Early tests on brain cancer patients show significant promise for the use of MR fingerprinting to produce previously unattainable quantitative information in a short time, according to Prof. Siegfried Trauttnig of the Medical University of Vienna, where new research on 10 volunteers has been carried out since ECR 2015.

The results using an advanced MR imaging protocol and MR fingerprinting showed that the T1 and T2 mapping of tissue provided by fingerprinting was better visualised than in the standard protocol, said Trauttnig, medical director of the university’s Centre of Excellence in High Field MR and the chairman of the European Imaging Biomarkers Alliance (EIBALL). The testing was conducted using five patients with malignant brain tumours and an equal number with low-grade gliomas.

“It’s my impression that we see more changes by using MR fingerprinting based on T1 and T2 maps on this quantitative data. And looking into the tumour, you see more details that are not shown on standard imaging,” he explained, emphasising that the results of the Austrian university’s 2015 tests are only preliminary.

ECR delegates have the opportunity to learn more about MR fingerprinting during today’s discussion of imaging biomarkers and their promise in the treatment of cancer and other chronic diseases. Fingerprinting has yet to be tested in clinical settings, and Trauttnig acknowledges that there are divergent views amongst radiologists on whether the technique can successfully deliver stable and robust quantitative data. Initially he was sceptical about the clinical potential of MR fingerprinting, but he now sees it as potentially transformational. Instead of a standard MR protocol that provides qualitative information, fingerprinting can automatically provide a fast sequence that delivers quantitative diagnostic data as well.

“I believe that MR fingerprinting will help the radiological community to make this paradigm shift from qualitative to quantitative imaging, and also to use quantitative data more in their daily routine work,” said Trauttnig, adding that the information provided from fingerprints could be used to tailor treatment to patient needs.

The technique is also fast: results from the Vienna tumour study showed that the standard advanced MR imaging protocol took one hour for each patient, while the fingerprinting protocol could be done in five minutes.

MR fingerprinting could be advantageous in other ways. Preliminary results suggest that there was low variability of the T1 and T2 relaxation times over multiple examinations of volunteers in Vienna, with the potential to accurately monitor and evaluate the progress of treatment, or even provide clues in the early detection of cancer. In addition, fingerprinting may also yield cost savings because of the reduced mapping time involved, and it is based on software that can be added to existing MR equipment, said Trauttnig.

The Vienna researchers have been collaborating with other colleagues, including Prof. Mark Griswold of the Department of Radiology at Case Western Reserve University in Cleveland, Ohio.
**HIGHLIGHTS**

ECR TODAY | THURSDAY, MARCH 3, 2016

**By Mélanande Rouger**

**Distinguished U.K. radiologist to give honorary lecture on oncologic imaging**

In recognition of her major contributions to oncologic radiology and her dedication to the advancement of the field in Europe and beyond, Professor Andrea G. Rockall from London, United Kingdom, has been invited to give the Wilhelm Conrad Röntgen Honorary Lecture ‘Imaging the invisible killer: towards personalisation of ovarian cancer care’.

Andrea G. Rockall is Consultant Radiologist at the Royal Marsden Hospital and Visiting Professor of Radiology at Imperial College London, UK.

She graduated in neuroanatomy at King’s College London in 1987 and received her medical degree from King’s College Hospital Medical School in 1990. She was awarded the Royal College of Radiologists’ (RCR) Rolland Williams Medal, the gold medal award for the FRCR examination, in 1997.

She chose radiology as a career because of the central role imaging plays in the diagnostic pathway. “I love the challenge of a difficult differential diagnosis and logically following the clinical and imaging clues to get to the correct diagnosis.” She was also drawn by the rapid pace of technological developments – as MRI came into clinical use when I was a junior doctor in internal medicine,” she said.

After completing her training in internal medicine, she started working as a registrar in radiology at St. Mary’s Hospital and then as a senior registrar in radiology at University College London Hospitals. In 2000, she was appointed Senior Lecturer and Consultant Radiologist at St. Bartholomew’s Hospital London, a position she held for twelve years. During that time, she was appointed Honorary Professor of Cancer Imaging at Bart’s Cancer Institute, Queen Mary University London, before taking up her current position.

Her interest in oncologic imaging grew under Prof. Rodney Reznik’s strong mentorship while working at St. Bartholomew’s Hospital. Prof. Reznik was leading developments in gynaecologic cancer imaging in the UK and there was a fantastic interaction with the surgeons and oncologists, which was very exciting. “My research followed this clinical interest,” she explained.

Rockall is currently chief investigator on three national multi-centre studies: the MAPPING study which is evaluating diffusion weighted imaging, FDG and F-Ethyl-choline PET/CT in nodal staging in cervix and endometrial cancer (funded by Cancer Research UK); the MALIBU study, which is developing machine learning in whole body MRI for detection of metastatic disease (funded by National Institute for Health Research – NIHR); and the MRCHC study, which is evaluating multi-parametric MRI in determining treatment planning and staging of ovarian cancer (also funded by NIHR).

Rockall has authored or co-authored more than 200 publications in peer-reviewed journals, three books and numerous book chapters.

She was president of the International Cancer Imaging Society for 2013 and is a council member of the British Gynaecologic Cancer Society. She is also currently a member of the RCR Steering Group for Cancer Imaging and Reporting, and she chairs the Female Pelvic Imaging Working Group for the European Society of Urogynaecological Radiology.

In addition, she serves on several committees, including the European Society of Gynaecologic Oncology’s quality standards in ovarian cancer surgery committee, the RSNA Programme Committee and the ACR D-RADS steering committee. She has also served as Chair of the ESR Statutes and Rules Subcommittee and as a member of the ESR Membership Subcommittee.

She started attending the ECR in 2003 when she presented one of her first research studies on the diagnostic performance of MR lymphography with USPIO in gynaecological malignancies. “I was absolutely delighted to be awarded Magna Cum Laude for my presentation. Since that time, I have regularly attended the ECR. I enjoy coming to Vienna for this excellent meeting and networking with colleagues with similar interests,” she said.

Rockall has received many distinctions for her work, including the Outstanding Teacher Award from the International Society for Magnetic Resonance in Medicine in 2014.

“Active involvement in the ESR is very important to me. In particular, I value the mission of providing high quality radiology education without borders through the many ESR initiatives.”

Don’t miss today’s Honorary Lecture

**Thursday, March 3, 12:25–12:45, Room A**

Wilhelm Conrad Röntgen Honorary Lecture

- Imaging the invisible killer: towards personalisation of ovarian cancer care

Andrea G. Rockall, London, UK

**New Horizons Session**

**Thursday, March 3, 08:30–10:00, Room L8**

NH 5 Imaging beyond morphology

- Chairman’s introduction
  O. Clément; Paris/FR
- MRI fingerprinting: the future?
  S. Tsantrizi; Vienna/AT
- Receptor-targeted multimodal imaging
  M. de Jong, Rotterdam/NL
- Radiomics
  L.S. Fournier; Paris/FR
- Panel discussion: Imaging biomarkers: a key role for radiologists in the future?
Hot Shots
from Day 1

Photography: A. Rinkhy, S. Kreuzberger
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Clinical decision support systems: has Europe’s time come?

