

## PROGRAMME



### 13th Capita Selecta Duikgeneeskunde



## (Patho)physiology and medicine of apnoea diving

An advanced course for dive physicians, other care professionals, (apnoea-) dive instructors and advanced apnoea divers.

Date: Saturday 29 November, 2014

Venue: Academic Medical Centre, University of Amsterdam  
Room 120 B1, Building B, Meibergdreef 9, 1105 AZ Amsterdam

#### Subject

(Patho)physiology and medicine of apnoea diving.

#### Aim

This course aims to give insight into the physiology and pathophysiology of recreational, professional and competitive apnoea diving, including treatment after the occurrence of a medical disorder due to an apnoea dive. Recreational breath-hold diving will be considered in wide sense: shallow water breath-hold distance swimming (also competitive), collecting items from the bottom (recreational and professional), spear fishing etc. The theme includes also safety aspects, both medical as well as general. Since there are many comparisons between Scuba diving and apnoea diving, the participants learn also much about the diving medicine of Scuba.

Knowledge of the above matter is of importance for the medical physician when examining a Scuba diver who also intends to perform breath-hold exposures, even under pool conditions.

It is also aimed that the medical participant obtains some knowledge of present day apnoea diving research that comprises about one quarter of the whole field of studies regarding diving medicine.

After this seminar, the physician will have the knowledge to decide whether a diver is also allowed to perform breath-hold dives. This also considers the type of apnoea dives and the environmental conditions in relation to his or her clinical characteristics and physiological performance of especially the cardiovascular, pulmonary system and the pathophysiology of the gas filled head cavities.

This seminar should be regarded as an advanced course. An elementary course on diving medicine (in the Netherlands e.g. SHF or VSG) is a prerequisite for physicians who apply for accreditation.

#### Teachers

- Rik Rösken MD, Dept. Internal Medicine, St. Elisabeth Hospital, Tilburg, The Netherlands.
- Prof. Dr. Erika Schagatay PhD, MSc, Director Environmental Physiology Group, Dept. of Health Sciences, Mid Sweden University, Östersund, Sweden.
- Prof. Dr. Jochen D. Schipke PhD, MEng, MEng, Research Group Experimental Surgery, Faculty of Medicine, University of Düsseldorf, Düsseldorf, Germany.

#### Participants

Diving physicians, academic and higher educated paramedics, high qualified instructors with higher education, apnoea dive instructors and advanced apnoea divers.

#### Accreditation

The program comprises **6 oral contact hours** and is assumed to give **6 accreditation points** for the Dutch NVD and VSG.

The course members obtain a certificate after completion of the whole course.

*Course members from outside the Netherlands* should apply personally with their own accreditation office. We will support them administratively. The level of the course is accordance with that of EDTC and ECHM for Medical Examiner (Level I) and Diving Physician (Level IIa), 2010.

### General: mission of the “AMC Capita Selecta Duikgeneeskunde”.

The Capita Selecta Duikgeneeskunde (CSD), refresher courses dive medicine, are given by the Academic Medical Centre (AMC), a one-board-cooperation of the medical faculty of the University of Amsterdam (UvA) and the academic hospital with the UvA. This hospital has a special position within the Dutch academic hospitals; it is the cradle, also in Europe of a related discipline, hyperbaric medicine, performed in the “Boerema Tank”. This type of refresher courses, offered to dive physicians, has a typical ‘Alma Mater’ character.

In the first place, the AMC Capita Selecta present extensively and discipline-wise education in dive and caisson medicine. In addition, they also give education in new developments as they occur in the academic hospitals and medical faculties. This implies that, within the lessons, the characteristics of disorders are discussed, including their diagnostics and treatment, from the point of view of the present academic state of the art.

In short, the Capita Selecta are marked by a mix of education in the dive medicine of the respective discipline and up-to-date education in the discipline itself, for instance in cardiology, ophthalmology, otology etc. Also, the Capita will pay attention to the requirements of the medical examination.

The Capita are aimed for non-specialized physicians, first line physicians, sport and occupational physicians, professional dive physicians, clinical doctors and paramedical academics and technicians, and diving instructors. In general, the teachers have their affiliation with academic hospitals and medical faculties, and have an international reputation in patient care, academic education and/or medical research as becomes clear from their curriculum vitae.

To have lower thresholds for the courses given in the Netherlands, the venue is easy to reach and centrally located, and moreover the course is low-budget.<sup>1)</sup>

### Programme committee

Nico Schellart (chair, medical physicist and diving physiologist), Marga Schweigmann MD (hyperbaric & diving physician), Erik van der Sande (family and sport physician), Tjeerd van Rees Vellinga MD (occupational and hyperbaric physician) and ad hoc Rik Rösken, MD, Erika Schagatay (physiologist), Jochen Schipke (hyperbaric and diving physician).

