

# Bright Horizons™ 8



**Expand your skills. Chat with the experts. Join our community of kindred spirits on this exotic journey.**

Our Speakers on Bright Horizons 8 are:

Zvi Ben-Avraham, Ph.D., Michael Coey, Ph.D., Steven Dick, Ph.D., James Gillies, Ph.D., Jeanette Norden, Ph.D., and James Welsh, M.D.

## Astronomy

### Pricing & Booking Information

(Full details:

[http://www.InSightCruises.com/booking\\_d/sa08\\_booking.html](http://www.InSightCruises.com/booking_d/sa08_booking.html))

**Course Fees:** \$1,375. Only passengers booked through InSight Cruises will be admitted. The fee includes all 90-minute seminars below.

#### **Life on Other Worlds**

Speaker: **Steven Dick, Ph.D.**

The discovery of life beyond Earth would be one of the greatest events in the history of science. Where do we stand in the search for life, both inside the solar system and beyond? What are the major questions as NASA's Kepler spacecraft stands on the verge of discovering thousands of extrasolar planets that may be similar to the Earth? And what would be the impact of the discovery of extraterrestrial intelligence on our society? We are at a unique time in history, and perhaps on the verge of a new world view.

#### **A Tour of the Universe: Astronomy's Three Kingdoms**

Speaker: **Steven Dick, Ph.D.**

Our view of the universe has changed radically over the last century, from a static anthropocentric cosmos a few thousand light years in extent to a dynamically evolving universe encompassing billions of light years. An entire bestiary of exotic objects such as pulsars, quasars, and black holes has been unveiled. Journey from our solar system through billions of light years of space and time as we explore astronomy's three kingdoms: the planets, the stars, and the galaxies.

Deposit: \$600 per person.

Cabin Type:	Cruise Rate (per person)
Insides	\$969 - \$1,099
Outsides	\$1,329 - \$1,469
Verandahs	\$1,669 - \$1,769
Mini Suites and up	\$2,294+

The pricing above is subject to change.

**Physically Challenged:** The ship has a very limited number of specially equipped cabins for the Physically Challenged. Please let us know your specific needs.

**Sharing:** For those wishing to share a cabin with another passenger in our group in an inside, outside, or outside w/ verandah cabin only. The prices are the same as the per person double occupancy rates.

**3rd Person Rate:** \$439

**Single Occupancy:** If you would like to be the sole occupant of a cabin, there is a single-occupancy upcharge: 100% for all cabins.

**Port Charges, Taxes, and Gratuities:** Government taxes, cruiseline fees, and port charges are approximately \$220, gratuities are \$11 per person per day, and there's an InSight Cruises service charge of \$50.

## Exploration, Discovery, and Culture: The Importance of the Space Age

Speaker: **Steven Dick, Ph.D.**

Fifty years into the Space Age and 40 years after the Apollo program landed 12 men on the Moon, NASA and humanity are at a turning point. Should humans return to the Moon and go to Mars? Are our robotic emissaries enough? What are the motivations for spaceflight? Should we spend money on space with so many problems on Earth? In this session we will contemplate the importance of exploration to culture, comparing and contrasting the Age of Space to the Age of Discovery 400 years ago.

## Cosmic Evolution and Human Destiny

Speaker: **Steven Dick, Ph.D.**

For the first time in history, we can see our true place in the universe in the context of 13.7 billion years of cosmic evolution, from the Big Bang to the present. What are the implications of our new understanding of space and time for humans, both in the short term and the long term? How does it affect our religions and philosophies? And what is the long-term destiny of humans? Join us in a journey through science fiction, science fact, and scientific extrapolation into the future as we ponder human destiny in the context of our new view of the universe.

## Particle Physics

### Particle Physics — Using Small Particles to Answer The Big Questions

Speaker: **James Gillies, Ph.D.**

Particle physics is a science of extremes, studying the tiniest constituents of matter using the largest machines ever built. Human beings have always been curious about their surroundings. That's why Columbus sailed the ocean blue, why men have walked on the moon, and why particle physics labs like CERN exist.