2016 should be a landmark year with respect to the use of radiology clinical decision support (CDS) systems in Europe. The year will mark the launch of ESR iGuide pilot programmes in hospitals in at least five countries.

The Hospital Clinic de Barcelona is the first hospital in Europe to use an electronic clinical decision support system interfaced with a computerised physician order entry system to assist referring physicians in selecting the most appropriate diagnostic imaging exam based on ESR best practice guidelines.

The ESR iGuide is the result of several years of planning and hard work to make integration of best-practice guidelines for the ordering of diagnostic imaging examinations into an electronic CDS system that is designed to be accessed through a computerised physician order entry (CPOE) system.

The European radiologist who has the most experience with CDS implementation is ESR President Prof. Luis Donoso, director of the imaging department at Hospital Clinic de Barcelona. In late 2013, his hospital launched the first pilot radiology CDS programme in Europe. The project began with 80 primary care and general physicians for the orders of musculoskeletal and neurological examinations.

He reported that the hospital is currently completing its first evaluation of two years of use before expanding the system to other physicians and departments. Today, regarding the appropriateness of the requests using the CDS, 98% of the exams were indicated, 5% with marginal benefit, and another 1% non-indicated. Interestingly, there has been a 20% increase in MRI requests. Partly because of this, the impact of the CDS in the clinical process is now being analysed.

Donoso said it is important to understand the reason for the rise in MRI orders and also to determine if the general practitioners physicians who use the CDS are being more effective in reducing the number of visits by patients to specialists.

“It is very important to all users in the process of making radiology CDS adoption a success consider this a win-win situation,” he said. “Our project has increased the visibility of general physicians at Hospital Clinic de Barcelona and has stimulated a better and closer relationship with our imaging department. We have succeeded in creating a more efficient workflow for the patient. Everyone involved is invited to be an active participant in the evaluation process to date and the publication of the results that we will soon know.”

Hospitals in the U.S. were the first to use electronic radiology CDS systems, and their mandatory use by the end of the decade is now federal law. But adoption has been slow very similar to the pattern of adoption of speech recognition dictation systems and the use of structured report templates. Implementation needs to be very carefully planned, and CDS systems need to be customised to meet the specific needs of a hospital or multi-hospital enterprise and the physicians who will use the system. The challenge will be even greater in Europe, believes Prof. Dr. Peter Mildenberger, professor of radiology at Mainz University Medical Center in Germany.

As an active member of the ESR iGuide and EuroSafe Imaging programmes planning CDS launches in Europe, he explained that health-care is a very different nation by nation in Europe, because healthcare regulation is organised on a national basis. For this reason, there are great differences in the roles of ordering physicians. In the U.K., the general physician has a very central role in the management of patients, including responsibility of cost management, so these physicians might be very accepting of CDS in its context of being a cost-effective use of imaging resources.

“In Germany, this may be different,” added Mildenberger. “Each physician is allowed to order any kind of imaging without much supervisory control and without the need to justify the order. Because radiologists are paid as a fee for service, and because referring physicians are concerned about any recall regarding clinical information before the imaging procedure is done by the radiologist, there is some ‘pressure’ to do the imaging. Otherwise, the referring physicians will probably send patients to another imaging institution the next time.”

Mildenberger thinks that physicians in Europe will consider radiology CDS as valuable and worthy of adoption if the technology can be shown to reduce radiation exposure to patients and improve the quality of patient healthcare. He believes that the climate of a hospital will be a key factor, and that in-house regulation of imaging costs and their distribution to the different stakeholders – specifically the radiology department versus referring departments – will also have an impact on adoption.

In some hospital settings there may be a high communication standard among the different departments, there will be limited room for optimisation by a CDS because there is a continuous self-regulation between referrers and radiologists. “Any hospital planning to implement radiology CDS must visibly demonstrate that the administrators and department chairs and manage accept and promote the project. This is an institutional project. It is not an isolated initiative of the imaging department,” said Donoso.

“The most difficult and challenging task when implanting CDS is to get the full involvement of the users from the beginning. They need to be involved in the design of the project, the integration process of the CDS into the CPOE, and in the ongoing evaluation process.”

Prof. M.G. Myriam Hunink, professor of radiology and clinical epidemiology at Erasmus University Medical Center in Rotterdam, The Netherlands, agrees. She also expressed the importance of customising a set of proven unified best-practice guidelines.

“We can use collective knowledge and expertise to establish guidelines but still allow for local differences if there are special circumstances. Academic hospitals can lead this process,” she noted. “It will be necessary for CDS feasibility and cost-effectiveness to be shown prior to widespread implementation.”

ESR Guide welcomes inquiries from hospitals to participate in the multinational pilot project.

Read more about CDS on page 21 of this issue.
Join us in Dublin to explore the latest in image-guided oncological therapies!

The 2016 programme will cover the full spectrum of IO, including such staples as HCC, colorectal liver metastases, lung cancers and the clinical management of patients, as well as newer clinical territories such as immunotherapy, neuroendocrine tumours and cholangiocarcinoma.

Find out more by visiting www.ecio.org/2016
Diffusion-weighted imaging breaks new ground in abdomen

It’s official: diffusion-weighted imaging (DWI) is no longer a research tool, and all radiologists should know how it works and the right way to analyse images in clinical settings. That’s the view of expert speakers at today’s session on abdominal DWI, which aims to evaluate the technical difficulties and clinical relevance of both qualitative and quantitative diffusion-weighted approaches in clinical practice. Delegates will also hear how small bowel DWI is edging ever nearer acceptance in routine application.

“DWI is a must in all the abdominal examinations. It is an extremely accurate technique for lesion depiction and lymph node assessment,” said session moderator Prof. Luis Martí-Bonmatí, chair of radiology and director of medical imaging, La Fe University and Polytechnic hospital, Valencia, Spain. “This technique is also crucial in the evaluation of lesion response to therapy, as different DWI matrixes are considered biomarkers of tumour cellularity. This means that we have a very early matrix of treatment effect and can quickly adjust therapy regimens accordingly.”

However, some technical hurdles remain. The chief difficulties with regard to the clinical use of DW images are related to signal homogeneity, spatial resolution, large b-value option and number of b-values, he said. Signal intensity in DW images decreases when the b-values increase. Furthermore, fat suppression techniques and echo planar imaging (EPI) sequences are prone to artefacts and distortions, and spatial resolution is limited by the inherent low signal intensity and long acquisition times.