### Executive committee

Nico Schellart (course director), Eduard van Riet Paap (administrative manager) and Hans van Dam.

### Recommendation

The course is recommended by the expert group of dive medicine of the Vereniging voor Sportgeneeskunde (Soc Sports Med) and by the Nederlandse Vereniging voor Duikgeneeskunde (NVD, Dutch Soc Dive Med).

### Responsibility

The Capita Selecta Duikgeneeskunde are given under the responsibility of the Academic Medical Centre, Univ. of Amsterdam (course leader Nico Schellart). The organization is by the Stichting Duik Research (SDR)<sup>1)</sup> and Biomed. Eng & Physics, AMC (Prof. Dr. A.G.J.M. van Leeuwen, chair).

### Announcements

Ongoing announcements about future courses can be found at [www.duikresearch.org](http://www.duikresearch.org), [www.diverresearch.org](http://www.diverresearch.org) or are communicated by E-mail.

<sup>1)</sup> SDR is a non-profit organisation aimed to promote dive safety. Work for SDR is done voluntarily.

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## Programme

### (Patho)physiology and medicine of apnoea diving

08:30-09:00 Welcome

09:00-09:05 **Nico Schellart**, Introduction.

1 09:05-09:35 **Rik Rösken**, Historical introduction and present day practice.

2 09:35-10:25 **Erika Schagatay**, Human natural diving; history and physiological aspects.

Break

3 10:45-11:35 **Jochen D. Schipke**, Medical risk assessment of recreational apnoea diving, especially focussed on prevention.

4 11:35-12:25 **Erika Schagatay**, Competition Apnea – prerequisites, performance and problems.

4 12:25-12:40 Instruction video.

Lunch

5 13:25-14:15 **Jochen D. Schipke**, Pathophysiological aspects of non-DCI accidents and of DCI accidents.

6 14:15-14:55 **Rik Rösken**, Medical coaching of competitive freedivers.

Break

15:15-15:45 **Marga Schweigmann** (Chair), Cases.

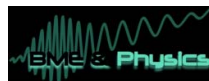
15:45-16:05 Round table; Aspects of Fitness to Freedive.

16:05-16:20 Examination

16:20-16:35 Evaluation

Drinks

Total lesson time 5h55min



Disclaimer: Capita Selecta Duikgeneeskunde (i.e. AMC and SDR) is bound to execute the educational program, but small program changes are under reserve.



Rik Rösken



Erika Schagatay



Jochen Schipke

## The lecturers

**Rik Rösken** obtained in 2010 his medical degree at Utrecht State University. He is currently a resident in Internal Medicine at the St. Elisabeth Hospital in Tilburg, The Netherlands. He has been involved in breath-hold diving since 2000, attending and competing in both national and international competitions. He is a member of AIDA (Association Internationale pour le Développement de l'Apnée) and in the International medical and science board of this association. He is also a AIDA certified freediving instructor, international judge and *the* medical expert in theory and practice for freediving in the Netherlands. Together with L.M.G. Geeraedts he has co-written a chapter about freediving in a Dutch textbook of Diving Medicine (Duikgeneeskunde, theorie en praktijk) and is member of the Dutch society of diving medicine (NVD). He enjoys freediving and SCUBA diving since 1996 and is a certified PADI Divemaster.

**Erika Schagatay** studied marine biology at Gothenburg University and completed her PhD on the physiology of human apneic diving at Lund University in 1996. After post-doctoral work at August Krogh Institute in Copenhagen she joined Mid Sweden University for a lectureship in animal physiology. In 2000 she was appointed associate professor at Lund University, and since 2007 she is professor at Mid Sweden University. Erika is director of research in the Environmental Physiology Group at the department of Health Sciences. She has since 1988 studied the physiology of apneic diving and other environmental challenges to human physiology. Aside from laboratory work she has done field studies of ethnic diving divers. Later studies have focused on competitive apnea divers which can reach depths of > 100 m on one breath as a model for extreme hypoxia. Pigs have been trained and their diving responses studied. Under her direction, the lab also conducts research in altitude and thermal physiology. She has supervised over 100 students for Master- or Bachelor projects and seven PhD students, and published some 50 original papers and book chapters. She is a member of EUBS and a co-editor of DHM. She is an active diver and instructor of apneic diving, and on an expert panel in the global competition diving organization AIDA.