In Western scientific tradition, particle physics traces back to the Greeks Leucippus of Miletus and Democritus who developed the idea of atomism. They wondered whether if a substance were repeatedly cut in half there would be a smallest indivisible unit of that substance: an "atom". Particle physics is the study of nature's true atoms — the smallest indivisible pieces of matter — and the forces that act between them. Focusing on CERN's latest research facility, the Large Hadron Collider (LHC), get the big picture of the state of the art and challenges that lie ahead in particle physics. James Gillies will outline some of the experiments at the LHC which may provide answers to big questions: Why do the fundamental particles have the masses they have? What is the nature of dark matter? What's the reason for nature's preference for matter over antimatter? Join the group and chart a course for CERN's exploration of persistent issues in particle physics.

**Private Tour of CERN and Luncheon**

From the tiniest constituents of matter to the immensity of the cosmos, discover the wonders of science and technology at CERN. Join Bright Horizons for a private pre-cruise, custom, full-day tour of this iconic facility.



Whether you lean toward concept or application there's much to pique your curiosity. Discover the excitement of fundamental research and get a behind-the-scenes, insider's look of the world's largest particle physics laboratory.

*continued below*

**The Large Hadron Collider — the World's Most Complex Machine**

Speaker: **James Gillies, Ph.D.**

Colder than outer space, yet hotter than the heart of the sun, and the fastest particle racetrack on the planet: the LHC is a machine of superlatives. It is a triumph of human ingenuity, possibly the most complex machine ever built, and its primary function is to produce new knowledge.

Three ingredients are necessary to carry out research at the high-energy frontier of particle physics: an accelerator to boost particles to almost the speed of light and make them collide, detectors to observe those collisions, and computing infrastructure to analyze the results. When the LHC was first dreamed up in the 1980s, the technology for all of these things did not exist, but that kind of detail has never deterred particle physicists in the past.

For the computing, a new paradigm — Grid computing — is being forged. The detectors are larger and more complex by orders of magnitude than their predecessors. And the accelerator itself is pushing back the frontiers of innovation in many domains.

Refine your understanding of the lineage of particle physics technologies from the invention of particle accelerators in the 1920s up to today. Then we'll focus on the LHC itself, laying out how accelerators and related tools have both allowed us to make phenomenal progress in understanding the Universe, and revolutionized our every day lives.

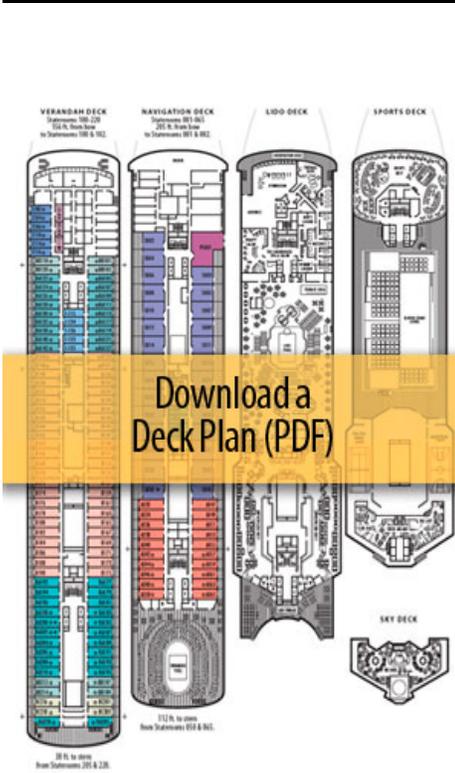
**Angels, Demons, Black Holes and Other Myths — Demystifying the LHC**

Speaker: **James Gillies, Ph.D.**

Along with humankind's natural curiosity comes a fear of the unknown. As we approached the LHC's first beam day in 2008, a handful of self-proclaimed experts struck up an end-of-the-world tune. (In a wonderfully ironic twist, the vehicle that carried the message was made at CERN: it was the World Wide Web.)

