

Planetarium systems



## Planetariums from Carl Zeiss

Perfect interplay of optical-mechanical and digital planetarium projection.



We make it visible.



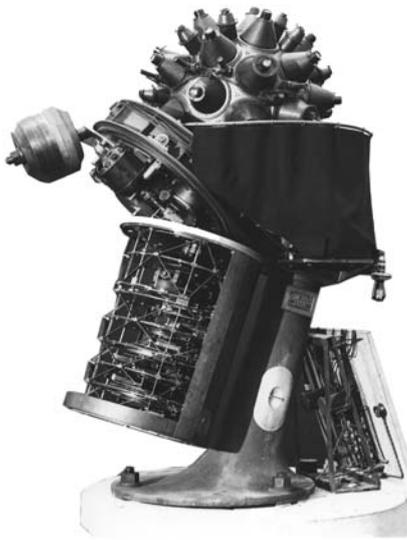
The moment when they see  
themselves as astronauts.

**This is the moment we work for.**

// PLANETARIUMS  
MADE BY CARL ZEISS



# Planetariums – made by Carl Zeiss.



*First projection planetarium instrument: ZEISS Planetarium Model I*

## **The invention of the planetarium**

Carl Zeiss has made planetarium history ever since Walther Bauersfeld, ingenious designer and member of the company's management board, presented the world's first projection planetarium at the German Museum in Munich on October 21st, 1923.

Known as Model I, it set technical standards that are still valid today. It was followed by Models II through IX, small- and medium-dome planetariums, and video systems for full-dome projection. The "Wonder of Jena" and its successors can be found all over the globe, many of them having been in service for decades. Each is a masterpiece of engineering, hand-assembled and almost indestructible.

Carl Zeiss attaches great importance to realistic star projections. To emulate the sight of their originals in the night sky, planetarium stars need to be bright, circular, and as tiny as possible. Sophisticated illuminating systems, specially designed fiber optics and particular technologies for making extremely accurate star masks, precision lens systems and proprietary optical coatings – in short, a great number of well-tuned factors are needed to create an artificial sky to the quality standard one would expect from Carl Zeiss: a jet-black background with pin-sharp, clear and brilliant stars

as small as to appear as points like their natural counterparts. The night sky as seen from the Earth under prime observation conditions is the yardstick for the projected stars, their proper number, and the simulation of their motions.

## **The distinctive quality of a planetarium**

Despite their differences, all planetariums of the world have one thing in common: They present and interpret the sight of the night sky, and explain why the aspect changes with time and location. This task – the predominant one for most planetariums – can be performed in a plain, matter-of-fact way, or so as to be emotional and inspiring. In the latter case, brilliant stars are a must.

Today, more than ever, the challenge is to simulate the magnificent view of a night sky that is unspoiled by city light and haze. The splendor should not be impaired by faint projections, pixel structures or movements jumping in the rhythm of a frame rate. The desired degree of realism can be satisfied only by optical-mechanical projection.



### **Fiber optics for the protagonists**

In the foreseeable future, no digital projection system can image stars in a quality comparable to those created by Carl Zeiss planetarium projectors featuring fiber optics. Fibers bundle the light into pencils, one for each star. The stars so projected are point-like and bright – up to 1000 lx. By contrast, digital stars consist of pixels. The brighter a star, the more pixels are needed. As a result, the stars are discs with staircase pixel structures. Their average brightness is a mere 50 lx.

### **Fulldome technology for the other players**

The possibility to play interactive applications and videos all over the planetarium dome has changed the planetarium. By means of UNIVIEW, the universe can be visualized from the solar system to the boundary of the observable cosmos – a wonderful supplement to the sky as viewed from the Earth, and a science-based way of disseminating knowledge of the world at large.

