

Conference Frontiers of Quantum and Mesoscopic Thermodynamics 2019

**Public Lectures of  
Rainer Weiss and Wolfgang Ketterle  
with Concert**

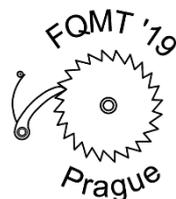
**Mayakovsky Hall of National House of Vinohrady  
Wednesday July 17, 2019**

<b>17:00 – 17:15</b>	<b>Music introduction</b>
	<b>Opening address</b>
<b>17:15 – 18:15</b>	<b>Rainer Weiss:</b> <b>“The beginnings of gravitational wave astronomy”</b>
<b>18:15 – 18:30</b>	<b>Discussion</b>
<b>18:30 – 19:00</b>	<b>Break</b>
<b>19:00 – 20:00</b>	<b>Wolfgang Ketterle:</b> <b>“Cooling close to absolute zero temperature: A recipe for discoveries”</b>
<b>20:00 – 20:15</b>	<b>Discussion</b>
<b>20:15 – 20:30</b>	<b>Break</b>
<b>20:30 – 22:00</b>	<b>Concert</b>

**Music Introduction**

**G. Klein (1919 – 1945)**  
T. Víšek (piano)

**Sonata for piano**  
First part: Allegro non fuoco



# The beginnings of gravitational wave astronomy

## Rainer Weiss

*Massachusetts Institute of Technology, Cambridge, USA*

Talk given on behalf of the LIGO Scientific Collaboration

The first detection of gravitational waves was made in September 2015 with the measurement of the coalescence of two  $\sim 30$  solar mass black holes at a distance of about 1 billion light years from Earth. The talk will provide a review of more recent measurements of black hole events as well as the first detection of the coalescence of two neutron stars and the beginning of multi-messenger astrophysics. The concepts used in the instruments and the methods for data analysis that enable the measurement of gravitational wave strains of  $10^{-21}$  and smaller will be presented. The talk will end with a discussion of prospects for the field.

## Rainer Weiss

Rainer Weiss is an American physicist known for his contributions in physics of atomic clocks, cosmic background radiation measurements, and gravitational wave detection. Weiss was born in Berlin in 1932. His father being Jewish the family fled first to Czechoslovakia and then, in 1939, to New York where he gained a scholarship to Columbia Grammar School. Weiss finished his BSc in 1955 and earned his PhD in 1962 from Jerrold Zacharias at MIT. He taught at Tufts University in 1960–62, was a postdoctoral scholar at Princeton University from 1962 to 1964, then joined the faculty at MIT in 1964, where he is now a Professor Emeritus.

As a technician in Jerrold Zacharias's lab he became involved with atomic clocks and an attempted test of the Einstein gravitational red shift – the fact that clocks run more slowly in strong gravitational fields than in weak ones. He was then a post-doctoral scientist with Robert Dicke at Princeton to search for gravitational waves. In 1964, he started a research program as an MIT faculty member. There were several directions in the programme: an attempt to determine if  $G$  (the Newtonian gravitational constant) was varying with time – requiring stabilised lasers and precision mechanical instruments to measure Earth  $g$  (gravitational acceleration), measurements of the spectrum and isotropy of the recently discovered Cosmic Microwave Background (CMB) radiation and a third programme to develop an interferometric gravitational wave detector. The CMB led to the Cosmic Background Explorer (COBE) measurements of the spectrum and angular distribution of the CMB. Weiss was a chairperson of the Science Working Group for COBE.

The work on interferometric gravitational wave detectors came from describing a gedanken experiment at MIT to detect gravitational waves using free masses floating in space and measuring the time it takes light to travel between them. A gravitational wave will cause the time to vary. Weiss discovered that if scaled to multi kilometer sizes, such a free mass detector with laser sources could actually has enough sensitivity to detect astrophysical gravitational wave sources. By 1983 MIT and Caltech joined together to form the Laser Interferometer Gravitational-Wave Observatory (LIGO) project. On 14 September 2015 the team's efforts were rewarded by a ripple in spacetime that had taken 1.3 billion years to reach Earth. For his work, Weiss was awarded a half share of the 2017 Nobel Prize in Physics, the other half being split between fellow pioneer Kip Thorne and project director Barry Barish.