Like its predecessors, the Large Electron-Positron Collider (LEP) and Relativistic Heavy Ion Collider (RHIC), the LHC never posed the slightest risk to humanity. However, the dangerous scientist has always made for a good story and that's something that Dan Brown exploited to the full when writing Angels and Demons. Dr. Gillies will cover the fact behind the fiction of Angels & Demons and black holes at the LHC, and share the behind-the-scenes on how CERN lived with the hype.

DAY	PORT	ARRIVE	DEPART	CONFERENCE SESSIONS
THURSDAY, OCT. 28	<u>SAVONA (GENOA), ITALY</u>	—	4pm	6pm, BON VOYAGE COCKTAIL PARTY
FRIDAY, OCT. 29	<b>AT SEA</b>	—	—	8:30am - NOON & 1:30pm - 5pm
SATURDAY, OCT. 30	<u>MALAGA, SPAIN</u>	NOON	6pm	8:30am - 11:30am
SUNDAY, OCT. 31	<u>CASABLANCA</u>	7:30am	9:30pm	—
MONDAY, NOV. 1	<u>CADIZ, SPAIN</u>	9am	7pm	—
TUESDAY, NOV. 2	<u>LISBON, PORTUGAL</u>	9am	7pm	—
WEDNESDAY, NOV. 3	<b>AT SEA</b>	—	—	8:30am - NOON & 1:30pm - 5pm
THURSDAY, NOV. 4	<u>VALENCIA, SPAIN</u>	NOON	7pm	—
FRIDAY, NOV. 5	<u>BARCELONA, SPAIN</u>	8am	1pm	1:30pm - 5pm
SATURDAY, NOV. 6	<u>SAVONA (GENOA), ITALY</u>	9am	—	—



Download a Deck Plan (PDF)

Deck Plan of Our Ship (pdf)



Inside Cabins: \$969 – \$1,099



Outside Cabins: \$1,329 – \$1,469



Outside w/ Balcony: \$1,669 – \$1,769



Mini Suites and up: \$2,294+

# Magnets

**Full payment is due on July 30, 2010** (or, if you book after July 30, at the time of booking).

**There is a \$25 charge for returned checks.**

**Air Add-ons:** Airfare from most major cities is available through the cruise line. You can call our office for this pricing. (These rates include transfers to/from the dock/airport plus transfers to/from your hotel if we've booked the hotel as well.) In most cases, however, you will find better airfares on your own. Online travel sites such as Expedia.com, or Orbitz.com are excellent resources.

**NOTE:** Costa Cruises will not accept any booking unless a fully completed Reservation Form is accompanied with a per-person deposit:

[http://www.InSightCruises.com/](http://www.InSightCruises.com/booking_d/sa08_booking.html)

[booking\\_d/sa08\\_booking.html](http://www.InSightCruises.com/booking_d/sa08_booking.html). Have

questions? Want to book voice-to-voice? Please give us a call: 650-787-5665



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## **What the Ancients Knew**

Speaker: **Michael Coey, Ph.D.**

The mysterious behaviour of lodestones — rocks naturally magnetized by lightning strikes — and their strange love for iron was known in ancient China, Greece, Sumer, and Mesoamerica. The directional property, attributed to the heavens, was used first for geomancy and then, a millenium later when occult knowledge became public, for navigation. The great voyages of discovery of Africa by the Chinese and America by the Europeans all depended on the compass. The ancients dreamt of levitation and perpetual motion. So do we.

## **Science Rules the Earth — OK?**

Speaker: **Michael Coey, Ph.D.**

Robustly polemical, but insistently evidence-based, William Gilbert's *De Magnete* (c. 1600) was the first modern scientific text. His insight that the Earth was a great magnet and insistence that data trumps speculation led to the heroic magnetic crusade of the 1830s, an understanding of how the Earth moves by plate tectonics, sunspots, and a way to date pottery. As scientists gradually distinguished themselves from charlatans and artisans by the truth and predictive power of their magic, Galvani's animal electricity led to neurophysiology, Mesmer's animal magnetism led nowhere.

