practitioners to fit a given eye

continued on page 2

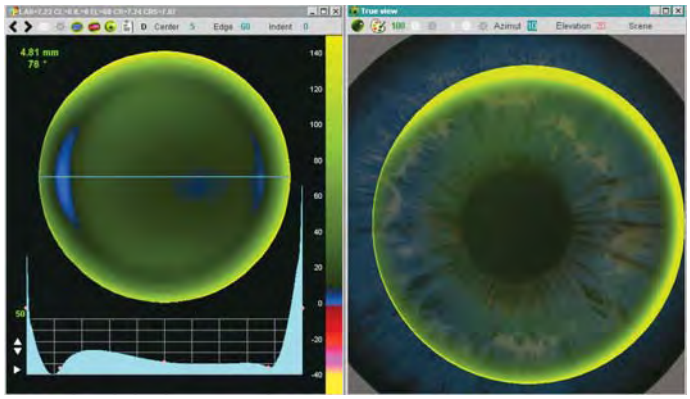


Figure 1a. Virtual lens fitting using simulated fluorescein pattern and on-eye evaluation.

Linking Standards with Product Performance

by Marianne Yarmey, Manager, New Business Technologies, Bausch & Lomb Wilmington

AS THE global marketplace expands, companies understand that conforming to international standards is necessary to improve their competitiveness in the world. Standards that once only defined product specifications are now expanding to focus on product performance. Ideally, GP material standards should allow eye care professionals to easily compare materials currently on the market and choose those most suited for their patient's vision needs. However, due to the variability in measuring these standard parameters, published product specifications can often be misleading. In addition, standards may not always reflect real life performance. In this article, we will explore two common standard parameters for GP materials, oxygen permeability and wetting angle. These standard parameters are often difficult to compare when published by different companies due to the large number of variables that can affect each measurement. In addition, while standard test methods

continued on page 6

IN THIS ISSUE...

Virtual Fitting of GP Lenses: A New Frontier . . . . . page 1
Linking Standards with Product Performance . . . . . page 1
Focal Points™: The Power of Computing . . . . . page 4
Legends of Contact Lenses Honored . . . . . page 5
LEAN: In Pursuit of the Perfect Process . . . . . page 10
International Congress in Slovakia . . . . . page 11
Around & About . . . . . page 12

DID YOU KNOW?

Did you know that Bausch & Lomb recently introduced its FDA-approved Vision Shaping Treatment™ (VST) system in the U.S.?

Vision Shaping Treatment is an "umbrella" concept for ortho-k fitting using a variety of methods and a series of tested and proven overnight orthokeratology designs.

VST will be distributed in the U.S. only through a select group of Authorized Boston Manufacturers, currently BE Retainer, Contex OK E-System, DreamLens, and Euclid Emerald.

FDA-required Certification Seminars are being held in major U.S. cities. Certification is also available online at: http://www.bausch.com/vst

continued from page 1

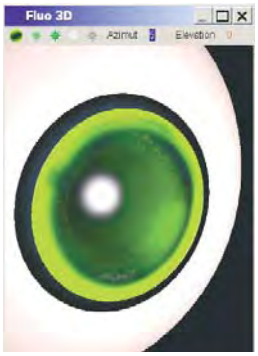


Figure 1b. Simulated on-eye lens fit evaluation.

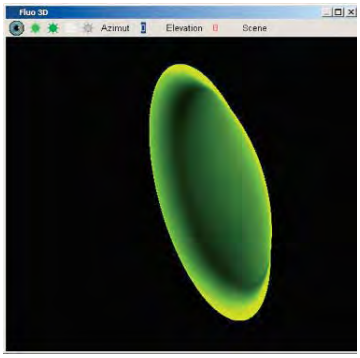


Figure 1c. Simulated fluorescein pattern, rotated viewing angle.

with the appropriate lens design, manipulate the fit using simulated fluorescein patterns, evaluate the lens on-eye in a variety of views, and order a lens that will fit each patient with a high degree of accuracy (Figure 1a, page 1; Figures 1b, 1c, this page).

New, sophisticated GP lens fitting software programs are about to be introduced that will enable the practitioner to fit GP lenses of all types easily and accurately for each patient. The investment on the practitioner's part is the cost of a corneal topographer, an inexpensive GP design/fitting software program, and the desire to take their contact lens practice strongly into the future.

One such program is called Focal Points Professional. Focal Points was invented by Renato Liffredo, an engineer and computer software designer from Milan, Italy. Mr. Liffredo's idea was to develop ways to accelerate technology gains for GP lens design, manufacture, and fitting through computer software programs.

At this moment, the majority of Focal Points users worldwide are manufacturing laboratories that have embraced this technology to create, license, and manufacture a multitude of sophisticated GP lens designs. But advanced manufacturing is of little value if the fitting process is still mired in the past. The next phase is for this technology to extend to the fitter.

Here is how a system such as this is envisioned to work:

1. Using software such as Focal Points, specific patient topography data is imported into the program.
2. Based on the type of lens being fitted (toric, keratoconus, ortho-k, etc.), a GP design is chosen.
3. The software program applies the chosen design to the patient's topography. With future versions, the practitioner can allow the software program to automatically select and apply the proper design

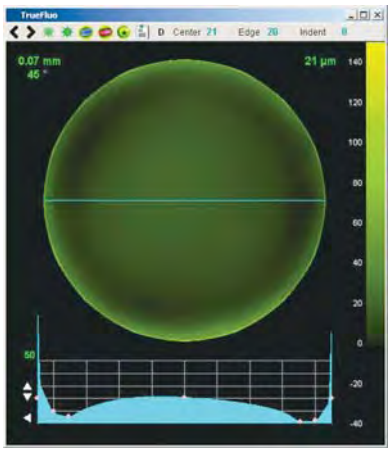


Figure 2a. Central tear layer thickness = 20 µm with 50 µm edge lift before design change

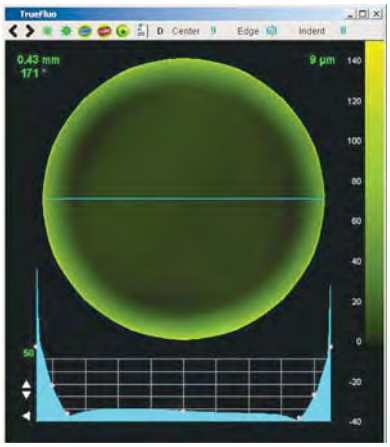


Figure 2b. Same cornea and design after change to 9µm central tear thickness with 60-µm edge lift