**Jochen Schipke** obtained in 1969 his MEng in General Electrical Engineering as well as in Business Engineering at the Technical University Aachen. After joining for 5 years IBM Deutschland he became senior staff member in the Institute of Physiology (Heart & Circulatory System) of University Düsseldorf. In 1980 he obtained his PhD in experimental physics at the University of Düsseldorf. Founded by DFG & AHA he was postdoc at Johns Hopkins University, Baltimore. After his Habilitation at the Heinrich-Heine-Universität Düsseldorf (1992), he was appointed as Deputy Head of the Institute of Experimental Surgery and 5 years later as Head of the Research Group Experimental Surgery. In 2007, he retired, but continued working for another 3 years as consultant of the Clinic of Cardiovascular Surgery.

Under his supervision about 50 students completed their doctoral theses and 7 assistant medical directors completed their habilitations (from Clinic of Surgery). He published some 80 papers and contributed 5 times in textbooks. Most of them respect cardiovascular and pulmonological research and several contributed to (free)diving medicine. He is still reviewer for national & international journals and grant awarding institutions and is in the board of the German Society of Diving and Hyperbaric Medicine (GTUEM) and editor CAISSON, GTUEM journal (the). Finally, he is active CMAS\*\* diving instructor.

## Description of lectures

### ***Rik Rösken, A historical introduction of breathhold diving and present day freediving practise***

Origin of Breathhold diving in a broad sense has its origin in the antique world. Then and later it was used for salvage and military purposes, food gathering, spear fishing, and nowadays also for freedive photography, during caving, etc. with sport and games (underwater hockey etc.), or recreation and competition (attempt to attain great depths, times, or distances with and without fins).

Freediving is currently almost exclusively associated with competition and daredevil record attempts, but through the ages it has predominantly an important technique used to provide food and thus secure people's livelihoods. The different practices of freediving will be introduced, from underwater hunting to the hunt for a new world record. Furthermore, attention will be paid to the challenges that have been met by competitive breath-hold divers in the past and how their experiences have shaped the current freediving world, including the developing relationship between freediving and science. Finally a short summary will be presented of how the challenges the freedive world will be facing in the future.

### ***Erika Schagatay, Human natural diving; history and physiological aspects***

Humans may have a history of entering the water to gather food from the days of our early ancestors. This activity has probably continued for periods across human history and been reinvented in modern groups such as the waterpeople (Bajau) in Indonesia and the Ama of Japan, which are still living on freediving. Nowadays most freediving occurs as a leisure activity, and freediving and spear fishing as competitive sport are additional applications. All these activities recruit a complex set of mechanisms enabling us to work under water for short periods without breathing, many of which we share with semiaquatic mammals. The physiological effects of immersion and submersion will be discussed, such as the cardiovascular diving response and other protective responses, as well as metabolic and thermal aspects of repeatedly diving to a maximum of 30 m depth. The mechanisms behind shallow water black out and other risks will be reviewed. The physiological requirements for natural diving will be discussed, considering the limitations in depth, duration, surface interval and total working time. Comparative and evolutionary aspects will be addressed and we will visit modern traditionally diving groups in Asia.

### ***Jochen Schipke, Medical risk assessment of recreational apnoea diving, especially focussed on prevention***

For humans, breath-hold diving is a challenging but in some respects dangerous activity. The various factors endangering the breath-hold diver will be discussed. One of the major factors, independent from the type of dive, is hypoxia. How it occurs and evolve during the dive will be discussed. With breath-hold deep diving, ambient pressure on the gas-filled spaces will decrease the gas volume. Among the manoeuvres of breath-hold divers, hyperventilation is practised since long. Newer manoeuvres include buccal pumping (glossopharyngeal insufflation) and glossopharyngeal exsufflation. In addition to specific effect of breath-hold diving, the similarities with SCUBA diving will be discussed, such as gas partial pressures increase with depth. Especially the adverse effect of increased  $pN_2$  will be addressed. The few published decompression models for breath-hold diving will be explained with the underlying rules of repetition tables. Another feature in common with SCUBA (or Closed Circuit breathing apparatus) diving, be it with differences, is the phenomena of barotraumas. Several types of barotraumas which may result will be presented.

To enjoy breath-hold diving and to keep well and fit, the Society of German Sport Divers (VDST) has published ten rules that are presented for discussion.

### ***Erika Schagatay, Competition Apnea – prerequisites, performance and problems***

Across the past two decades the sport competitive freediving or "apnoea" has developed rapidly. This sport explores human maximal diving ability on one breath for duration, distance or depth. The world record of "Static apnea is currently 11 min and 35 sec, and a depth of 128 m has been reached swimming – and 214 m with a weighted sled – how is this at all possible? The prerequisites for performing long apneic duration, distance

swimming under water and deep diving in the various disciplines of competition diving will be addressed. In order to better understand which resources – and limitations – we as air breathers have under water, we have to compare human physiology with that of marine mammals. How can we maximize body gas storage, minimize metabolism and enhance our tolerance to asphyxia? Where are the limits – and what happens when we approach them? We will discuss the roles of the diving response and spleen contraction in extreme diving, hypometabolism, equalization, lung packing, lung barotrauma, DCS, narcosis, short- and long term training effects and diving safety. Extreme apnea diving will be compared to high altitude climbing and other extreme conditions in health and disease.