To solve these problems, a sequence with a robust fat suppression technique – with a high signal-to-noise ratio, acquired with a very early matrix and with at least 6 b-values – is needed to qualitatively evaluate restriction and depict lesions and at the same time measure the D, D* and F components of the intravoxel-incoherent-motion (IVIM) model.

“Apparent Diffusion Coefficient (ADC) is simple and widely used but it is a bad matrix which introduces errors, due to the difference between centres and machines. ADC should be replaced with the IVIM matrix,” Martí-Bonmatí said.

At present, this approach is clearly undertaken by hospitals participating in clinical trials and in cancer research programmes, but within a few years most hospitals will use this technique because high-quality sequences will be made available by vendors. General radiologists need to know the direction that DWI is taking, he noted.

“For a clinical radiologist who is interested in whether DWI can help aid both detection of affected bowel and differentiation of active disease versus non-active disease. The application of DWI is well-established in helping to detect and characterise disease in the brain and liver, but it is relatively new in Crohn’s disease. Key to management of this chronic relapsing disease of the bowel is differentiating between active inflammatory disease and chronic fibrosis because this helps determine whether the patient will be treated with immunosuppressive drugs or surgical resection.”

Gastrointestinal imaging specialists believe there is compelling evidence that bowel affected by Crohn’s disease leads to abnormal DWI and there is considerable interest in whether DWI can help aid both detection of affected bowel and differentiation of active disease from fibrosis, according to Prof. Stuart Taylor, consultant gastrointestinal radiologist and professor of medical imaging at University College London. He is concerned about how the inflammatory process affects the movement of water, yielding abnormal DWI signal.

“In theory the greater the inflammation, the more abnormal the DWI signal,” he said in an interview ahead of the congress. However, recent information correlating MRI with histopathological examination of surgical resection specimens suggests chronic fibrosis could affect DWI signal in a similar way as inflammation. This means that when there is a question about fibrosis, for example in longstanding disease or in patients who are still symptomatic after long drug treatments, DWI probably should not be used on its own for differentiation. Instead, the radiologist should deploy conventional T2 and contrast-enhanced sequences which can help differentiate active versus non-active disease.

continued on page 10
continued from page 9

"In the literature, one suggested role for DWI is to replace enhanced sequences. However, we need further evidence that such replacement will not impact on the ability of the radiologist to distinguish, whether there is predominantly inflammation (active disease) or fibrosis (non-active disease)," said Taylor, stressing that such differentiation is fundamental to determining treatment pathways. He emphasised that high sensitivity of DWI for abnormal bowel will give it a role in initial staging of the small bowel in newly diagnosed patients. It will also be useful in established Crohn’s disease cases for defining how active the disease is, and particularly for monitoring therapy response during treatment.

Taylor reports particular use of DWI by paediatric radiologists as a sensitive, minimally invasive method to identify abnormal bowel in young children. In addition, DWI may replace sequences using intravenous contrast, particularly if detection of fibrosis is not the main clinical question.

"The question that now needs to be answered is whether or not DWI should be a part of routine practice every time there is a suspicion of Crohn’s disease, or if it should be reserved for selected cases, for example to monitor activity change during or after treatment, or in a newly diagnosed patient to establish the exact location of the disease," he noted.

"The evidence will grow over the coming years, through retrospective and prospective studies, according to Taylor, who is currently conducting a trial to research whether DWI changes overall diagnosis compared to conventional sequences.

At the University College London, DWI is routinely used to diagnose and assess Crohn’s disease, but he admits that the additional 5–10 minutes required, on top of an existing 20–30 minute procedure, represents a time increase of around 25%, and not all institutes may be willing to include it.

At today’s session, ECR delegates will also learn how DWI state-of-the-art sequences can be standardised and optimised in clinical practice by using techniques like IVIM sequences to measure properties such as cellularity, perfusion, and vascular fraction, yielding qualitative and quantitative data.

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may enable a CT beam to be pulsed instead of coasting on.

Acknowledging that modality vendors are to be commended and rewarded for their development of dose-reduction technologies, Foley states that making dose-saving features as optional extras is a difficult conundrum. He points out that there are many clinical centres in Europe that would use patient-beneficial dose-optimising features, but lack the funds to purchase them.

No matter what the economic status, radiology departments should consider ALARA protocols for procedures where lesser image quality – and less radiation dose – can produce a diagnostically acceptable image. Foley cited hydrocephalus and renal calculi exams as examples. Such optimisation should be routine in clinical practice, but evidence suggests many centres do this. Foley applauds the European Union Directives that require using dose-saving reference levels (DRLs) in February 2018, but hopes that these will be implemented much sooner because it is so straightforward.

Session co-chair Dr Isabella Björkman-Burtcher, a neuroradiologist and associate professor at Skåne University Hospital in Lund, Sweden, adds that the image quality objective for a CT image should indicate production of technologically flawed or aesthetically appealing images, but rather adequate reproduction of clinically important anatomical structures and pathological processes for diagnostic purposes.

Over-representation of excellent image quality at a department is indicative of a too high radiation dose that should be lowered. She also reminded ECR attendees to keep in mind that the CT protocols used for an examination should reflect the clinical question asked. For instance, in the case of an unclear clinical question, the indication for the examination should be re-evaluated, instead of using a more extensive CT protocol covering many potential clinical questions.

Radiology departments in Europe could better improve CT dose optimisation if each had the newest CT technology available for use. However, both large and incremental improvements to reduce radiation dose to patients may be made without it, according to the experts.

### Special Focus Session

**Thursday, March 3, 16:00–17:30, Room D2**

**SF 84 CT radiation dose optimisation: are we doing enough?**

- Chairmen’s introduction
  - I.M. Björkman-Burtcher; Lund/SE
  - C. Malamantinos; London/UK
- CT radiation dose optimisation: what has been achieved so far?
  - J. Santos; Coimbra/PT
- Dose reduction techniques in paediatric CT: from A to Z
  - S. Zaric; Paris/FRA
- Challenges and opportunities in CT dose optimisation: what can we do in the future?
  - S. A. Sardari; Shiraz/IIR
- Panel discussion: What are the suggested priorities and actions for CT dose optimisation?

### CLINICAL CORNER

**BY MÉLISANDE ROUGER**

**Overshoot from page 10**

Obesity is changing the pattern of illnesses and affecting healthcare in an unprecedented way. Radiology can provide ways to assess body fat and, more recently, minimally-invasive weight loss therapy, which could help to slow down the epidemic, as speakers from various fields of medicine will show today in a session at the ECR.

The prevalence of obesity doubled between 1980 and 2008 and obesity is now of similar global cost to society as smoking, or armed violence, war and terrorism. In particular, the incidence of diabetes type 2, the disease most closely linked with obesity, is swamping healthcare systems, which could help to slow down the epidemic, as speakers from various fields of medicine will show today in a session at the ECR.