# Cooling close to absolute zero temperature: A recipe for discoveries

## Wolfgang Ketterle

*Massachusetts Institute of Technology, Cambridge, USA*

Why do physicists freeze matter to extremely low temperatures? Why is it worthwhile to cool to temperatures which are a billion times lower than that of interstellar space? In this talk, I will experimentally demonstrate phenomena at low temperature and discuss new forms of matter. Of special interest are superfluids which can flow without dissipation, and quantum phase transitions which occur even at zero temperature. I will illustrate persistent flows using superconductors. Recently, we have observed a supersolid which is gaseous, liquid and solid at the same time.

## Wolfgang Ketterle

Wolfgang Ketterle has been the John D. MacArthur professor of physics at MIT since 1998. He leads an experimental research group in atomic physics exploring new forms of matter of ultracold atomic and molecular gases. A major focus is the study of novel aspects of superfluidity, coherence, and correlations in many-body systems. His observation of Bose-Einstein condensation in a gas in 1995 and the first realization of an atom laser in 1997 were recognized with the Nobel Prize in Physics in 2001 (together with E.A. Cornell and C.E. Wieman).

Ketterle received a diploma (equivalent to master's degree) from the Technical University of Munich (1982), the Ph.D. in physics from the University of Munich (1986). He did postdoctoral work at the Max-Planck Institute for Quantum Optics in Garching and at the University of Heidelberg in molecular spectroscopy and combustion diagnostics. In 1990, he came to MIT as a postdoc and joined the physics faculty in 1993. Since 2006, he is the director of the Center of Ultracold Atoms, an NSF funded research center, and Associate Director of the Research Laboratory of Electronics.

His honors include the Rabi Prize of the American Physical Society (1997), the Gustav-Hertz Prize of the German Physical Society (1997), the Fritz London Prize in Low Temperature Physics (1999), the Benjamin Franklin Medal in Physics (2000), the Knight Commander's Cross (Badge and Star) of the Order of Merit of the Federal Republic of Germany (2002), the MIT Killian Award (2004), a Humboldt research award (2009), memberships in several Academies of Sciences including the National Academy of Sciences, and several honorary degrees.

# Program of the concert

**F. Liszt** (1810 - 1856)

T. Víšek (piano)

**Liebesträum No 3**

**F. Liszt** (1810 - 1856)

T. Víšek (piano)

**Legend No 2** "St. Francois de Paule  
marchant sur le flots"

**B. Martinů** (1890 - 1959)

T. Víšek (piano)

**Etude in F**

**V. Novák** (1870 - 1949)

T. Víšek (piano)

**Song on a Carnival Night, op. 30, No 4**

**A. Marcello** (1673 - 1747)

J. Thuri (oboe)

J. Kšica (harpsichord)

Praga Camerata

**Concerto in D minor for oboe**

Andante, Adagio, Presto

**A. Vivaldi** (1678 - 1741)

J. Thuri (oboe)

L. Hucek (bassoon)

J. Kšica (harpsichord)

Praga Camerata

**Concerto in D major for oboe and  
bassoon**

Andante Molto, Largo, Allegro Molto

**J. S. Bach** (1685 - 1750)

J. Thuri (oboe)

J. Kšica (harpsichord)

**Sarabande, 5<sup>th</sup> English suite in E  
minor, BWV 810**

**P. J. Vejvanovský** (1640 - 1693)

J. Thuri (oboe)

J. Kšica (harpsichord)

**Offertur for oboe and harpsichord**

Andante, Sarabande, Allegro

**J.-J. Mouret** (1682 - 1738)

M. Kejmar (trumpet)

M. Stříteský (trumpet)

J. Kšica (harpsichord)

Praga Camerata

**Suite in D minor**

Allegro, Menuet

## Performers

### **Luboš Hucek (bassoon)**

He regularly performs with The Prague Symphony Orchestra. He first aroused considerable public recognition in 1981 when he won The International Prague Spring Festival at the age of 24 when he was already bassoonist of the Film Symphony Orchestra and The National Theatre Orchestra. He has played as a soloist with renowned orchestras at concerts in many countries of the world.