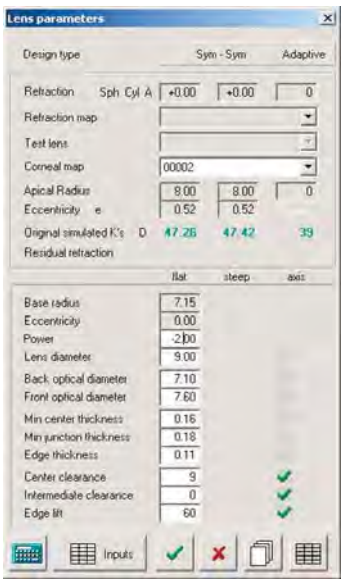


Figure 3.
Lens parameter record

INTERNATIONAL OFFICES:

Europe: Mr. Marcel Kopito
e:mail marcel_kopito@bausch.com
Italy and Balkans: Mr. Guido Crespi
e:mail guido_crespi@bausch.com
Russia, CIS & Baltic States:
Mr. Marcel Kopito
e:mail marcel_kopito@bausch.com
Australia/New Zealand/Singapore/Malaysia:
Mr. Charles Di Natale
e:mail charles_dinatale@bausch.com
Chinas: PRC/Taiwan/HK: Mr. Jackson Leung
e:mail jackson_leung@bausch.com
Japan and South Korea:
Mr. Tatsuo Harata
e:mail tatsuo_harata@attglobal.net
For Latin America: Mr. David Cardente

NORTH AMERICAN OFFICES:

Jonathan Jacobson
Director of Global GP Business
e:mail jonathan_jacobson@bausch.com
David Cardente
Latin America Regional Manager/
Int'l Customer Support Manager
e:mail david_cardente@bausch.com
Alex Cannella
Global Professional Services Manager
e:mail alex_cannella@bausch.com
Elizabeth Shannon Morin
Executive Administrative Assistant
e:mail elizabeth_morin@bausch.com
Christina Englund
Senior Graphic Designer
e:mail christina_englund@bausch.com
David Bland
Director of North American Sales
e:mail david_bland@bausch.com
George Andrews
Product Manager,
Boston Materials & Solutions
e:mail george_andrews@bausch.com
Milt Kallas
Regional Manager
e:mail milton_kallas@bausch.com
Dennis McClure
Regional Manager
e:mail dennis_mcclure@bausch.com
Andrew White
Regional Manager
e:mail andrew_white@bausch.com
John Hibbs
Regional Manager
e:mail john_hibbs@bausch.com
Sonia Tumminelli
Sales Promotions Manager
e:mail sonia_tumminelli@bausch.com
Amy Kelly
GP Lab Sales Representative
e:mail amy.j.kelly@bausch.com

FOR NEWSLETTER INFORMATION CONTACT:

Bausch & Lomb, Incorporated
100 Research Drive, Wilmington, MA 01887 USA
phone 1-978-658-6111 / e:mail boston@bausch.com

The Boston Update Newsletter publishes articles and studies contributed by practitioners from around the world. The points of view presented should not necessarily be construed as those of Bausch & Lomb, Inc. ®/™ denote trademarks of Bausch & Lomb, Inc.. © Bausch & Lomb, Inc. All rights reserved. Trademarks proprietary to other corporations used with permission.

for a specific topography. Nothing ***really*** "magic" happens yet, right?

Based upon the design, the fit can now be manipulated according to the rules associated with that design. For example, if the design is a fixed parameter system such as Boston® Envision®, the design can be altered according to the range of base curves and diameters available for Envision.

Figure 4

The real value of Focal Points will be the ability to apply and manipulate completely adaptive GP lens designs. These designs can be changed not by altering curve radii and widths, but by specifying the clearance between the back surface of the lens and the front surface of the cornea at any point along the back lens surface. The tear layer thickness can be analyzed and changed until a desired lens-cornea fitting relationship, as evidenced by simulated fluorescein pattern, is achieved (Figures 2a and 2b).

The "magic" begins when the best-fit design is chosen. Quickly, the fitter will come to the realization that during this process, no reference was required to keratometry readings. It is also realized that no curvature calculations or choices were necessary during the process. The best-fit GP lens design parameters are automatically calculated and recorded at the same time the virtual GP lens was being fitted and refined. All this information is then stored in the patient record for future reference (Figure 3).

The magic continues as the patient lens data is transferred electronically to the lab where the manufacturing side of Focal Points takes over. Here the patient lens data is bar-coded and printed out so that all the lens information can be quickly and accurately scanned into the lathe manufacturing program (Figure 4). The obvious advantage of this system is that fewer errors will be made using this approach compared to manually receiving, transcribing, and entering lens parameters, as the human element is removed or limited.

The real magic occurs when the practitioner receives the lens, places it on the patient's eye for evaluation, and finds that the actual lens fit mirrors the fitting image seen during the virtual fitting process with a high degree of accuracy (Figures 5a and 5b).

It is easy to see that this process not only streamlines choosing the initial lens, but it also shortens the entire fitting process. Table 1 shows a comparison between actual diagnostic lens fitting and the virtual process.

Further refinements to this fitting software continue to be made with the intent of streamlining the virtual fitting process even more. Focal Points Professional will soon introduce a new in-office fitting software program called "Quick Fit." This program is expected to be a very affordable package for practitioner offices.

So, the path is clear. The use of topography coupled with software fitting programs will become the diagnostic fitting for the future… the very near future. True specialty and custom GP lens fitting is at hand. Laboratories have and continue to make the investments necessary to facilitate this next advancement. What remains is for each practitioner to now determine the direction and outlook for their own contact lens practices over the next 5 or 10 years, and ask themselves where they want to be and then ask where they are going to be.