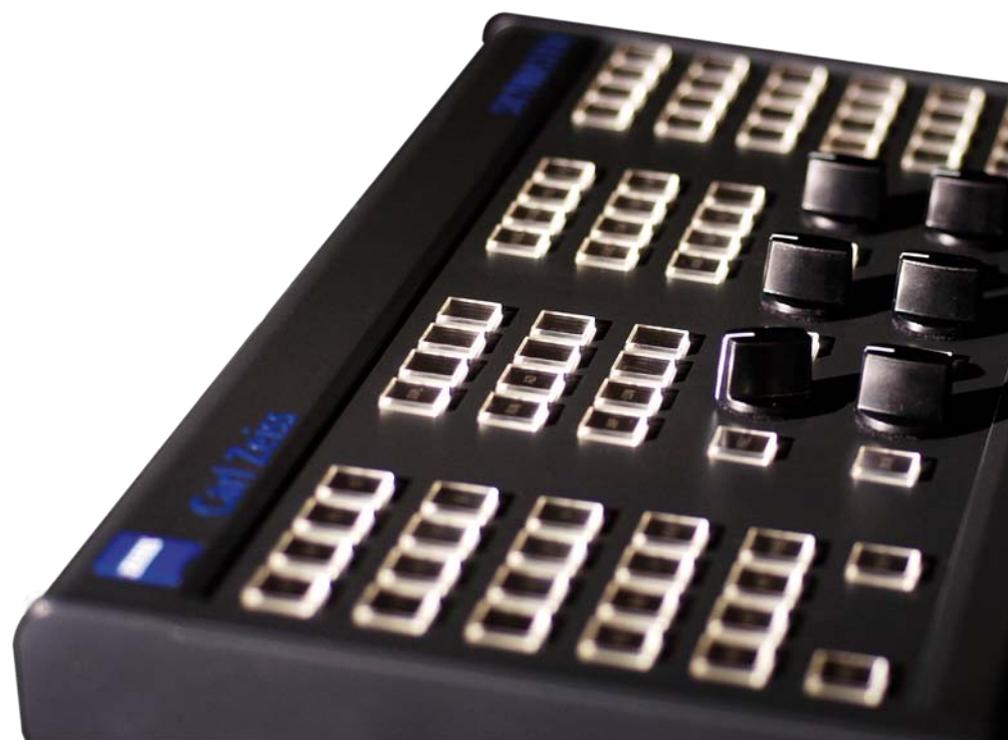
Computer animations, live footage and time-lapse shots, rendered for dome projection, bring quite new themes to the planetarium. With modern full-dome technology, the spectrum of shows can be expanded to attract new target audiences.

### **Combined control for the operator**

The control units of a planetarium projector and a digital full-dome system from Carl Zeiss are interlinked so that both systems play their astronomical displays in synchronism. The digital constellation figures register with the analog stars; digital planets, including zoom function and correct phases, are always at their proper locations relative to the stars. Changes of place and time occur simultaneously in both systems. A common operating panel is provided for easy manual and programmed control of virtually all planetarium functions. The replay of programmed digital and analog functions takes place concurrently, too.

*Every single star is a light spot projected through a separate optical fiber. Each fiber – up to 9 000 for a planetarium projector – is positioned manually. The fiber technology delivers about 100 times the brightness achieved by classical illuminating methods.*

*The convenient panel for manual and time-controlled operation of the planetarium functions is available for analog and digital systems, whether used separately or in combination.*





The moment, the unreachable is suddenly within our grasp and the inscrutable becomes transparent.

**This is the moment we work for.**

A planetarium makes our world come across vividly and comprehensibly. How does a lunar eclipse come into being? Why is the waxing moon to be found in the evening sky only? Why can I identify the points of the compass by looking at the Big Dipper?

These are some of the many questions answered in planetariums every day. Audiences are enlightened about natural phenomena, made to understand complex relations, and familiarized with a considerable part of the world. The planetarium is an audiovisual aid that is irreplaceable by any other medium.

#### **Astronomy and society**

Observation of the starry sky is as old as mankind itself and the basis of our view of the world. Rightly, then, astronomy is the central theme of any planetarium. Today it is part of a comprehensive store of knowledge as well as of global research efforts. In the planetarium, it is visualized in the context of history, multiple cultures, and many other sciences. The modern planetarium offers multimedia capabilities to disseminate knowledge and provide entertainment for all sections of society. Among the ingredients of planetarium shows today are factual information as well as emotion, excitement and wit. This makes the planetarium a very special place of learning – whether you present a live show relying on the capabilities of a star projector and the power of your personality, or whether your team stages a perfect full-dome show involving movie records and dramaturgical devices.

#### **The modern planetarium**

Carl Zeiss offers varied solutions for modern planetariums – solutions tailored to different dome sizes, aims and demands.

On the following pages we present examples of planetarium systems. Contact us to talk about your own planetarium project. Ask for detailed information about our planetarium projectors, full-dome systems, and services.

Every planetarium project is unique. Let us work at your project together – you will profit from our project managers' decades of experience.

## How we support your planetarium project.

Planetarium projectors and full-dome systems are our core competence. You can be sure that the systems ordered will be designed, manufactured, configured, tested, installed and serviced by Carl Zeiss – with a quality claim that is substantiated by independently certified management systems.