## **The End of an Aether**

Speaker: **Michael Coey, Ph.D.**

The modern world began in 1820, when Hans-Christian Oersted stumbled on the connection between electricity and magnetism. The news spread like wildfire across Europe as electromagnetism spawned motors and generators, electric trains and mains power, telegraphs, radio and magnetic recording — all before 1900. If Maxwell's equations were the greatest intellectual achievement of the century, the origin of magnetism was one of its greatest puzzles — a puzzle that could only be understood with relativity, quantum mechanics, and Dirac's electrons with spin.

## **Billions of Magnets for Billions of People: How and Why**

Speaker: **Michael Coey, Ph.D.**

The mystery of magnetism was solved in 1930, but it was only when the shape barrier was shattered in 1950 that the technology that serves our modern lives could emerge. Set free from the straightjacket of bars and horseshoes, the quality of magnets began to double every ten years. In this session you'll learn that small, powerful rare-earth magnets power countless gadgets from screwdrivers to carrot slicers but, more importantly, that one of the greatest modern miracles is magnetic recording.

Why and how have magnets have multiplied a billion-fold? Is it true that today we now make more magnets than we grow grains of rice? In this session you'll get the answers to these questions, plus answers to questions you hadn't even pondered.

## The Geology of the Mediterranean Basin

### Private Tour of CERN and Luncheon *continued from above*

Our full day will be led by a CERN official and physicist. We'll have an orientation; visit an accelerator and experiment; get a sense of the mechanics of the large hadron collider (LHC); make a refueling stop for lunch in the Globe of Science and Innovation; and have time to peruse exhibits and media on the history of CERN and the nature of its work.



To take advantage of this unrivaled insider access to CERN, rendezvous with Bright Horizons on October 25, 2010 in Geneva, Switzerland. The price is \$175 and includes

- Entrance to CERN
- Lunch at CERN
- A roundtrip transfer from our Geneva hotel to CERN
- Spend the following day, October 26, on your own in Geneva
- On October 27 we'll then transfer from our Geneva hotel to Genoa, Italy.

This trip is limited to 50 people. For questions and hotel pricing, please contact Neil or Theresa, or give us a call at (650) 787-5667.

*continued below*

### Tectonics of Continental Margins Around the Eastern Mediterranean Sea

Speaker: **Zvi Ben-Avraham, Ph.D.**

We know the fate of the Mediterranean basin. Nestled in the midst of Africa-Eurasia convergence, it is progressively shrinking and will eventually vanish. Basin margins record these dramatic events. Normally, after continental breakup, margin formation, sediment accumulation, and plate tectonics relax and the margins become passive for millions of years. The passive days of the Mediterranean's northern African margins are soon to be over. The Mediterranean seafloor is being consumed, sliding northward under the seismically active Calabrian, Ionic, Hellenic, and Cyprian margins. Tune in to Dr. Ben-Avraham's discussion of the geological, ecological, and human consequences of the geological evolution of the Mediterranean basin.

### The Dead Sea Fault and its Effect on Civilization

Speaker: **Zvi Ben-Avraham, Ph.D.**

The Dead Sea fault (DSF) is the most impressive geological feature in the Middle East. It is a plate boundary, which transfers sea floor spreading in the Red Sea to the Taurus collision zone in eastern Turkey. The DSF has influenced many aspects of this region, including seismicity and ground water availability. It may have even affected the course of human evolution — the DSF is an important part of the corridor through which hominids set off out of Africa. Join Dr. Ben-Avraham for a look at the remarkable paleoseismic history of the DSF, going back about 70,000 years. Learn how geological activity affected human history and politics in ancient days, and how the interplay of geology, ecosystem, and human activity are of ongoing concern and discussion.