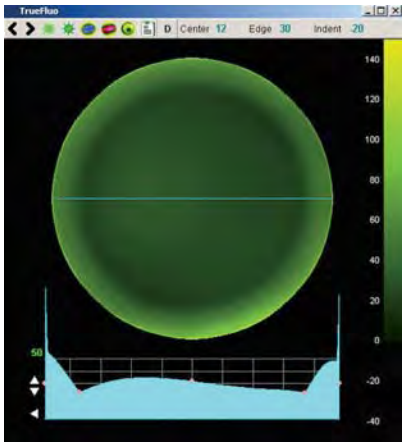


Figure 5a. Simulated spherical adaptive GP fluorescein pattern on topography

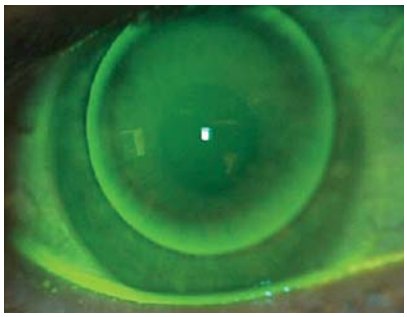


Figure 5b. Actual spherical adaptive GP fluorescein pattern on topography

Diagnostic Fitting	Virtual Fitting
Visit One: • Obtain patient data (K's/Rx) • Calculate initial trial lens parameters • Place lens on eye and allow to settle • If fit is acceptable, order lens from lab • If fit not acceptable, trial fit again and order • Lab ships lens same/next day • Patient required to be in office	**Visit One:** • Obtain patient data (Topography/Rx) • Import topography and choose appropriate initial lens from menu or choose Auto-Fit • Evaluate simulated fluorescein pattern • Adjust virtual lens design to determine best fit lens and electronically send order to lab • Lab ships lens same/next day • Patient ***not*** required to be in office
Visit Two: • Schedule patient visit for trial/dispensing • Patient education/dispense • If unacceptable, reorder	**Visit Two:** • Schedule patient visit for trial/dispensing • Evaluate lens on-eye • Patient education/dispense

Table 1

Focal Points

The Power of Computing in GP Lens Design and Manufacturing

by Kurtis Brown, Consultant, Bausch & Lomb Wilmington

THE gas permeable lens industry, like virtually all contemporary industries, has adopted computer-driven processes to improve productivity and quality. In most labs, computers have long been involved in a broad range of activities, from order taking to accounting. More recently, they have been brought into the manufacturing process. While progress in this area has been significant, there is growing awareness that much more is possible.

The efficiency, precision and reproducibility that modern computer numeric control (CNC) lathes deliver can be exceptional, but entering design data and making changes can be a very time consuming, cumbersome, and often expensive process. These limitations and inefficiencies confront all of the participants involved in the lens fitting process from the lens designer, to the manufacturing lab, to the fitter, as well as the processes and people who support them. To answer this need, Renato Liffredo of Advance Medical (Milan) developed Focal Points. This work earned Mr. Liffredo the prestigious EFCLIN Technology Award in 2002.

The Focal Points system is a collection of linked software programs that help the GP lens manufacturer integrate and fully exploit modern lathing technologies to efficiently provide gas permeable lens designs for optimal comfort and exacting reproducible quality. Additionally, a link between the practitioner and the manufacturer can be formed with the use of Focal Points Professional.

Barcoded job orders ensure error-free data entry at the lathe.

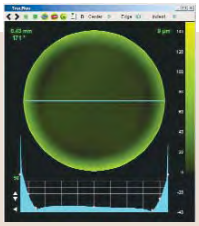
Renato Liffredo (left) receiving the 2002 EFCLIN Technology Award from Shimon Behar, EFCLIN president.

Focal Points Professional gives the fitter the ability to auto-fit truly custom lenses using a variety of commonly available corneal topographers. By combining the powerful design tools of Focal Points Designer with the ease and simplicity of auto-fitting, Focal Points Professional vastly simplifies the process of fitting even complex lenses such as torics, without diagnostic lenses.

Developed in association with manufacturers and fitters, the new Focal Points Professional is highly intuitive and designed with the fitter in mind. Most designs can be fit by simply selecting a patient from the database, loading a topographic map, and entering refraction data. By using the QuickFit feature, the rest of the lens parameters will be calculated and an interactive simulated fluorescein pattern will be displayed. Characteristics of the corneal topography of the patient's eye will determine which lens is initially selected and fit.

Of course, experienced fitters will have an array of customization tools to choose from if they wish to use them. However, they are not necessary to get an excellent fit the first time. Analysis of the lens form, of the tear layer, and of the power profile are all possible, offering fitters the ability to better predict the performance of lenses before they are manufactured and dispensed.

The simplicity of the fitting process will encourage practitioners uncomfortable with GP fitting to build their success rate and their confidence in GP fitting. Experienced GP fitters will enjoy the customization options and also will be encouraged to virtually fit a broader array of lenses faster and easier than they might otherwise have considered if each fit required a trial lens or a custom lens purchase.



Trial-free fitting may be possible with advanced simulated fluorescein displays.

On the laboratory side, order processing is simplified with the use of Focal Points Practitioner in some practical ways. First, orders coming in from fitters don't need to be re-entered into the system. When a new order is received, it automatically appears in the manufacturing queue, flagged for review. Laboratory personnel then review the order for pricing and for accuracy and, when satisfied that it is ready for production, accept the order and release it to production. At no point in the process does the lab need to enter data or calculate lens parameters; the order arrived from the fitter ready to go.

The communication between the lab and the fitter is two way. While new orders are coming into the lab, the lab is automatically sending price list updates, new lens designs, and

other messages back to the practitioner. When a new lens design is available, it will automatically appear as an option in Professional. Price lists and discounts are also maintained behind the scenes.

Focal Points will also handle invoicing, sales reports, inventory, and raw material management, as well as shipping and case labeling.

The optical performance of the lens can be controlled with a variety of tools.

Increasingly, practitioners are investing in corneal topographers and, more importantly, are getting in the habit of using them as part of their standard exam. By giving them the tools that they need to broaden the value of this technology, Focal Points Professional will greatly aid in the growth of the GP segment. By simplifying the fitting process and improving the initial success rate, Focal Points Professional will add greatly to the perceived value of GP lenses to the practices of both experienced and novice fitters.

TOPOGRAPHERS CURRENTLY SUPPORTED BY FOCAL POINTS

C.S.O. S.R.L., Italy

EyeMap EH-290, Alcon, USA

Humphrey Refractor/Keratographer, Carl Zeiss Meditech, Inc., Germany

Keratron Optikon 200

Keratron Scout

Magellan Mapper, NIDEK, Japan

OPD-Scan Refractive Power/Corneal Analyzer, NIDEK, Japan

E-300, Medmont Pty., Australia

CT-100, Shin-Nippon Commerce, Inc., Japan

TMS-4, Tomey Corp., Japan

Legends of Contact Lenses Honored

Left to right: Perry Rosenthal, Leonard Seidner, and Donald Korb (Not pictured: Newton Wesley). Photo courtesy of John Rinehart OD.