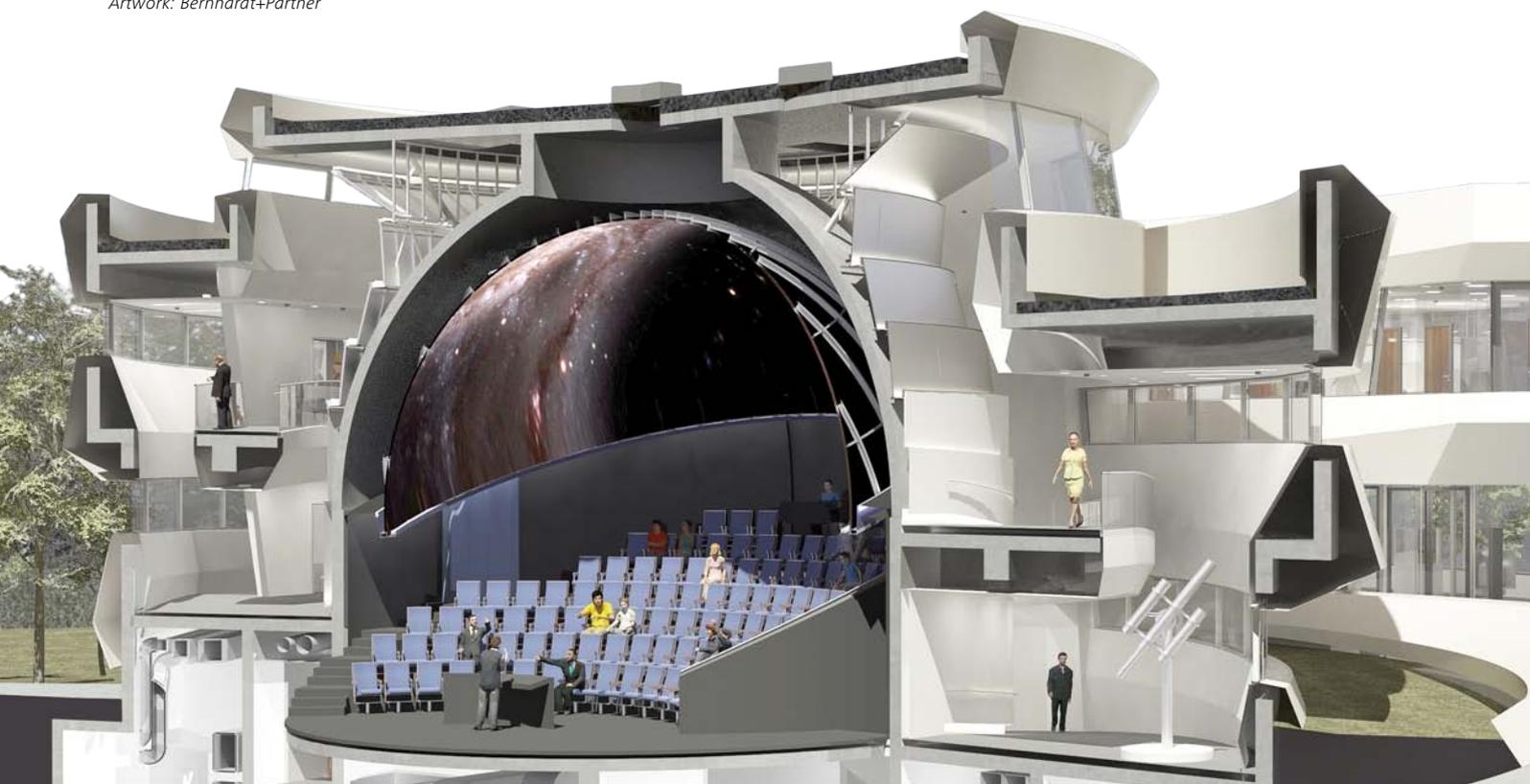
### **Deliveries and services**

We will gladly undertake extra services for your planetarium project and arrange the optimum scope of performance with you. In every trade involved we collaborate with a number of experienced subcontractors to offer solutions meeting your requirements and your budget. If it is of advantage to you, we will supply and install the entire technical equipment of your auditorium.

*The "House of Astronomy" in Heidelberg (Germany), implemented in 2011, uses the dome as a central auditorium for lectures and presentations. It is 12 m in diameter, tilted by 25 degrees, and equipped with a five-channel powerdome®VELVET system.*

*The project was designed by architects Bernhardt+Partner in close collaboration with Carl Zeiss.*

*Artwork: Bernhardt+Partner*



### **Our spectrum of supplies includes**

- Projection domes
- Audio systems
- Dome lighting systems
- Operating panels
- Elevators for planetarium systems
- Planetarium seating
- Laser effect systems
- Interior design (barriers/operator desk design)
- Workstations for digital productions
- Fulldome Shows

### **Project management**

With Carl Zeiss, you can be confident that your project is in good hands. One of our project managers will personally attend to it – from the first contact to the opening ceremony. Involve us in your planning in good time – we will help you with ideas, suggestions and solutions. Consider that some interfaces with the building have to be allowed for to ensure optimum dome projection. We will assist your project team with tried-and-approved guidelines and checklists.