Finer sees more promise in assessing body fat and, more recently, minimally-invasive weight loss therapy, which could help to slow down the epidemic, as speakers from various fields of medicine will show today in a session at the ECR.

Finer will focus on genetic predisposition, a factor estimated to contribute to obesity in 60% of cases. “Although I don’t think there is the ability to do a complete genetic diagnosis, we have identified about 100 genes that make you susceptible to obesity, which is likely to have a body mass index (BMI) that is up to two units higher than somebody who doesn’t have those genes,” he said.

Finer sees more promise in assessing relevant phenotypes to prevent obesity related diseases, an area where ultrasound is already useful. Ultrasound is instrumental in evaluating anatomical tissue density (cIMT), a measure used to treat stroke. A recent study showed that individuals who dropped a BMI category in adulthood had lower cIMT, even when weight loss was not maintained, compared with individuals who never lost weight. “This is an interesting finding. We know that people who lose weight have lower incidence of diabetes 2 and there is evidence that weight loss is beneficial even if not maintained over time, for the incidence of metabolic and cardiovascular disease,” he said.

But one cannot define obesity by calculations using weight and height, as with BMI; measuring fat distribution around the waist line, for instance, can help to determine belly fat, which is more harmful than fat around the hips or thighs.

“What we do need are better ways to quantify where that fat is and that’s where radiology imaging is very helpful,” said Finer. MRI is one of the best modalities to do so, but examinations cannot be performed in large cohorts, nor does the cost justify doing scans for patients only for the sake of research. Dual energy x-ray, however, is more accessible and cheaper.

Sarcopenic obesity, i.e. shortage of muscle with obesity, is becoming an indication for assessing fat distribution with imaging. The condition is common in the elderly, but losing weight can be dangerous for such people, as it can also trigger a further loss of lean tissue. “Imaging techniques may be a potentially important tool in these patients to make sure we are not over-treating them,” Finer said.

Interventional radiology is becoming an area for the development of obesity treatment and one procedure in particular, Bariatric Arterial Embolisation (BAE), is showing promise. To date, the most effective treatment for obesity is bariatric surgery, and it leads to significant, sustained weight loss. Much of this effect has been attributed to hormonal changes that occur almost immediately following surgery. Interventional radiologists at Johns Hopkins University in Baltimore, U.S., have been working to develop a similar hormone-altering interaction with BAE, according to one of its pioneers, Dr Clifford Weiss, Associate Professor of Radiology Surgery and Biomedical Engineering and Director of Interventional Radiology Research at the Johns Hopkins University School of Medicine.

Bariatric surgery either removes or bypasses the fundus of the stomach where most ghrelin is produced. Afterwards, ghrelin drops, hormones that signal fullness, rise, and patients are less hungry, explained Weiss. “We at BAE we attempt to emulate the metabolic and hormonal effects of open surgery using a minimally invasive technique. By taking advantage of the anatomic location of ghrelin-producing cells in the fundus and the specific vascular supply of the stomach, we determined that we could block certain blood vessels and decrease the production of ghrelin and mimic the effects of bariatric surgery.”

Weiss started developing the procedure on mice ten years ago. In BAE, specific arteries that feed the gastric fundus are blocked using tiny embolic microspheres that are commonly deployed in interventional radiology procedures to treat bleeding.

Weiss and his team received a government grant to study this procedure further in animal models and an industry sponsor for an FDA approved clinical trial, titled Bariatric Arterial Embolization for the Treatment of Obesity (BEAT Obesity). During the session, he will present the results of his first seven human patients, all of whom have lost weight.

**Special Focus Session**

**Thursday, March 3, 16:00–17:30, Room D3**

**SF 1c Imaging in obesity**

- Chairmen’s introduction
  - S. Law; Manchester/UK
- Epidemiology and current trends in obesity
  - N. Fiser; London/UK
- Fat quantification and advanced body composition assessment using MRI
  - C. Dahnert Leinhard; Linkoping/SE
- Imaging of modern surgical procedures and their complications
  - M. Rengo; Latin/IT
- Is there a role for bariatric embolisation in the treatment of the obese patient?
  - C. Weiss; Baltimore, MD/US
- Panel discussion: How to best manage obesity and its implications on the radiology department
Experts face infection control issues in ultrasound

To highlight the need and the importance of a review of current procedures and a consensus regarding guidelines for decontamination, in today’s session hosted by the ESR Working Group on Ultrasound, experts will discuss the potential risk of transmitting infections through ultrasound and current accepted decontamination practices.

One of the problems caused by the financial crisis, which Greece has been facing since 2008, is the increasing numbers of doctors leaving the country to work and train abroad. Greek doctors, both in the public and in the private sector, are leaving in increasing numbers due to pay cuts and fewer job opportunities.

The problem is not new. As a country with one of the highest doctor-per-capita ratios in Europe, Greece used to have long waiting lists for specialty training, since this demand used to outgrow the number of available paying positions, and junior doctors were leaving the country in order to evade years of waiting. These waiting lists exist no more. Nowadays, many doctors leave before or during their training, and the problem has turned the other way around: hospitals around Greece have vacancies in training jobs and there are departments staffed only by specialised physicians, with no junior doctor present. In the specialised medical field, the number of doctors interested in training is that there are fewer and fewer jobs available in the public and private sectors. For both groups, two more reasons exist: the prospect of much better pay and better facilities abroad.

The number of emigrating doctors started to rise in 2009 and has grown considerably since then, both in training as well as specialised physicians. According to data from the Medical Association of Athens (ISA), over 10% of all emigrating doctors are very specialised professionals who have completed their education. This makes things even worse, considering that the country has already paid for these doctors’ training, only to see them leave once their education is completed. For the time being, the Greek National Healthcare Service, as well as the private sector, has not been able to attract new specialised doctors. Since 2012, the number of doctors leaving ISA has more than doubled. The most popular countries for Greek doctors deciding to work abroad are those of Western Europe (the UK and Germany being the first choices). However, doctors...
How to identify and minimise common errors in breast imaging

When it comes to breast imaging, errors occur more frequently in breast MRI than in mammography. They can be broadly connected to the patient or to technical factors. In the following, five areas where errors occur will be discussed: breast MRI, mammography, breast ultrasound, second-look ultrasound of the lesion, and breast MR exams. 

In a screening setting there is the necessity to work at slightly lower levels of sensitivity to achieve acceptable levels of specificity, whereas when faced with a patient with a symptomatic problem, attention is also paid to more benign appearing features.