Four pioneers and major contributors to the field of contact lens design, materials, education, and research were honored at the 31st Annual Bronstein Contact Lens Seminar held recently in Scottsdale, Arizona.

The 2005 recipients of the Bronstein Memorial Awards are Drs. Donald Korb, Perry Rosenthal, Leonard Seidner, and Newton Wesley.

Dr. Edward Bennett, Executive Director of the Gas Permeable Lens Institute (GPLI), the educational branch of the CLMA, was Master of Ceremonies and made the presentations to the three recipients who attended the event. Dr. Newton Wesley was unable to attend, but provided an audio message of thanks to his friends and colleagues for the award.

Dr. Wesley was honored (along with former student and business partner George Jessen) for the development, education, and public awareness created in the US for contact lenses as the result of their work with the Plastic Contact Lens Company of Chicago, Illinois.

Dr. Donald Korb was cited for his research and clinical contributions in the field of contact lens design and clinical physiology, particularly for the introduction of the"Korb-Fit" philosophy that was incorporated into the Polycon lens GP design.

Dr. Perry Rosenthal was honored for his role in the development and leadership, as a founder of Polymer Technology, in introducing the Boston® GP lens materials and solutions. Dr. Rosenthal was also honored for his ongoing work as founder and president of the Boston Foundation for Sight, a nonprofit foundation that provides Dr. Rosenthal's unique vision restoring lens designs to people afflicted with debilitating corneal disorders.

Dr. Leonard Seidner was honored for his work with Norman Gaylord to introduce the first FDA-approved GP lens in the U.S. in 1979, with the introduction of the Polycon GP lens and the low-eccentricity aspheric presbyopic GPs, such as the Lifestyle GP multifocal lens.

continued from page 1

for operating oxygen permeability can be indicative of on-eye lens oxygen permeability, standard contact angle bench test methods have not shown high correlation to on-eye lens wettability.

DK MEASUREMENTS

In 1996, ISO established the international standard for measuring oxygen permeability (Dk) of contact lens materials (ISO/DIS 9913-1 *Determination of Oxygen Permeability and Transmissibility by the FATT Method*). This method, developed by Dr. Irving Fatt Ph.D. at the University of California, Berkeley, USA, measures the oxygen permeability of GP lenses under wet conditions and simulates the Dk performance of a lens on the cornea. During the test, a lens is placed on an oxygen probe with the other side of the lens exposed to an oxygen saturated, buffered saline solution. As the probe measures the concentration of oxygen, it depletes the oxygen on the probe side of the lens causing an oxygen differential across the lens (Figure 2). Oxygen will then diffuse from a region of high oxygen concentration through the lens toward the probe side where the oxygen concentration is low. This rate of oxygen flow or Dk can then be calculated through a series of equations. Similarly when a lens is worn on the eye, the cornea depletes the oxygen on one side of the lens causing oxygen to diffuse through the lens towards the cornea to replenish this oxygen. The ability of a lens material to allow oxygen to pass through it is very important to corneal health, closely linking this ISO/Fatt Dk measurement with actual on-eye performance.

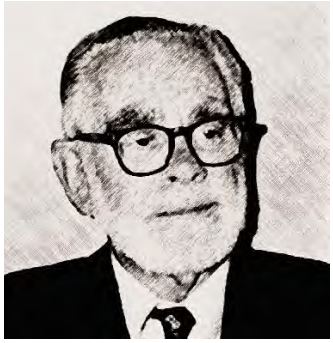


Figure 1.
Dr. Irving Fatt PhD, 1920–1996

In 1998, the Contact Lens Manufacturers Association (CLMA) became increasingly concerned that inaccurate permeability measurements were still being reported by manufacturers. They commissioned the Eye Physiology & Ocular Prosthetics Laboratory at the University of Alabama Birmingham to derive the Dk values of contact lens materials marketed in the U.S. by the ISO 9913-1 method. As new GP materials continue to enter the market, the CLMA recommends that manufacturers submit the new material to this laboratory for confirmation of the Dk.

In a recent study using the standard ISO/Fatt Dk method, we measured the permeability of some of our own materials and newer materials from other companies that have recently entered the market. We found some discrepancies between the Dk values that are currently reported in the manufacturers' literature and those that we measured (Table 1). To verify the accuracy of our results, standards were obtained from the Permeability Reference Material Repository (custodian Dr. William J. Benjamin, University of Alabama, Birmingham, Alabama). Measurements carried out by our lab and official repository values are presented in Table 2, showing close agreement. From these findings, we would suggest that our results are closer to the real Dk value of these materials than Dk values currently reported in the literature. This difference in Dk values leads us to the conclusion and recommendation that Dk measurements should be confirmed for all new materials by an impartial recognized laboratory, such as that of the repository lab at he School of Optometry, University of Alabama at Birmingham, through blind submission of the material from an independent source.

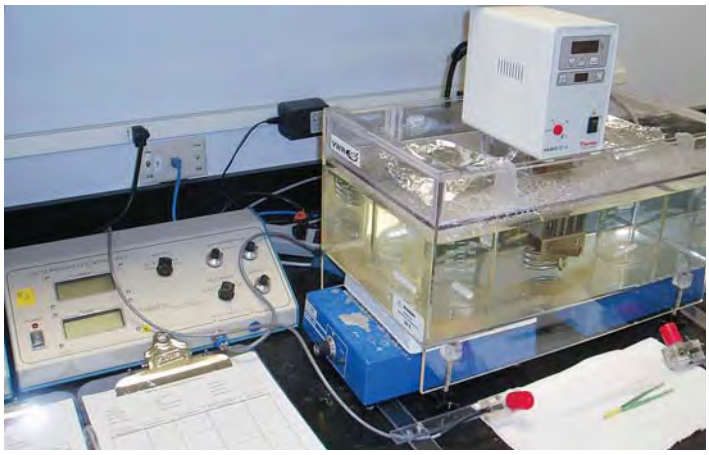


Figure 2. Rehder Polarographic Oxygen Permeability Unit

CONTACT ANGLE MEASUREMENTS

Contact angle is a measure of the ability of a liquid to wet a solid surface producing a uniform, continuous film. The standard test method for measuring the contact angle of contact lens materials is defined in ANSI Z80.20-1998, Section 8.11. Two techniques are described in this standard, the sessile drop method and the captive bubble method. The sessile drop method measures the angle of