### **Installation and training**

All planetarium and fulldome systems are installed and startup-tested by our specialists. In this way we ensure that all components are properly installed and operate in perfect coordination. Installation will be accompanied by instructing your staff about the operation and maintenance of your new planetarium system. As far as required you can contract us to provide detailed training covering all or selected system components.

### **Fulldome shows**

With powerdome you can compile astronomical shows in fulldome format, present them live, and record them for automatic playback. The powerdome®ShowManager and the operating panel are powerful tools for a wide variety of operating, programming, recording and playback functions.

You can also present fulldome shows made by other producers, of course. We can offer you a varied spectrum of shows by international producers and will help with other language versions if required. The shows will be supplied in a readily playable powerdome format without extra charge.

With the software supplied you can convert shows provided in dome master format into the powerdome format and play them.

### **powerdome®Library**

The powerdome®Library forms part of all powerdome systems. It consists of several hours of video clips between ten seconds and several minutes in length. You will find a great many trailers, hundreds of images, music files and other contents.

### **Maintenance and upgrades**

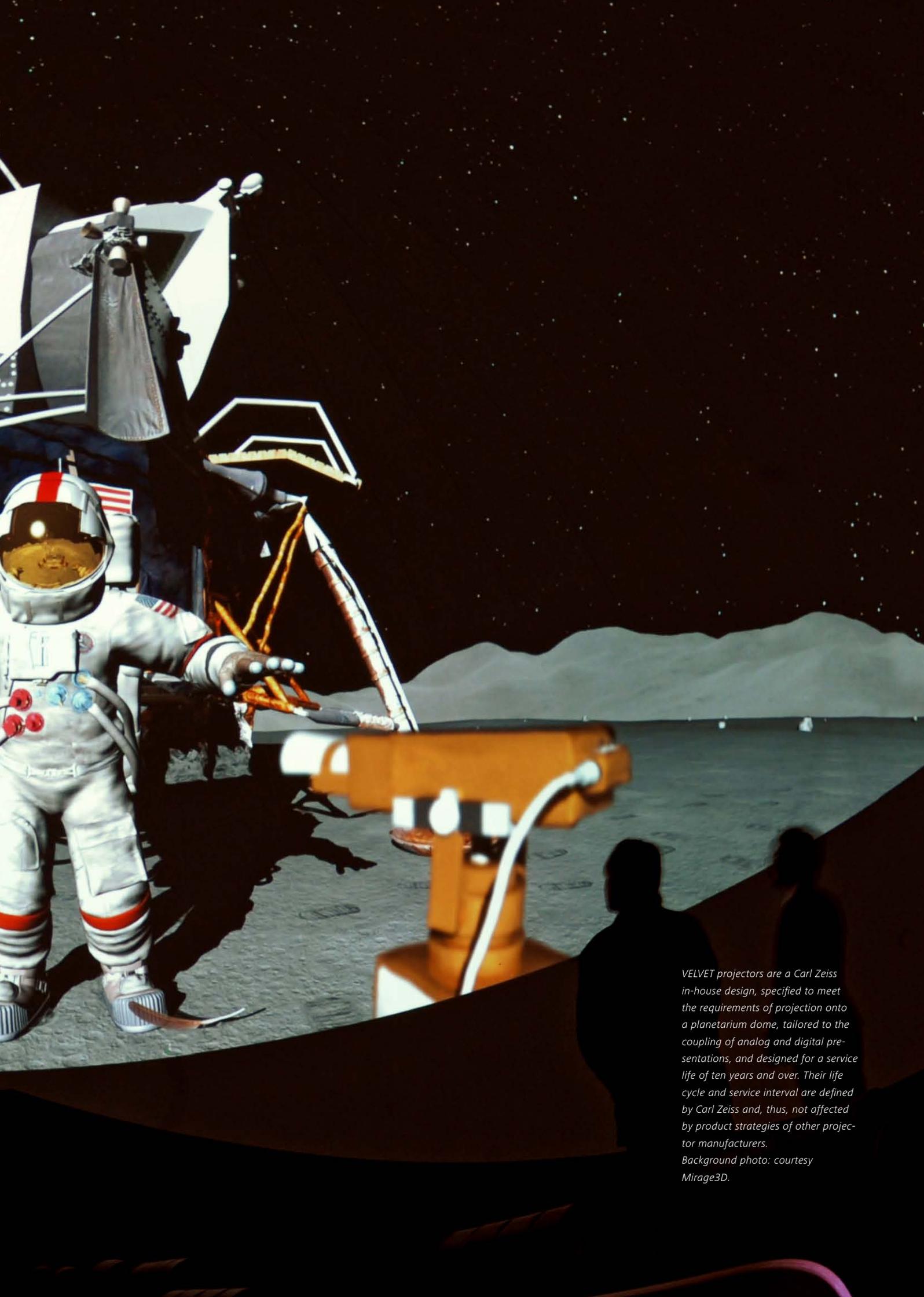
Maintenance at regular intervals extends the useful life of your system. Carl Zeiss offers you online servicing, software and hardware updates (some of them for free), and maintenance contracts for dependable operation.