Second look ultrasound

Second-look ultrasound of the lesion. It’s an oval, horizontally oriented lesion with circumscribed borders, posterior acoustic enhancement, and no hypervascularisation. Internal features unsppecific hypo-echoic. It was found to be probably benign on ultrasound, and followed up over two years without evidence of growth. (All images provided by Dr. Pascal Baltzer) What factor of imaging interpretation can be attributed to the presence of background parenchymal enhancement that can reduce the diagnostic accuracy and insufficient history or lack of practice in reading MRI images. During her presentation, Pediconi will provide an overview of different types of diagnostic errors as well as the way to avoid them and handle them. Errors in second-look ultrasound after breast MRI are also quite common. Every finding detected by breast MRI deserves a second opinion. However, the lesion is known where the breast MRI is done. It is found to be probably benign on ultrasound, and followed up over two years without evidence of growth. (All images provided by Dr. Pascal Baltzer). 

Some mistakes are more common. Every finding detected by breast MRI deserves a second opinion. Baltzer anticipates an increased use of ultrasound in breast imaging, particularly to determine whether lesions can be upgraded or downgraded by ultrasound and whether ultrasound follow-up is possible in MRI-detected lesions. Empirical evidence is lacking, in spite of the many examinations done everywhere, he added. “I guess this is because you can’t really measure something. What is the impact of ultrasound?” he said. “Second-look ultrasound, it is similar to mammography, but with a lack of expertise in reading ultrasound. However, the lesion is known where the breast MRI is done. It is found to be probably benign on ultrasound, and followed up over two years without evidence of growth. (All images provided by Dr. Pascal Baltzer). 

Other factors of imaging interpretation can be attributed to the presence of background parenchymal enhancement that can reduce the diagnostic accuracy and insufficient history or lack of practice in reading MRI images. During her presentation, Pediconi will provide an overview of different types of diagnostic errors as well as the way to avoid them and handle them. Errors in second-look ultrasound after breast MRI are also quite common. Every finding detected by breast MRI deserves a second opinion. However, the lesion is known where the breast MRI is done. It is found to be probably benign on ultrasound, and followed up over two years without evidence of growth. (All images provided by Dr. Pascal Baltzer). 

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This is expensive and in many cases not possible as most radiologists doing breast MRI do not provide a biopsy unit. According to Dr. Pascal Baltzer from the Department of Radiology at the Medical University of Vienna. The next choice is ultrasound. A second-look ultrasound can be worked up through follow-up or biopsy, which can be done by MRI (as that was the method detecting the lesion). But this is expensive and in many cases not possible as most radiologists doing breast MRI do not provide a biopsy unit. According to Dr. Pascal Baltzer from the Department of Radiology at the Medical University of Vienna. The next choice is ultrasound. A second-look ultrasound can be worked up through follow-up or biopsy, which can be done by MRI (as that was the method detecting the lesion). But this is expensive and in many cases not possible as most radiologists doing breast MRI do not provide a biopsy unit. According to Dr. Pascal Baltzer from the Department of Radiology at the Medical University of Vienna. The next choice is ultrasound. A second-look ultrasound can be worked up through follow-up or biopsy, which can be done by MRI (as that was the method detecting the lesion). But this is expensive and in many cases not possible as most radiologists doing breast MRI do not provide a biopsy unit. According to Dr. Pascal Baltzer from the Department of Radiology at the Medical University of Vienna. The next choice is ultrasound. A second-look ultrasound can be worked up through follow-up or biopsy, which can be done by MRI (as that was the method detecting the lesion). But this is expensive and in many cases not possible as most radiologists doing breast MRI do not provide a biopsy unit. According to Dr. Pascal Baltzer from the Department of Radiology at the Medical University of Vienna.
Experts to push for online image sharing framework for hospitals

Sharing medical data via the internet presents many benefits, but a number of issues currently hinder the full use of what is now commonly known as ‘the cloud’. A panel of international experts will assess the situation and explore potential strategies to make the most of the available technology in a dedicated session at the ECR.

Healthcare is evolving

Current hospital-centric model

Collaborative care model

Healthcare professionals are not always aware that they have this responsibility. They must be able to choose among a wide array of tools and compare who can provide access to medical records, etc.

However, the necessity of easily sharing this information remains, as it would benefit the patient, said Ranschaert. “As long as hospitals do not provide a safe framework for sharing images, the cheaper alternatives will remain attractive.” This is a good example of disruptive innovation. We live in an era where information is shared digitally and hospitals need to follow this trend within short notice. The traditional hospital-centric concept is moving towards a patient-centric concept, where the patient’s information can be fluently transmitted from one department to the other and from one hospital to the other. This concept is also called the liquid hospital,” said Ranschaert.

“The EMR will become standard for hospitals tend to be very protective of confidentiality. Today, doctors and hospitals are held responsible for patient data protection and providers like Dropbox comply with local regulations – the Health Insurance Portability and Accountability Act (HIPAA) in the U.S. and local regulations in every EU country. These vary in degrees of strictness, according to Prof. Osman Ratib, head of the division of nuclear medicine and molecular imaging at the University of Geneva and chair of the ESR e-health and Informatics Subcommittees, who will also speak during the session.

“The situation is quite heterogeneous in the EU. In Switzerland, I am not allowed to store anything on the cloud that is not physically present on a server elsewhere in the country. This is a very restrictive and counter-productive regulation, because the point is to be able to share the data over the country,” he said.

EU guidelines and recommendations on cloud storage are the same across the board, but hospitals are free to choose the cloud provider that best suits their needs. However, the cloud is a fantastic opportunity for hospitals to apply to have data kept in the cloud. Access to the data can be identified. Legal framework is always remote from technical implementation and hospitals tend to be very protective even beyond regulations. Most facilities will therefore have complex keys, cards and biometric identification to access the data. The weakness of the system comes from the users. “Very often, it is the miscommunication or lack of training of users regarding patient data safety that creates problems. It is so much easier to attach the data to an email to my colleague. So it’s our responsibility to educate users that they are the guardian of the data; if something goes wrong, they go to court,” Ratib said.

Healthcare professionals are not always aware that they have this responsibility. They must be able to choose among a wide array of tools and compare who can provide access to medical records, etc.

However, the necessity of easily sharing this information remains, as it would benefit the patient, said Ranschaert. “As long as hospitals do not provide a safe framework for sharing images, the cheaper alternatives will remain attractive.” This is a good example of disruptive innovation. We live in an era where information is shared digitally and hospitals need to follow this trend within short notice. The traditional hospital-centric concept is moving towards a patient-centric concept, where the patient’s information can be fluently transmitted from one department to the other and from one hospital to the other. This concept is also called the liquid hospital,” he said.

The ESR issued a white paper on telemedicine in 2012 and will soon publish one on portable devices to help users recognise which key features data sharing providers must offer to ensure data safety.

“It’s a little bit of a jungle out there. It’s crucial to make sure which system is secure and which isn’t. We need to continue to issue new guidelines to help users make the right choices,” Ratib concluded.