TABLE 1. OXYGEN PERMEABILITY MEASURED USING ISO/FATT METHOD

Material	Average Dk*	95% Confidence Limits*	Published Values
PARAGON HDS	41	39.4 – 43.1	58*
BOSTON EQUALENS® II	85	76.5 – 93.5	85*
OPTIMUM EXTREME	96	86.2 – 107.9	123.8*
VISTA OPTICS HiRI	9	8.1 – 9.8	50†
ONSI-56	33	30.4 – 34.9	56*

* $\times 10^{-11}$ (cm^3 O_2) (cm) / [(sec)(cm^2)(mmHg)]
† No units given

TABLE 2. OXYGEN PERMEABILITIES OF REFERENCE MATERIALS MEASURED BY ISO/FATT METHOD

Material	Dk*	95% Confidence Limits*	Repository Value*†
FLUOROPERM 30	25.8	24.6 – 27.2	26.0
BOSTON® EQUALENS I	47.0	43.1 – 57.1	51.2
MENICON EX	57.3	52.2 – 63.5	62.4

* $\times 10^{-11}$ (cm^3 O_2) (cm) / [(sec)(cm^2)(mmHg)]
† Repository values were complied from the measurements at four different laboratories. Individual labs values were within 8.8% of the above repository values.

contact between a liquid and solid when a drop of standard saline solution is placed on a flat polymer surface in air. The captive bubble method measures the angle of contact between a gas bubble and a polymer surface when a bubble of air floats up against the underside of a flat polymer surface in standard saline solution (Figure 3). The CLMA has adopted this method as their standard for determining wetting angles on GP materials. Due to the wide number of variables that can influence wetting angle measurements, the ANSI standard clearly defines the sample preparation, sample conditioning, experimental apparatus, and environmental conditions under which these tests must be run. In a recent study, we measured the wetting angle of some our own materials and materials from other manufacturers by the captive bubble method. All materials were cleaned with Boston Laboratory Lens Cleanser and rinsed with distilled water. Boston GP materials were then cleaned with Boston Advance Cleaner, rinsed with water, and soaked in Boston Advance Comfort Formula Conditioning solution for 7 days. Contamac Optimum GP materials were cleaned in Optimum by Lobob Cleaning/Disinfecting/Storage Solution and then soaked in this solution for 7 days. All materials were rinsed with distilled water before making captive bubble measurements in phosphate buffered saline solution (PBS). Table 3 shows the contact angle values and different methods published for several GP materials of different manufacturers. A more dynamic method of measuring contact angle is the Wilhelmy plate method where wetting angles are not measured directly, but are calculated from force measurements as a function of immersion depth of the lens material in saline solution (Figure 3).

TABLE 3. CONTACT ANGLE RESULTS FOR GP MATERIALS USING VARIOUS TECHNIQUES

Material	Contact Angle	
BOSTON® EQUALENS II	30°	
BOSTON® EO	49°	
BOSTON® XO	49°	
PARAGON HDS	14.7° (receding angle)	
PARAGON HDS 100	42° (receding angle)	
OPTIMUM COMFORT	6°	60°
OPTIMUM EXTREME	6°	66°
MENICON Z	24° (after soaking)	
VISTA OPTICS HiRI	<25°	

Captive Bubble, ISO/ANSI | Receding angle | Not specified

It is our opinion that, due to the dynamic nature of the Wilhelmy plate method, two contact angles, an advancing and a receding angle, for a single lens material can be easily measured. The difference between these two angles is called the contact angle hysteresis. Both angles are needed to completely describe the wetting properties dynamically.

We investigated the dynamic advancing and receding contact angles of these same GP materials using a Cahn Dynamic Contact Angle (DCA) Analyzer DC315. The motor speed was set to 100 microns/sec. The immersion depth for all samples was 6 mm. Samples were cleaned and conditioned prior to the contact angle measurements. All measurements were done in PBS (phosphate buffered saline solution). The results of this study are shown in Graphs 1 and 2. Only small differences were observed in contact angle measurements when comparing the various GP materials. The biggest difference in contact angle measurements was observed when comparing care solutions. The samples soaked in Boston Advance Conditioning Solution demonstrated lower advancing contact angles and hysteresis values than the Optimum care solutions and the PBS.

A word of caution must be raised when attempting to use these contact angle results to predict actual on-eye wetting characteristic of a GP lens. Although we feel that the DCA method is a more accurate way of

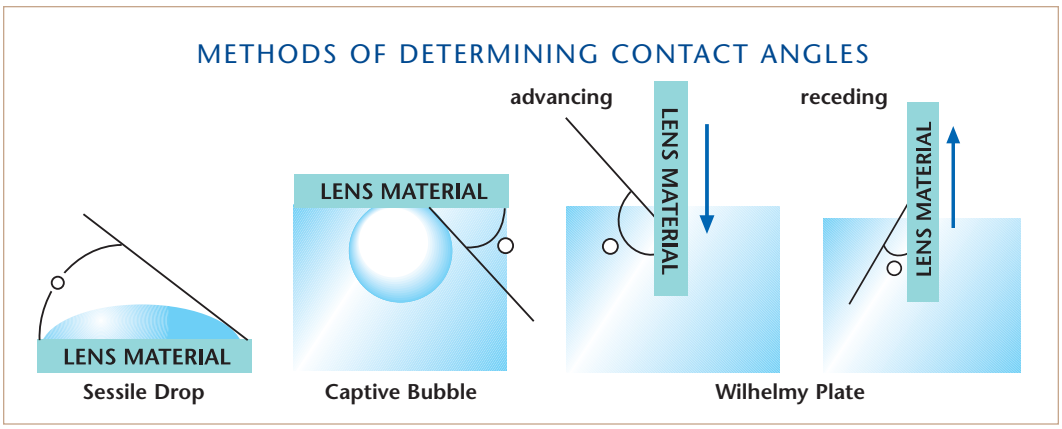
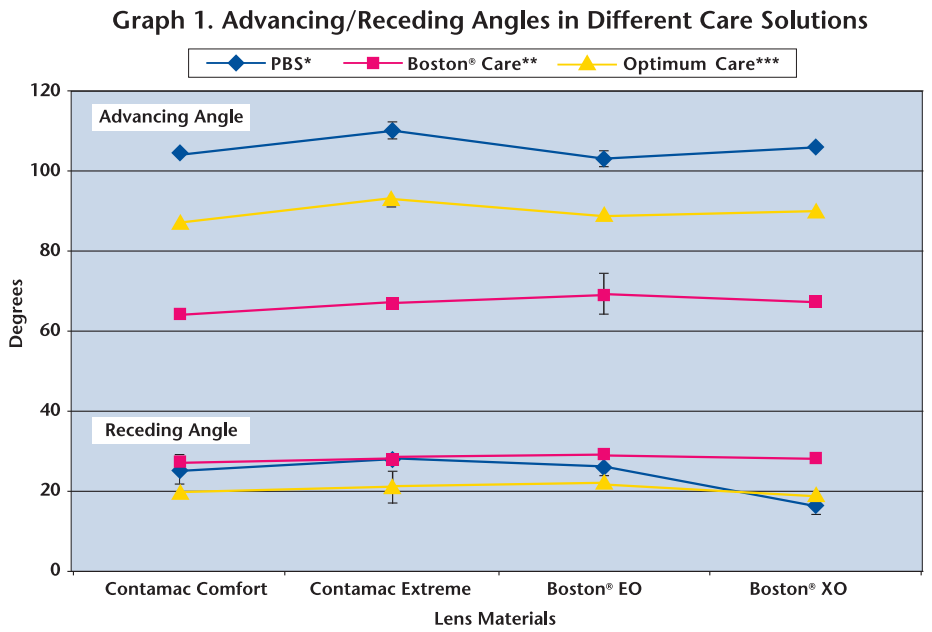