## The right system – a key factor of your success.

Which planetarium system is the right one for you? Obviously, every planetarium project depends on the budget. But we know as well that, within a certain budget, choice of the right equipment determines the scope, flexibility and lifetime of using a planetarium system. Whether a system is the right one for you can be seen from its specification and functionality, but also from its useful life and from the promptness of help available from your supplier in case of any problems.

Technological excellence and reliability are warranted by Carl Zeiss.





*VELVET projectors are a Carl Zeiss in-house design, specified to meet the requirements of projection onto a planetarium dome, tailored to the coupling of analog and digital presentations, and designed for a service life of ten years and over. Their life cycle and service interval are defined by Carl Zeiss and, thus, not affected by product strategies of other projector manufacturers.*

*Background photo: courtesy Mirage3D.*

# The best technologies for your educational tasks.

There is a good reason why, almost a hundred years after its invention, the projection planetarium still is the best tool for teaching astronomy. It is only on the projection dome that the night sky can be vividly simulated and the laws of nature that determine the motions of stars and planets become easily comprehensible.

## **Planetarium projector**

There is a good reason also why the most efficient simulation of the celestial bodies is by means of an opto-mechanical planetarium projector. Its precision mechanisms are specialized to perfectly mimic the night sky and its motions; its optics image the stars as realistically as technology can achieve. For all that, technology is but a means to an end: a brilliant star scene ensures that astronomical knowledge is passed in an emotional, inspiring way.

Carl Zeiss planetarium systems assist you, as a presenter, producer or planetarium manager, by delivering perfect simulations and allowing you to focus on your presentation rather than on operating controls. Apart from that, your investments in equipment and in your productions enjoy long-term protection.