### ***Jochen Schipke, Pathophysiological aspects of DCI accidents and of non-DCI-accident***

Similar to SCUBA diving, immersion – via blood shift – will impact the pulmonary and the cardiovascular system. Its complicated and multi-causal way will be explained. The most obvious feature is the diving response after submersion which will in particular induce bradycardia. However, this bradycardia is affected by a variety of factors, which will be addressed. The neurological injuries diagnosed after apnoeic dives, as marker of nerve cell injury due to hypoxia will be reviewed. The increasing ambient pressure affects rigid (ear) and semi rigid (lungs) cavities. The risk of inducing barotrauma, such as middle/inner ear injuries and intra-alveolar haemorrhage will be addressed. Pulmonary barotrauma is also possible after buccal pumping (high intrathoracic pressure), which in turn impairs venous return. Depending on the frequency, the length and the depth of breath-hold dives, DCI can develop. In case of cerebral DCI, treatment in the hyperbaric chamber is mandatory. Finally the question arises whether breath-hold diving is dangerous. For instance one could normalize risk by determining the risk per minute submerging ((competitive) freediver, spear fisher, food gathering diver) related to SCUBA diving? The unfortunately few epidemiological data will be discussed.

### ***Rik Roskens, Medical coaching of competitive freedivers***

Like with any other athlete, coaching and assisting a freediver is finding a delicate balance between making the impossible possible and not causing physical harm. The specific nature of freediving, including its outdoor environment, can make preparing for a record attempt a challenge. In this lecture the experiences, unfounded beliefs and scientific proof that competitive freedivers have at their disposal in their quest to achieve their performance will be discussed. Attention will be paid to the current state of dive medical care and its challenges during competitions and during training. The most recent recommendations from AIDA (Association Internationale pour le Développement de l'Apnée) will be discussed, as well as the current trends in freediving medicine.

## Fees

From € 62.50 to € 142,50 dependent on profession and requested accreditation (see subscription form).

The fee includes reader, test, certificate, lunch, welcome, breaks and drinks.

## Hotels

Suggestions for nearby hotels are:

### Hotel Abcoude

Kerkplein 7, 1391 GJ Abcoude

+31 294 281 271, [info@hotelabcoude.nl](mailto:info@hotelabcoude.nl)

Rooms from ca. 90 €/day

Train at Abcoude station (10 min) and bus connection to AMC: no. 120 and no. 126, 2 times per hour (ca. 20 min in total).

### Bastion Hotel Amsterdam/Amstel

Verl. Van Marwijk Kooystraat 30, 1096 BX Amsterdam

+31 (0)20-6634567, <http://www.bastionhotels.nl/nl/onzehotels/amsterdam>

Rooms from ca. 105 €/day

Metro connection with AMC: many times per hour (ca. 20 min in total).

## Entertainment

Stay one more night for culture and entertainment in one of the most exciting cities of Europe.

The **Koninklijk Concertgebouw** (Royal Concert Hall)

- 5 and 29 November with programs of Mahler, Barock music and in the small hall Liza Ferschtman (*Ticket should be ordered long in advance*).

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The **Muziek Theater** (Stopera)

29 November Lohengrin, Wagner.

- (*Ticket should be ordered long in advance; from 3 June*)

And many more flamboyant podium art theatres.

## Museums

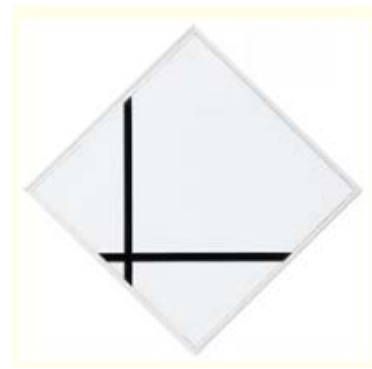
- **Rijksmuseum** (The National Museum), completely renovated and with the Vatican Museum and the Louvre one of the best general museum of the world.
- **Van Gogh Museum**
- **Stedelijk Museum** (City Museum) with 20 Century Art
- **Scheepvaartmuseum** (Maritime Museum)
- Many more attractive museums.



**Rijksmuseum**  
Rembrandt van Rijn  
*The "Nachtwacht"*



**Van Gogh Museum**  
Vincent van Gogh  
*Selfportrait*



**Stedelijk Museum,**  
Piet Mondriaan  
*Composition with 2 lines*



**Scheepvaartmuseum**



**The Amsterdam Canals**