Figure 3



* Samples were cleaned with Boston® Laboratory Lens Cleanser, rinsed with distilled water, and then soaked for 7 days in Phosphate Buffered Saline.

** Samples were cleaned with Boston Laboratory Lens Cleanser, rinsed with distilled water, cleaned with Boston ADVANCE Cleaner, rinsed with distilled water, soaked in Boston Advance® Comfort Formula Conditioning Solution for 7 days.

*** Samples were cleaned with Boston Laboratory Lens Cleanser, rinsed with water, cleaned with Optimum by Lobob Cleaning/Disinfecting/Storage Solution (C/D/S), rinsed with water, soaked in Optimum C/D/S for 7 days, rinsed with distilled water, placed in Optimum by Lobob Wetting/Rewetting Drop and in-the–eye lubricant for 20 minutes.

Graph 1. Advancing and receding contact angles measured for various GP materials soaked in different care solutions. All samples were first cleaned with Boston Laboratory Lens Cleanser and rinsed with water. The samples were then cleaned using the appropriate cleaner and were placed in separate vials to soak in the appropriate conditioning solution for seven days. Just prior to testing each wafer was removed from solution and rinsed by dipping it 10 times into 15 ml of PBS. All dynamic contact angle measurements were made in PBS.

measuring contact angle, none of these techniques provide results that correlate well with on-eye wetting of GP lenses. For example, although most GP contact lens materials have a lower wetting angle than PMMA, most clinicians would agree that PMMA has probably the best on-eye wetting properties for a rigid contact lens material. This is due to the fact that a drop of conditioning solution applied to a lens is quickly replaced by tear fluid upon insertion of the lens in the eye. Tear fluid contains proteins and lipids that greatly affect the wetting characteristic of a lens. Tear components can vary significantly from person to person and therefore, it is difficult to develop a laboratory standard that accurately predicts on-eye wetting performance.

CONCLUSIONS

Ideally, the eye care professional should be able to compare and choose the most appropriate GP material when fitting a patient with contact lenses using the data from the material properties reported by the manufacturer. For example, oxygen permeability is a key indicator in determining product performance for particular applications such as Extended Wear and Overnight Ortho-K/corneal reshaping. However, due to the variability, it is often difficult to compare published Dk values. The need remains for the permeability measurements of all GP materials to be tested by the same impartial recognized laboratory so that this parameter can be compared on an equal basis.

On-eye wetting characteristics of a GP material are also very important to the eye care professional in choosing a GP material. Unfortunately, although the captive bubble method for determining contact angle has become the industry standard, it is not indicative of real life performance. Other methods for measuring contact angle, perhaps more accurate than captive bubble, also do not reliably predict on-eye wetting. The need still exists for a standard test method that directly correlates material surface properties with on-eye wetting performance.

References

W. J. Benjamin, A. Ho, L.C. Winterton, K. Nakada, *Optometry and Vision Science,* **1997,** 74 (Suppl): 95

W.J. Benjamin, Q.A. Cappelli, *Optometry and Vision Science,* **2002,** 79 (1)