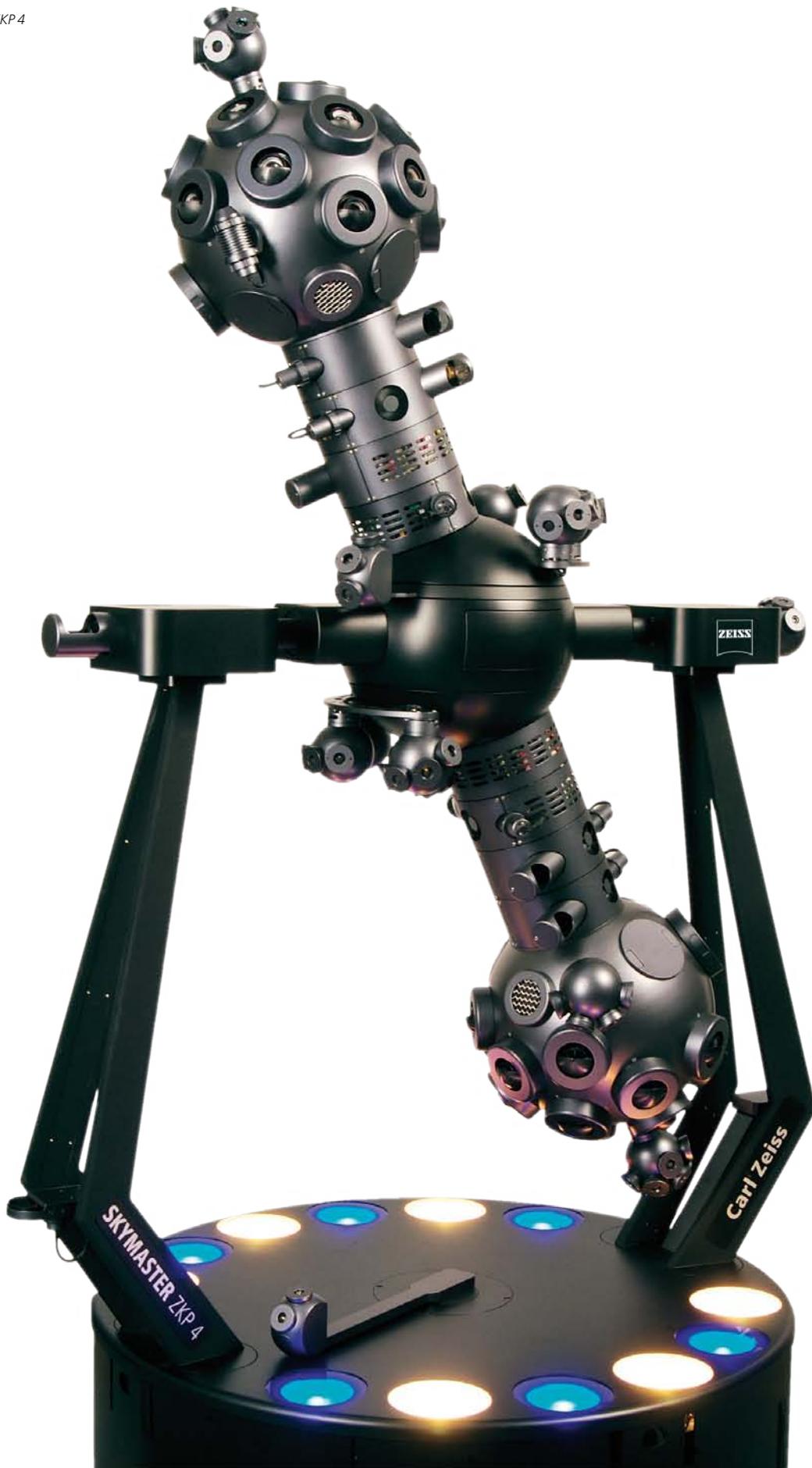
## **The challenge of education**

Education is the most important mission of almost all small-dome planetariums. The distinctive merit of such planetariums is the presence of a live narrator who interacts with the audience and promptly responds to questions and debates.

It is for this very purpose – interactive work with the audience, for public education and specialist training – that we have developed the SKYMASTER ZKP 4, our smallest star projector. Designed for planetariums with small and medium-sized domes, it offers the performance and functionality of a large projection machine and permits unrestricted live operation on the basis of topocentric computations. Enter a time and a place, and within a few seconds you get the desired position of the sky.

The starry sky projected by the SKYMASTER ZKP 4 is the result of decades of development aimed at a realistic view. With our laser-perforated star masks, specially designed fiber optics and LED light sources, the stars are tiny but fabulously bright and clear. Stars bound to inspire and enthrall: the greatest pleasure a planetarium can contribute to education!

SKYMASTER ZKP 4



### Digital planetarium

Education and training does not mean that you have to do without the gamut of digital display capabilities. Additional constellation outlines and stick figures, planetary orbit trails, the formation of the analemma, zooming in to planets and the Moon are strong points of the digital planetarium. We have integrated these and many other elements of didactic astronomy into our digital powerdome planetarium. Moreover, you can control the digital components in the same way as you do the "analog" planetarium functions – in live or automatic mode, using the operating panel or the PC control system, or both.

### Fulldome systems

For digital projection you can choose from several options. The best one is a powerdome@VELVET fulldome system. VELVET, a video projector designed and built by Carl Zeiss, boasts a completely black background to the imagery. When used in combination with SKYMASTER ZKP 4, it does not impair the contrast of the projected sky – the sky remains as dark and the stars as bright as ever. With two VELVET projectors at the dome center you get a convincing fulldome image.

SPACEGATE Nova is the name of our multichannel fulldome projection systems, which are based on commercial video projectors and can be adapted to domes of any size. A broad spectrum of configurations permits individual requirements to be satisfied in the best possible way.

You can, of course, use either fulldome system for playing fulldome shows and other contents produced for the full-dome format.



**VELVET**



Carl Zeiss



# The Starball – with the best sky for science and entertainment.

## STARMAS-TER Starball

*The starball version for domes up to 24 m in diameter is particularly intended for full-dome theaters that can do without a fully configured planetarium projector. This version presents the complete starry sky including the Milky Way, with Sun and Moon as options (integrated on the starball).*



Projecting a fascinatingly clear and brilliant night sky is indispensable also for many planetariums with larger domes – planetariums that not only disseminate knowledge but also offer various programs in the fields of science, culture and entertainment.