### **Miroslav Kejmar (trumpet)**

Miroslav Kejmar graduated from The Prague Conservatory after studies with Professor Junek. He then studied in the class of Professor Václav Pařík at The Prague Academy of Arts. Already during his studies at The Academy of Arts in Prague, he played in various orchestras, e.g. in the Film Symphony Orchestra and the Czech Philharmonic Orchestra. Apart from guest appearing with several chamber brass ensembles, he works on a permanent basis with the Prague Brass Soloists, of which is a founding member. His career as a soloist is equally wide-ranging. He is well known to audiences in many European countries, as well as Japan. Apart from classical music, he is also interested in dance, jazz and popular music. For about three years he played in the orchestra involved in the famous musical, Jesus Christ Superstar. He was a member of the Karel Vlach orchestra. Miroslav Kejmar was, over thirty years, the first trumpeter of the Czech Philharmonic Orchestra, and played many years with the "Ten of the Best" ensemble, the famous international group of trumpeters. He nowadays plays frequently as a soloist; he is a member of the Prague Brass Soloists and Czech Philharmonic Brass ensembles.

### **Josef Kšica (harpsichord)**

Josef Kšica studied organ at the Conservatory in Brno and at the Academy of Performing Arts in Prague in the class of professors Milan Šlechta and Jiřina Pokorná. In addition, he studied composition with Professor Jan Duchoň. After many years of practicing as an organist and a singer of Czech leading choirs (Prague Philharmonic Choir, Prague Chamber Choir) Mr. Kšica became the choirmaster in St. Vitus Cathedral in Prague. Beside these activities, he performs old Czech as well as world sacred music, occasionally in new premieres. He also cooperated with the specialist on Bach music, Professor H. Rilling. As an organist, Mr. Kšica has been performing at concerts in his country and abroad. He has also been increasingly seen on the stage as a conductor. Aside from his interpretation achievements, Josef Kšica is a well-known scholar and editor for many European archives. Ars Instrumentalis Pragensis, in particular, is grateful to him for his continued broadening of their repertoire.

## **Jan Thuri (oboe)**

A leading Czech oboist Jan Thuri was born into a family of musician in Praha in 1975. He came in contact with art at an early age through playing violin and piano. He has been playing oboe since the age of thirteen. When he graduated from the Prague Conservatory in the class of his father Frantisek Xaver Thuri, he crowned his studies at the Utrecht College of Music with Ernest Rombout and at the Ostrava University with Dusan Foltyn. He also took part in a few excellent courses with Jean-Louis Capezzali, Maurice Bourgue, Han de Vries, Jérôme Guichard and Jacques Tys. During his studies he won many awards in international competitions (Czech Republic, France, Great Britain). Jan Thuri is a sought-after solo and chamber music player. He co-operates with the foremost local and foreign orchestras. As a soloist, Jan Thuri has played in virtually all countries of Europe, in the USA, Japan and Korea. He records for the radio stations Czech Radio, Radio France and the British BBC where he recorded the Richard Strauss oboe concerto in D-Major in live broadcast. In 2002 he founded the chamber orchestra "Thuri Ensemble" and he plays actively with them at home and abroad. Besides that he is a member of several chamber orchestras, primarily ensembles specialising in the baroque style music, he is also a member of wind trio "Trio DuBois". In the exceptionally rich repertoire of Jan Thuri there are compositions of all styles and periods including contemporary and also avant-garde ones. The artist is often sought-after for the premiere interpretation of compositions of famous Czech and foreign contemporary composers. Jan Thuri has made a number of outstanding recordings for EMI, Virgo and Thuri Records. One of the most important pieces of work of Jan Thuri in the recent period of time is a collected recording of his father's concertos for oboe and orchestra. Since 2004 Jan Thuri has held oboe and chamber music classes at the Prague State Conservatory and performs master-classes in Europe and Asia (Japan, Korea). Jan Thuri is often invited to take part in juries for international competitions (Chieri, Wroclaw, Prague).