R.H. Dettre, R.E. Johnson, *J. Phys. Chem.,* **1965,** 69, 1507

J. Zhang, R. Herskowitz, *Contact Lens Spectrum,* October **1992**

S. Tonge, L. Jones, S. Goodball, B. Tighe, *Current Eye Research,* **2001,** 23 (1), 51

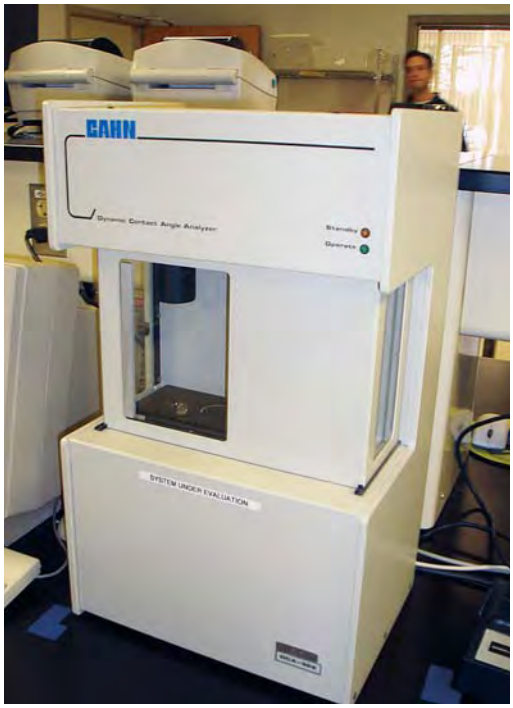
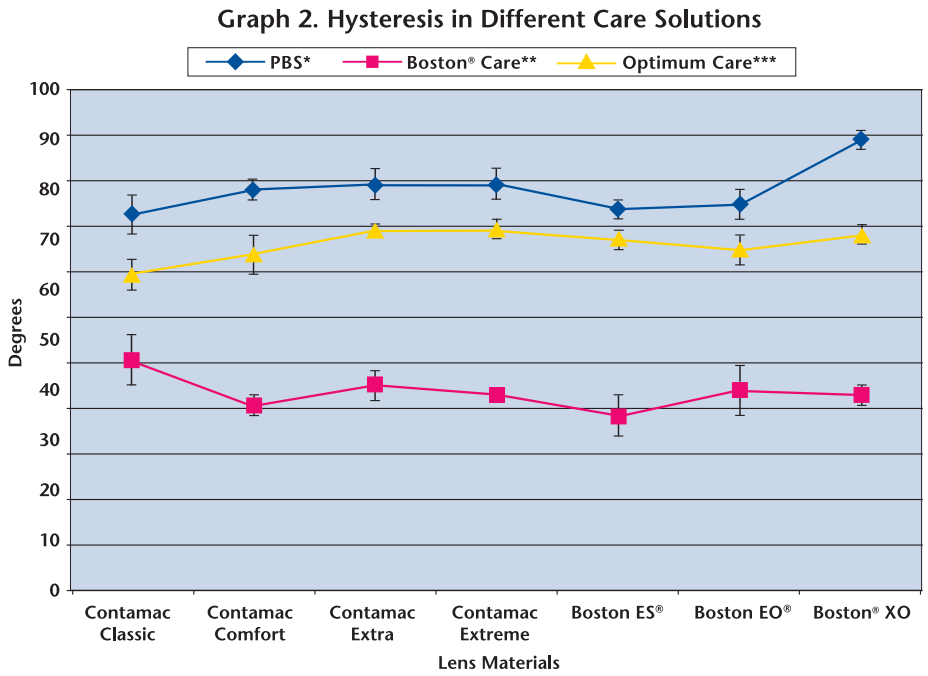


Figure 4. Cahn Dynamic Contact Angle Analyzer DC315



* Samples were cleaned with Boston® Laboratory Lens Cleanser, rinsed with distilled water, and then soaked for 7 days in Phosphate Buffered Saline.

** Samples were cleaned with Boston Laboratory Lens Cleanser, rinsed with distilled water, cleaned with Boston ADVANCE Cleaner, rinsed with distilled water, soaked in Boston Advance® Comfort Formula Conditioning Solution for 7 days.

*** Samples were cleaned with Boston Laboratory Lens Cleanser, rinsed with water, cleaned with Optimum by Lobob Cleaning/Disinfecting/Storage Solution (C/D/S), rinsed with water, soaked in Optimum C/D/S for 7 days, rinsed with distilled water, placed in Optimum by Lobob Wetting/Rewetting Drop and in-the–eye lubricant for 20 minutes.

Graph 2. Contact angle hysteresis was obtained by subtracting the receding contact angle from the advancing contact angle for each GP material. Lower hysteresis values correlate with better wetting properties under the conditions of the study.

Spotlight on Jim Lunkley

Editor's note: Jim Lunkley is Boston's Technical Field Representative, based in Fountain Hills, Arizona, who travels around the globe to assist and advise customers.

Would you tell our readers briefly about your background, education, job experience, and positions held?

After graduating from college in the early 1970s, my wife and I moved to Phoenix. I worked for a motorcycle rental business for a few months and then purchased the business. This business happened to be located in the same building as Guaranteed Contact Lens, the developers of the Polycon GP material. By the late 1970s, I was out of the motorcycle business and was contacted by Syntex Ophthalmics, the company that purchased Polycon from Guaranteed Contact Lens, and asked if I would consider working for them. Starting in 1978, I worked for Syntex as a Process Engineer and Production Manager until 1989 when I moved to my present position.

How do you see the GP industry evolving from a technical perspective over the next 5 to 10 years?

I think the GP industry will become an industry of specialty products. This will mean that it will become increasingly important for GP manufacturers to implement equipment and processes that can accurately and consistently produce and evaluate the more complicated designs.

Tell us little about your family, your hobbies, and what you like to do in your free time.

My wife and I met in high school and got married when we were in college. We have been happily married for 36 years. In my spare time I like to get on my motorcycle and ride. I also like to do some woodworking and landscape oil painting.

What part of your job gives you the most personal satisfaction?

I find it very satisfying to meet and work with our customers on a one-to-one basis. I especially enjoy helping them solve problems and improve their manufacturing systems.

What do you find most challenging about your work?

The amount of travel I do can sometimes be challenging. Working with people new to the industry is also quite challenging because there are many terms and processes unique to this industry. This can also lead to some of the most rewarding experiences.

LEAN: In Pursuit of the Perfect Process

by Ken Harty, Operations Manager, Bausch & Lomb Wilmington

IS THE perfect manufacturing process one that results in the lowest operating cost, produces zero defects, results in perfect on-time delivery, or some combination of these attributes? At our Wilmington, Massachusetts production facility where we produce Boston® buttons, we define the perfect manufacturing process as ***one that consists entirely of value-added operations producing the right product, the right way, at the right time.***

"Value-added" is defined as those activities that, ***in the eyes of the final customer,*** make a product or service more valuable. For example, precision grinding of a GP button to a 12.7 mm diameter is a value-added operation. Conversely, non value-adding activities do not make the product or service more valuable and are considered wasteful. For example, transferring parts from one container to another as they move through the manufacturing operations may seem to be a necessary activity, but is considered wasteful based on our definition of value in the eyes of the customer.

Our goal is to continually improve all aspects of our processes by focusing on the methodical elimination of successive layers of wasteful, non-valued-added activities. To guide us in this endeavor, we have recently embraced a manufacturing philosophy commonly referred to as LEAN Manufacturing.

LEAN Manufacturing is defined as "a manufacturing philosophy that shortens the time-line between the customer order and the shipment by eliminating waste."

This system is based upon the revolutionary production system pioneered by the Toyota Motor Corporation. While LEAN manufacturing has become increasingly popular in recent years, it is still highly underutilized in many industries.

LEAN Manufacturing is defined as "a manufacturing philosophy that shortens the time-line between the customer order and the shipment by eliminating waste."

We believe that LEAN manufacturing provides the tools and methods that will allow us to move closer to achieving that perfect manufacturing process. So, what exactly is LEAN manufacturing?