Reference | http://www.esra.org/image_share.aspx

Special Focus Session
Thursday, March 3, 08:30–10:00, Room C
SF 5 Taking imaging to the cloud

- Chairman’s introduction
  - J. Repanen, Raahide/FI
  - “What does it work?”
  - J. Fernandez-Bayo, Sabadell/ES

- What are the benefits?
  - E. B. Ranschaert, J.-H. Rendsboeck/NL
  - “What are the applications of cloud in radiology?”
  - C. Ratih, Geneva/CH

- Panel discussion: ‘Will cloud computing be the future of image storage?’

HAVE A COFFEE WITH THE PRESIDENTS!
Don’t miss the Meet & Greet Sessions with ESR President Luis Donoso Bach (today, 10:40–16:00), and ECR 2016 Congress President Katrine Riklund (today, 16:20–16:30), in the Rising Stars & RTF Lounge on the lower level.

Free coffee will be served.

RFT MEET & GREET SESSIONS
Today, at the RFT Booth in the Rising Stars Lounge you will be able to meet the following Radiology Trainees Forum (RFT) representatives:

11:00–12:00 Neeja Purnhill (UK) 12:00–13:00 Ekatrina Kasatkina (Russia) 15:00–17:00 Yvonne Purcell (Ireland)

Join your European colleagues and representatives in an informal and relaxed discussion, exchange opinions and recommendations and open discussion about best of Radiology.

Take advantage of this great opportunity!

The RFT General Assembly takes place today, 09:00–10:30, in Meeting Room 2B (Delirium). For more detailed information please visit the RFT Meeting Point in the Rising Stars & RTF Lounge.

And join us at the RFT Quiz with Guimarães José Villar today, 12:30–13:30 in Room 2.
Ultrasound elastography is a complementary imaging technique for the characterisation of breast lesions. There are two types: hand elastography and shear wave elastography. The former involves the application of a compressive force by a conventional transducer to the breast tissue and measurement of the lesion stiffness compared to that of surrounding tissue. Generally, malignant lesions are harder than benign lesions. The results can be expressed as a colour scale or lesion-to-fat strain ratio. According to a five-point colour scale by Takada, knees of strain are observed as blue throughout the entire lesion or even in the surrounding area.

Shear wave elastography is a technique using shear waves, which propagate faster on hard tissues than in soft tissues. Both colour-coded images and the maximum elasticity value (kPa) are obtained by this technique. Colour closer to red or a higher kPa indicates a malignant lesion. These techniques, added to conventional 2D ultrasound imaging, have been introduced to help physicians avoid unnecessary biopsies without a significant loss of sensitivity.

The purpose of our study was to investigate the added value of breast ultrasound elastography combined with conventional sonography for differentiating between benign and malignant breast lesions. In our prospective study, 135 non-palpable breast lesions (92 benign and 43 malignant) from 115 women were evaluated by conventional sonography and added strain and shear wave elastography. Both colour scale and lesion-to-fat strain ratio were evaluated. Four radiologists independently reviewed the obtained images. At first, each lesion captured by 2D sonography with video was scored on a cancer probability scale of 0 to 100% and evaluated on BI-RADS at the same time. They were rescored on the same cancer probability scale and re-evaluated on BI-RADS after addition of colour scale strain images and shear wave images. The diagnostic performance was compared using the area under the receiver operating characteristic (ROC) curve for each result and strain ratio from strain and shear wave elastography. The cut-off value of a strain ratio for both strain and shear wave elastography was determined.

The diagnostic performance was significantly higher when using conventional sonography images plus colour scale images or lesion-to-fat strain ratio of elastography than when using conventional images alone. The cut-off values of lesion-to-fat strain ratio were > 2.93 in strain and > 3.5 in the shear-wave method. The results indicate that the addition of either colour visual assessment or strain ratios of elastography to conventional sonography may improve diagnostic performance in keeping with the results of previous published studies.

Detailed results will be presented in the breast scientific session.

Costal cartilage fractures: an overlooked injury in polytrauma patients?

A review of 978 consecutive blunt trauma patients

In trauma patients, chest trauma is the second leading cause of mortality and morbidity after head injuries. Injuries of the chest wall, such as rib fractures and flail chest, have been widely covered in the literature, although costal cartilage injuries are rarely mentioned. Previous reports on this subject have focused mainly on diagnosing anterior chest pain of unknown etiology or patients with a known history of trauma. There are also many case reports of post-traumatic imaging in sports-related costochondral injuries. The clinical significance and long-term effects of costal cartilage injuries remain unknown. It has been shown that cartilage injuries tend to heal poorly and may present as persistent post-traumatic pain and discomfort. Sometimes the patient complains of a palpable mass on the anterior chest wall that turns out to be a result of cartilage injury. Conventional chest radiology cannot reveal costal cartilage fractures, but cross-sectional imaging techniques such as CT MRI and ultrasound have proven to be useful for their detection.

The aim of our retrospective study was to evaluate the incidence of costal cartilage fractures in blunt trauma patients, as well as mechanism of injury, associated injuries and accuracy of reporting. In a systematic retrospective review of 978 whole body computed tomography (WBCT) trauma studies, we found that cartilage cartilage fractures are indeed fairly common (9.9%) in blunt chest trauma patients. These injuries are often overlooked or undiagnosed, especially in the presence of multiple severe and potentially life-threatening concomitant injuries. The fractured cartilage ends tend to be smooth and well delineated, making it more difficult to notice the fracture than in osseous rib fractures, where
Measurement of blood velocities in renal, intrarenal and carotid arteries

Comparison of ultrafast Doppler and conventional colour duplex Doppler

Dr. Gordana Ivanac is Associate Professor at the Department of Diagnostic and Interventional Radiology, Dubrava University Hospital, University of Zagreb School of Medicine, Zagreb, Croatia.

Case 2: 37-year-old male, fell from a height, resulting in polytrauma. CT coronal image of a non-dislocated costal cartilage fracture (arrow) on the left (a). Axial CT image (B) and axial ultrasound image (C) of the same fracture. (All images provided by Mari Nummel and Frank Bensch.)

Measurements can be performed independently on all spectrograms and compared to each other with a high degree of reliability, since all spectra are computed at the same time, on the same cardiac cycle. This is an example of simultaneous demonstration of spectra from common, external and internal carotid arteries, where one can easily differentiate internal carotid arteries from external carotid arteries on the basis of spectral morphology.

Doppler analysis is a very demanding feature of an ultrasound system, and its complexity is caused by technical limitations like low frame rates and small regions of quantification, which have a negative workflow impact. The advent of massive parallel computing capabilities where new graphics processing units (GPUs) allow the simultaneous processing of thousands of channels means an important step forward in medical imaging, which has enabled a new level of ultrasound called ultrafast imaging.