## Particle Physics in Treating Cancer

### Subatomic Frontiers of Radiation Therapy

Speaker: **James Welsh, M.D.**

The connection between quarks and cancer therapy might at first appear a bit obscure but hadrons may prove to be a critical component of twenty-first century oncology. As counterparts to the six leptons of the Standard Model, the six quarks (along with their antiparticles) combine into mesons and baryons — the so-called hadrons. Presently, proton therapy is gaining attention thanks to some technological advances that might make this formerly exotic treatment more widely available. The name hadron comes from the Greek word for "strong" because their interactions are dominated by the strong force. The name may prove doubly apt since it requires some strong medicine to battle our ancient enemy, cancer.

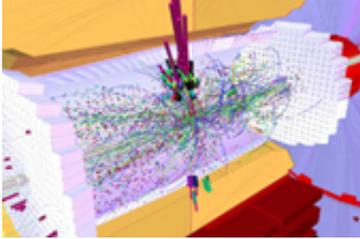
In this lecture we shall review the basic molecular and cellular mechanisms whereby normal cells transform into cancer cells and then discuss some of the means through which this understanding has been exploited, such as the advent of the molecular targeted therapies. We shall then briefly review some principles of radiobiology and radiation therapy. Finally we will review some basics of the Standard Model and how this relates to the next frontier in cancer management — hadron therapy.

# The Amazing Brain

**Private Tour of CERN and Luncheon**  
*continued from above*

## THE LARGE HADRON COLLIDER (LHC) EXPERIMENTS

The six experiments at the LHC are all run by international collaborations, bringing together scientists from institutes all over the world. Each experiment is distinct, characterised by its unique particle detector.



The two large experiments, ATLAS and CMS, are based on general-purpose detectors to analyse the myriad of particles produced by the collisions in the accelerator. They are designed to investigate the largest range of physics possible. Having two independently designed detectors is vital for cross-confirmation of any new discoveries made.

Two experiments, TOTEM and LHCf, are much smaller in size. They are designed to focus on 'forward particles' (protons or heavy ions). These are particles that just brush past each other as the beams collide, rather than meeting head-on.

**Introduction to all four sessions:** *The human brain is the most complex, and exquisitely organized, organ in the body. The estimated 100 billion neurons that comprise the brain and spinal cord are responsible for everything we see, hear, and feel; for every movement we make; for every thought we think; and even for our perception of who we are. This lecture series will be a journey of discovery about what modern science has revealed about the brain and the major disorders that affect this incredible structure.*

## General Organization of the Central Nervous System

Speaker: **Jeanette J. Norden, Ph.D.**

We begin with an introduction to how the central nervous system is divided into structural and functional areas. This knowledge will allow us to understand why after a stroke an individual might be blind, but not know it; why an individual might lose the ability to speak, but not to understand language; why an individual might be able to describe his wife's face, but not be able to pick her out from a crowd.

## Cellular and Molecular Organization of the Central Nervous System

Speaker: **Jeanette J. Norden, Ph.D.**

In this session we will focus on the structure of individual neurons and on how neurons in the central nervous system are believed to be connected to each other by an estimated 100 trillion synapses. This understanding of the structure of individual neurons and on how neurons communicate with each other allows us to have insight into disorders as diverse as depression and multiple sclerosis.

## Parkinson's Disease and Other Disorders of the Motor System

Speaker: **Jeanette J. Norden, Ph.D.**

Movement is a complex behavior controlled by a number of different subsystems in the brain and spinal cord. Knowing what each of these subsystems do to allow us to move in space will provide the knowledge necessary to understand the loss of normal motor movement in Parkinson's disease, spinal cord injury, and other disorders of the motor system.

## Alzheimer's Disease

Speaker: **Jeanette J. Norden, Ph.D.**

Alzheimer's disease is the most common neurodegenerative disease in the United States. We will explore what is currently known about this devastating disorder, and about the specific areas of the brain which are affected. Next we discuss the risk factors associated with Alzheimer's disease. Finally, we will end this lecture series with a discussion of what you can do to decrease your risk of getting this disease and on how to keep your brain healthy!