Introducing a new philosophy to an existing manufacturing system is often easier said than done. The key to successfully introducing such a change in philosophy is that every employee within the organization must be trained to ***recognize*** what those wasteful, non-value-added activities are. Experience shows that when an organization realizes that an activity being performed is wasteful, employees will intuitively look for ways to eliminate or improve the activity.

The LEAN philosophy has identified seven categories of wasteful activities. Upon adopting this program, every employee in our facility received training and awareness of these seven "deadly" wastes and is always on the lookout for activities that fall into one of these categories.

1. **Overproduction:** producing too much or too soon, resulting in poor flow of information or goods and excessive inventories.
2. **Defects:** frequent errors in paperwork, product quality problems, or poor delivery performance.
3. **Inventory:** excessive storage and delay of information or products, resulting in excessive cost and poor customer service.
4. **Over-processing:** going about work processes using the wrong set of tools, procedures, or systems, often when a simpler approach may be more effective.
5. **Transportation:** excessive movement of people, information, or goods, resulting in wasted time, effort, and cost.
6. **Waiting:** long periods of inactivity for people, information, or goods, resulting in poor flow and long lead times.
7. **Motion:** excess motion to locate tools, obtain parts, or retrieve information, resulting in poor workplace organization, frequently lost items, and delays.

It's important to notice that these "wastes" apply not only to the manufacture of product, but also to the flow of information. Purchasing components, processing orders/invoices, and other

logistical/administrative activities are just as prone to wasteful, non-value-added activities as are manufacturing operations.

Do these "deadly wastes" exist in your operation? Would you be surprised to learn that close to 95% of all activities in most industries, are considered to be non-value-added, and thus are wasteful? It is this seemingly vast amount of wasteful activity that represents the significant opportunity for improvement.

In the 18 months since this philosophy has been implemented in our operation, we have seen significant improvement in many facets of our business. For instance, we have…

- Reduced our lead-time to manufacture product by 45%,
- Reduced our inventories by 20%,
- Increased our product yields by 4%, while maintaining same-day commitment-to-order shipment.

In addition, there have been numerous improvements to workplace organization, streamlined administrative processing, and space utilization.

We believe LEAN provides the most comprehensive manufacturing philosophy that any organization can employ to further improve every aspect of their operation. In future articles, I will present and discuss some of the specific tools LEAN employs and describe how we've put them to use. I will also present how these principles might be applied to the lab manufacturing processes.

Please contact us if you seek further information as to how we have successfully integrated LEAN into our organization. Ken Harty may be reached at +1-978-694-1229 or by email at: ken_harty@bausch.com.

First International Contact Lens Congress Held in Slovakia

By Marcel Kopito, Regional Business Manager, Europe and Middle East

The first-ever contact lens congress to be held in the Slovakian capital of Bratislava occurred on April 2, 2005. The congress was organized by Angela de Rossi Jelsova, a well-known contact lens practitioner in Bratislava. Distinguished presenters spoke on a variety of topics:

- Mr. Wolfgang Cagnolati, President of the German Optometry Association, gave an overview of optometry in Europe and the world.
- Prof. Theo Gumpelmayr, President of the Austrian Optometry Association, described the academic program for optometrists in Austria.
- Prof. Anton Gerinic of the University Eye Clinic of Bratislava spoke on the topic "Contact Lenses and Children."
- Dr. Torsten Bendrat, Consultant to the Slovakian government on European economic issues, described how technology can be transformed into economic opportunities in new European markets.
- Mr. Ulrich Maxam, of Deutsch Optiker Zeitung, presented the challenges for the optometry and optician professions in competition with the internet, large chains, and hypermarkets.
- Christian Krüsi from Galifa Contact Lenses in Switzerland discussed the wide range of opportunities in contact lens fitting, employing modern aspheric, toric and multifocal lens designs.

Before proceeding with the election of the Board of Directors of the new Prof. Wichterle Contact Lens Association, Sibylle Scholtz from AMO Germany recounted an exciting history of Prof. Otto Wichterle, his work, his independent political voice, and his dedication to the development of the first HEMA soft lens material, which eventually became the Bausch & Lomb Sof-Lens in the U.S. in 1971.

Elected to the Board of Directors were: President Angela de Rossi and Board Members Katarina Eckert, Engineer/Optician, and Sibylle Scholtz, Biologist/Chemist (See photo). The evening celebration featured a concert by various orchestras and choirs from Bratislava in the Mirror Hall of the Primatial Palace. This historical hall was witness to the signing of the peace treaty of Bratislava between Napoleon and the Federated countries in 1805 after the battle of Austerlitz.

Left to right: Sibylle Scholtz, Angela de Rossi, Katarina Eckert

Around & About

Boston® Informational, Educational, and Marketing Events

Above, left to right: Sra. Daniela Garese (Montevideo, Uruguay), Sami El Hage OD (Houston, TX) and Penny Asbell, MD (Long Island, NY) attending the Pan American Academy of Ophthalmology in Santiago, Chile in March. Drs. Asbell and El Hage were among the featured speakers on orthokeratology from the U.S.

Right: Dr. Li Yuan Yuan (standing) and Jonathan Jacobson meet for discussion during Shanghai Optical Fair in April.

Above, at left: Marcel Kopito, with Dmitry Mirsaiafov of Doctorlens Moscow, presents information on Boston products and activities at the Moscow Optical Trade Show.

Right, standing in center: Kurtis Brown and Jim Lunkley (Bausch & Lomb) visit Dr. Tom Tao (second from left) and sales and production team at Autek Lab in Hefei, China PRC, to assist in maximizing GP lens production techniques.

Left: Jim Lunkley (Bausch & Lomb) with GP lab manufacturing personnel at Wenzhou Medical College, China PRC, to initiate Boston GP lens production in their new laboratory facility.

EVENTS CALENDAR

MAY

1–5	ARVO* Ft. Lauderdale, FL, USA
6–9	MIDO** Milan, Italy

JUNE

3–5	BCLA* Brighton, UK
22–26	AOA (American Optometric Assn.) Dallas, TX, USA
24–26	ECLSO* London, UK

JULY

28–31	GOS, 3rd Annual** Chicago, IL, USA

AUGUST

14–17	Int'l Vision Expo West Las Vegas, NV, USA
21–23	China Int'l Optics Fair** Beijing, China (PRC)

* Indicates Boston attendance
** Indicates Boston exhibit

Bausch & Lomb, Incorporated
100 Research Drive
Wilmington, MA 01887 USA

RPL0204 Printed in USA. All rights reserved.