Ultrafast imaging can acquire image information at frame rates of up to several thousand Hz, an increase by a factor of 100 relative to conventional ultrasound systems. The increase in computing power has resulted in two major innovations: shear wave elastography, which provides real-time tissue elasticity in a colour-coded map, and ultrafast Doppler, which unites colour flow imaging with pulsed wave Doppler. Ultrafast Doppler renders ultra-fine frame rate colour flow clips that are up to 10 times faster than conventional colour Doppler. With such high frame rates, high sensitivity and fully loadable flow information over a large region of interest, ultrafast Doppler may have a major impact on a physician’s workflow, examination time and diagnostic accuracy. Using the SuperSonic Imagine Aixplorer system, the ultrafast imaging platform is linked with colour flow imaging with pulsed wave Doppler. The same technology also acquires fully loadable Doppler data throughout the colour box, enabling the generation of post-processed pulsed wave Doppler spectra from multiple locations in the same image. Retrospective ultrafast Doppler spectral analysis offers the ability to compare flow spectra and measurements from multiple locations, which have been acquired simultaneously and therefore correspond to the same cardiac cycle, exhibiting perfect temporal synchronicity. In the context of vascular diseases, a tool with these abilities has the potential to increase diagnostic accuracy. With these improvements, complex flow haemodynamics and transient flow events can be visualised in a much more accurate manner, potentially leading to a more reliable haemodynamic assessment of vascular diseases. One, for instance, is stenosis grading through the comparison of proximal, distal, and mean velocity and calculation of resistance indexes in renal arteries.

The purpose of our study was to compare accuracy of blood velocity measurements of renal, intrarenal, and carotid arteries and examination duration of ultrafast and conventional colour duplex Doppler. Ultrafast Doppler and conventional duplex Doppler examinations of common (CCA), internal (ICA), external carotid arteries (ECA) and renal (BA) and intrarenal interlobar arteries were performed by a single experienced examiner in 30 patients. Peak systolic velocity (PSV) was measured in each patient and values were correlated between the two methods. Measurements of PSV from carotid, renal and intrarenal arteries are equally accurate with ultrafast and conventional colour duplex Doppler, while examination duration is significantly shorter using ultrafast Doppler.

Dr. Mari Nummel and Dr. Frank Bensch work at the Department of Radiology (HUS Medical Imaging) in Töölö Trauma Center, Helsinki University Hospital, Finland. Prof. Seppo Kaskinen currently works as professor of Medical Radiology at the Department of Clinical Science, Intervention and Technology (CLINTEC), Karolinska Institute, and as a senior consultant at Karolinska University Hospital, Stockholm, Sweden.

Scientific Session: Vascular
Thursday, March 3, 10:00–12:00, Room L 8
- Measurement of blood velocities in renal, intrarenal and carotid arteries: comparison of ultrafast Doppler and conventional colour duplex Doppler
  G. Ivanac, N. Decic Dominkovic, K. Ivanac, B. Brijkajlic; Zagreb/HR

Scientific Session: Emergency
Thursday, March 3, 14:00–15:30, Room Da
- Costal cartilage fractures: an overlooked injury in polytrauma patients? A review of 978 consecutive blunt trauma patients
  M.T. Nummel, F.V. Benich, S.K. Kaskinen; Helsinki/FI, Stockholm/SE

#ECR2016 myESR.org
Time is money’ is a common expression in any branch of business, but in a radiology department, time is much more valuable than currency. In this situation, being able to provide a prompt and accurate diagnosis can help save lives. That’s why the new technologies on show in the commercial exhibition at ECR 2016 are designed to help radiologists make better use of their most important resources: seconds, minutes, and hours.

M.R.I is the ideal modality for investigating most neurological disorders, but scanning the patient is never as quick as users would like. For stroke patients with suspected cerebral thrombosis or bleed, the clock is ticking from the moment the patient arrives at the hospital’s emergency unit.

Siemens Healthcare is presenting two products aimed at significantly reducing the time needed to carry out a neurological examination. Simultaneous Multi-Slice can reduce the time needed to obtain 2D images by a factor of three, while also improving the temporal resolution of images taken using BOLD (blood oxygen level-dependent) functional MRI, according to the manufacturer. The company’s second product, GOBrain, reportedly allows clinically validated brain examinations to be carried out within five minutes, using the company’s high-channel density coils and its DotGO software to automatically set essential image orientations and contrasts.

Dr Donald Hardie, head of the clinical marketing team at Siemens’ global MRI unit, thinks the ability to obtain high-resolution diffusion imaging in a much shorter time frame could have a major impact on clinical practice. “It means that techniques like advanced BOLD and diffusion tensor imaging which have only been available to researchers, can now be part of routine clinical procedures,” he said. “This will expand the range of services available to our customers so that MRI can become part of pre-surgical planning and will allow more efficient use of operating room resources.”

It is not just in emergency situations that Hardie feels that technology can provide a valuable service. He believes that these applications can speed up the throughput of more routine neurological cases and those patients, old and young, who may become distressed and uncooperative during a lengthy spell in an MRI scanner. “Up to one in four MRI scans in a modern hospital focus on the brain,” he explained. “Hospitals around the world are being asked to do more of these investigations with fewer resources to pay for them. So we want to provide our customers with the solutions needed to give the same diagnostic-quality images but at a much faster rate.”

While one vendor offers insights into what is happening in the patient’s head, another is looking inside the heart. In the exhibition hall, GE Healthcare staff will be demonstrating ViosWorks, which aims to deliver a 3-D spatial and velocity-encoded dataset at every time point during the cardiac cycle, yielding high-resolution, time-resolved images of the beating heart and a measure of the speed and direction of blood flow at each location. The company explains that the product can help to capture seven dimensions of data (three in space, one in time and three in velocity direction). So with a free-breathing scan, typically acquired in less than 10 minutes, ViosWorks can simultaneously provide key elements of a cardiac MR exam: anatomy, function and flow.

The product was developed using new algorithms that allow large datasets to be evaluated in real-time via the cloud-based Arterys software. This can significantly reduce the amount of time spent on data processing and bring new visualization routines to life, according to the manufacturer. At ECR 2016, GE is also promoting the SIGNA Pioneer 3.0T MRI system that combines the power of a 3.0T unit with the ease-of-use and flexibility of a 1.5T system. It also offers improved image homogeneity and reproducibility for oncology and spine imaging, for example. In addition, ultra-high-efficiency gradient technology offers high performance, even during demanding clinical applications such as cardiology or oncology, the company says.

Meanwhile, a focus of Philips’ efforts has been on a group of patients who are often denied the

continued on page 18
benefits that MRI scanners may offer in directing their treatment: those people with metallic implants. If there is doubt over the composition of the implant or its likely behaviour when exposed to a powerful magnetic field, physicians will often decide that it may be better to avoid taking any risks. This led the company to develop ScanWise Implant, the MR-guided user interface and automatic scan parameter selection application that aims to simplify the scanning of patients with MR-conditional implants such as knee and hip replacements, spine implants and pacemakers.