## STARMAS-TER Starball

In domes between 14 m and 24 m in diameter, the STARMAS-TER Starball with its new LED light sources delivers stars of maximum definition and superb brilliance.

STARMAS-TER is a planetarium projector of modular design. For full-dome theaters keen to present their audiences with the starry sky in all its beauty, we recommend starball versions featuring the complete fixed-star sky, with or without projectors for Sun and Moon. All other celestial objects (such as planets), constellation figures and didactic functions are played by the full-dome system. Here again, power-dome ensures synchronous superimposition of the opto-mechanically produced sky and the components delivered digitally.

In its fully configured version, STARMAS-TER offers the complete functionality of a traditional planetarium projector. Live operation, automatic playback, and recording of control data during operation are a matter-of-factness. STARMAS-TER is suitable not only for traditional dome theaters: thanks to controlled shutters, it can also be installed in tilted domes. Thus equipped, STARMAS-TER is a full-blown planetarium projector fit for exciting planetarium shows – even without any full-dome system or supplementary projectors!

## powerdome

STARMAS-TER can be combined with any Carl Zeiss powerdome full-dome system. The digital planetarium functions meticulously follow the starball motions. You can create your own shows combining classical planetarium and full-dome projections, or have recourse to an increasing number of show productions available under license. Carl Zeiss is a distributor of many shows, among them shows for children, school and adult education, presentations in special fields of knowledge, entertainment, and art projects.

The system combination of STARMAS-TER and VELVET full-dome projection is an ideal match.



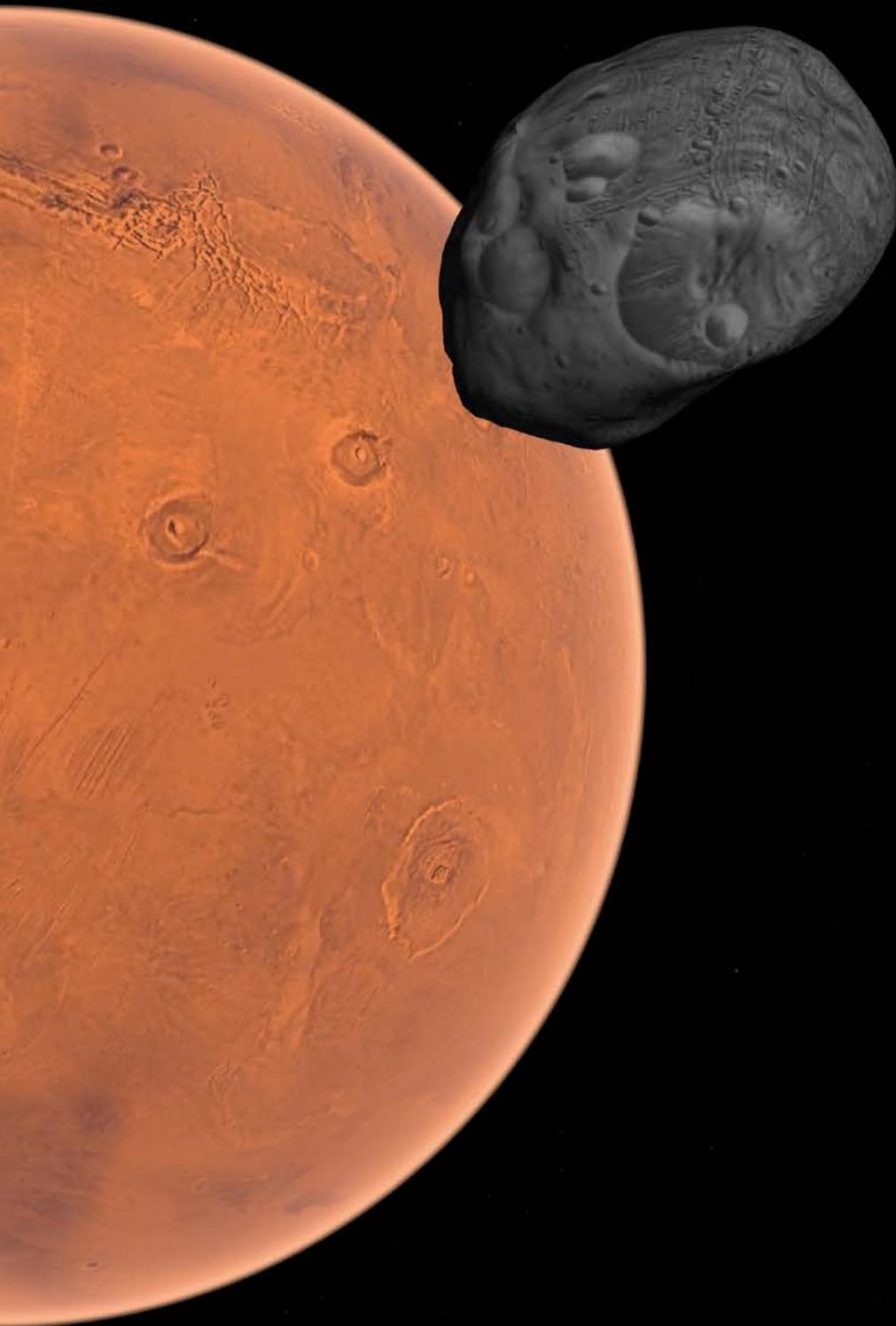
*STARMASTER  
Planetarium projector for medium  
dome sizes (approx. 14 m to 20 m in  
diameter, with tilts up to 30°).  
STARMASTER is of modular design  
and can be equipped with many  
astronomical and didactic projectors  
as options.*