## **Tomáš Víšek (piano)**

Tomáš Víšek developed his carrier as a solo pianist after graduating from the Prague Conservatory (Professors V. Kameníková and Z. Kožina), and from the Academy of Music Arts in the class of Professors J. Páleníček and Z. Jílek. He has established his reputation performing both famous and lesser known repertoire, some of which being undeservedly neglected. He has toured throughout the world including Austria, Holland, Switzerland, France, Italy, Egypt, Japan, USA, and has made recordings for radio and television and on CDs. Tomáš Víšek won numerous prizes in international competitions (Hradec Králové, Vienna, Ragusa, Paris), in 2013 he won the 1st prize and CMF Prix at the "Concours Musical de France" in Paris, in 2015 the 1st prize at the competitions „Music Without Limits“ (Druskininkai) and „Grand Prize Virtuoso“ (video-competition), in 2016 he won the 1st prize at the „International Master Competition for Music Teachers“ in Warsaw. His solo recital in the Prague Spring Festival in 1997 and the further performances there in 2002, 2003, 2006, and 2014 were met with high acclaim, as were his interpretation of Gershwin's Rhapsody in Blue in the sold out Rudolfinum concert hall in Prague.

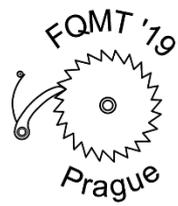
## Praga Camerata

Pavel Hůla, leader, 1<sup>st</sup> violin  
Lucie Hůlová, 1<sup>st</sup> violin  
Jan Marek, 1<sup>st</sup> violin  
Josef Vychytil, 2<sup>nd</sup> violin  
Dagmar Virtová, 2<sup>nd</sup> violin  
Radek Trupl, viola  
Martin Sedlák, cello  
Ondřej Merecký, double bass

The ensemble **Praga Camerata** follows the tradition of the Prague Chamber Soloists ensemble, which was established in 1961 by the principal conductor of the Czech Philharmonic Orchestra Václav Neumann. Pavel Hůla, a current leader of the Praga Camerata, had been a member of the original ensemble since 1972. The Praga Camerata members are exclusively outstanding instrumental soloists, chamber musicians, The repertoire of the ensemble is centred around highlights of the world concertante literature from baroque to contemporary music. The orchestra's standard string combination is occasionally enlarged by wind instruments, opening up the way to a broader repertoire.

Praga Camerata appears not only on the major music platforms in its home country, the Czech Republic, but also worldwide. Since 2003 the orchestra has been regularly invited to Japan and participated there e.g. in the very successful "Dvořák Festival 2004", performed in such famous halls such as the Suntory Hall, Tokio. In 2006 Praga Camerata was invited to tour Spain, France and Germany and performed also in the „Prague Symphony Orchestra Chamber music series“. In 2007 Praga Camerata recorded the first CD for the French label *Praga Digitals*, distributed by Harmonia Mundi, with Schubert's music including the string quartet „Death and the Maiden“ in Mahler's arrangement for string orchestra. This CD was highly acclaimed by international music critics. In 2008 the ensemble participated in the prestigious festival "Folle Journée" in Nantes, France, devoted to Schubert's anniversary year. Praga Camerata performed also in famous halls such as the Tonhalle Zürich, Palau de la Musica in Barcelona or Auditori in Valencia.

**Pavel Hůla**, the current artistic director, is a versatile violinist, successfully combining the twin careers of soloist and chamber music player. Since 2010 to 2015 he has been first violinist of the Pražák Quartet, while from 1975-2010 he was a leader of the Kocian Quartet with which he appeared in over 3200 concerts worldwide, and made more than 60 CDs for Denon, Supraphon, Orfeo and Praga Digitals. In 1997 the Kocian Quartet was awarded a Grand Prix du Disque in Paris. Pavel Hůla is a professor at the Prague Academy of Music. In connection with his leadership of the Praga Camerata orchestra he also became a conductor.



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