## **UNIVIEW**

Our small terrestrial world is embedded in a cosmos of unimaginable expanse. What science and technology have found out about the universe adds up to a fantastic picture. Software programs have been developed that visualize practically the entire observable universe, to give us an idea of its structure and its development.

UNIVIEW Theater is a package of such programs, which comprises the Digital Universe developed by the American Museum of Natural History and other data, and processes them three-dimensional for dome projection. UNIVIEW can be integrated into powerdome fulldome systems as an option. Use mouse clicks or a game controller to travel through the solar system or across the Milky Way, and have a look at our region in space from a distance of several million light years. UNIVIEW adds another dimension to your planetarium experience.





*Mars and its moon Phobos are floating in the apparently infinite dome space. UNIVIEW presents the surface features of Mars in extreme detail. Take your audience to the Grand Cañon and to the biggest volcano of the solar system – live and interactively.*

## Universality for large and extra-large star theaters.

### **UNIVERSARIUM**

Wherever they are on the globe, large planetariums attract large audiences. From Nagoya to New York, from Saint Louis to São Paulo and from Moscow to Beijing, the many popular shows offered by large star theaters draw hundreds of thousands of viewers every year. Visitors expect to be enlightened on astronomical phenomena, to hear about things hidden in the vastness of the universe, and to learn how mankind has garnered all that knowledge.

Large planetariums are places of multi-medial experience. Although they often offer live shows, they predominantly present carefully produced pre-recorded shows, often with professional actors as speakers and narrators, and accompanied by especially composed music.

It is for these spectacular theaters with domes sized up to 50 m in diameter that UNIVERSARIUM has been designed, the top-of-the-line model among the Carl Zeiss planetarium projectors. Of modular design, it is a full-blown planetarium projector that can simulate the complete range of celestial phenomena or be limited to the projection of the stars, with or without the bodies of the solar system.

### **powerdome®VELVET**

For those large multimedia dome theaters, a fulldome system is a matter of course. Our VELVET system has been developed especially for planetariums attaching great importance to the presentation and explanation of the sky as viewed from the Earth. With eight or more image channels, VELVET projectors deliver dome-covering imagery of extremely high contrast, brightness and resolution, as a harmonic complement to the UNIVERSARIUM.

It is no question that all fulldome systems from Carl Zeiss also work without, and independently from, a planetarium projector. For large domes, too, we offer varied systems based on commercial video projectors, which we configure to your individual requirements, e.g., regarding the projection channels. We can also arrange the equipment for shadow-free projection obliquely past the central planetarium projector.



*UNIVERSARIUM Starball  
for large domes (up to 50 m in diam-  
eter and tilts up to 30°).*

// WONDERMENT  
MADE BY CARL ZEISS



The moment science and wonderment merge.  
**This is the moment we work for.**

Whether small, medium-sized or large planetarium – the starry sky is in the focus of interest in any star theater. The best possible way to present it is by means of an optical-mechanical planetarium projector made by Carl Zeiss. Carl Zeiss stars are not only a perfectly realistic image of their originals; they also inspire their viewers and motivate them to occupy themselves with science.

With fulldome technology in perfect harmony with the planetarium projector, science merges with wonderment, horizons broaden, and hitherto unknown worlds open up. The VELVET fulldome technology developed by Carl Zeiss is an excellent answer to the specific challenges of dome projection.

Serving the aims of your planetarium, you can select the optimum solution from a broad spectrum of products, from modular components and individually configurable systems. Carl Zeiss will assist you in conceiving your project and support you for a long time after commissioning. We work for your audiences to get fascinated, and for science, culture and entertainment to blend into unforgettable experiences in your star theater.



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