Philips believes that these predominantly older patients will form a growing part of the caseload of radiology departments around the world, with the numbers of people with cardiac pacemakers expected to increase by about 70% over the next five years in some developed countries.

“We saw an opportunity to use our advanced digital health technology to help make MRIs more accessible to a patient population routinely denied access to this modality,” said Robert Cascella, CEO of the Business Group Diagnostic Imaging that includes MRI, CT, PET and x-ray.

Toshiba is also emphasizing the importance of ensuring that an MRI examination forms part of the diagnostic work-up for as many patients as possible, not just those being cared for in large university hospitals. The company is presenting the latest software updates for its Vantage Elan 1.5T scanner, which is equipped with the company’s Advanced Magnet system and reportedly can produce an optimal homogenous magnet field coupled with a unique gradient coil technology to ensure stability and highly effective eddy current suppression. Significantly, as far as patient comfort is concerned, the scanner is also one of the quietest units on the market, due to the company’s Pianissimo² noise-reduction technology.

Technical Exhibition Opening Hours
Thursday, March 3 to Saturday, March 5 10:00–17:00
Sunday, March 6 10:00–14:00

The Vantage Elan system has musculoskeletal, abdominal, and other applications. (Provided by Toshiba)

The GoBrain application enables five-minute, clinically validated brain examinations with multiple orientations and all relevant contrasts, according to Siemens. (Copyright: Massachusetts General Hospital and Athinoula A. Martinos Center for Biomedical Imaging)
EU-funded project develops new tools for breast cancer surgery and research

Worldwide, breast cancer is the most common cancer in women and the second most common cancer overall. Diagnosing breast cancer as early as possible is crucial to ensuring the most effective treatment, with the survival rate for breast cancer drops sharply in the latest stage of its progression.

Virtual Physiological Human: Personalised Predictive Breast Cancer Therapy through Integrated Tissue Micro-Structure Modeling (VPH-PRISM) is a three-year collaborative project funded through the European Union’s Seventh Framework Research funding programme. It aims to support the development of better diagnosis and treatment tools for clinicians and surgeons through improved modelling of tumour.

The European Institute for Biomedical Imaging Research (EIBIR) is the project coordinator and leads the project management and dissemination work package in VPH-PRISM, working closely with the scientific coordinator Prof. Horst Hahn and scientific project manager Dr. Markus Harz at Fraunhofer MEVIS in Bremen, Germany. The project’s nine partners bring together researchers from Austria, Germany, the Netherlands, the United Kingdom, and the United States, as well as expertise in the fields of computer modelling, physics, medical imaging, surgery, and clinical practice.

Over the course of VPH-PRISM’s three-year run time, the partners have worked together to create the tools for more accurate modelling of breast tumours to enable earlier breast cancer diagnosis and better treatment options. This not only entailed creating improved models with greater accuracy, but also putting these models into practice to give surgeons and clinicians better diagnosis and treatment tools which will ultimately benefit the patient. Deriving knowledge from the multi-disciplinary data, and associating the image-derived knowledge with known cases and known predictors for breast cancer risk and therapy success — including epidemiological information — is the crucial step towards personalised therapy decision making, and hence the core of the project.

Providing computer support for this pivotal clinical task aims to remove subjectivity by bridging parts of the ‘complexity gap’ that would otherwise need to be filled by clinicians.

“Radiologists, gynaecologists, pathologists, surgeons, radiotherapists and oncologists all make important contributions to the care a patient with breast cancer receives. To do their work, each of the specialists uses a different set of tools specific to their discipline. While this works fairly well for qualitative assessments, it complicates accurate assessment of the combined results,” said Prof. Horst Hahn, from Fraunhofer MEVIS, Germany, scientific coordinator of the VPH-PRISM project.

The tools resulting from VPH-PRISM include a unique data-base that contains histopathological, molecular, environmental and imaging data. The data and the system will be maintained after the project ends and be made accessible to other researchers to ensure that the project’s results can continue to benefit further research into breast cancer and other diseases. The software solution developed during the project is an on course to be commercially available to researchers in the near future, allowing them to set up multi-centre studies with various types of data easier and quicker.

Surgery is an increasingly important treatment option in the arsenal against breast cancer. VPH-PRISM researchers have anticipated this trend and worked to give surgeons better planning tools. An iPad app has been developed that can visualise the breast in supine position and show the disease area corrected for deformation, helping the surgeon to determine optimal referencing at the time of surgery and access during surgery. Utilising the project’s results of advanced spatial multimodality imaging and other diseases, the software solution developed during the project can continue to be beneficial for researchers and other medical personnel.

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The project began in March 2013, with its kick-off meeting at ECR 2013, and officially ended in February of this year. To find more about the project’s key achievements and results, along with another EU-Funded project, ASSURE, you can attend the Joint VPH-PRISM/ASSURE Session taking place this afternoon at Studio 2016.

Joint Session
Thursday, March 3, 14:00–15:30, Studio 2016

EIBIR Session 1
(Internal Institute for Biomedical Imaging Research)
Joint VPH-PRISM/ASSURE Session – from screening to therapy: innovative breast care concepts
Moderator: H.K. Hahn, Bremen/DE

- Introduction: challenges and innovative approaches in image-based breast care
  H. K. Hahn, Bremen/DE
- Density patterns, breast cancer risk and masking in screening mammograms
  C. van Gils, Utrecht/NL
- Novel ultrasound and MRI technologies for breast cancer screening
  N. Karssemeijer, Nijmegen/NL
- Breast cancer risk and masking risk-based stratification protocols: key drivers of cost-effectiveness
  E. Gray, Manchester/UK
- Histopathology images: the new kid on the block of clinical multimodality imaging
  J. van der Laak, Nijmegen/NL
- Quantitative treatment planning, response prediction, and monitoring
  K. Pinker-Domenig, New York, NY/US

10 YEARS OF EIBIR
€63,000,000 research funding secured with EIBIR support

VISIT OUR BOOTH IN THE MAIN ENTRANCE HALL www.eibir.org
CIRSE: Improving standards in interventional oncology

Interventional radiology has undergone enormous growth in recent years, and now offers a complex array of therapies. While image-guided biopsies and drainages are still routinely performed by many radiologists, more and more practitioners are opting to focus primarily – or even exclusively – on minimally invasive therapies. This pattern is reflected by many training and certification guidelines across Europe and beyond. The European Curriculum and Syllabus for Interventional Radiology and the European Board of Interventional Radiology (EBIR) were launched by the Cardiovascular and Interventional Radiological Society of Europe (CIRSE) on a voluntary basis, but have been enthusiastically received by many individual interventional radiologists and health boards across Europe. Indeed, the EBIR has been formally adopted by the Interventional Radiological Society of Australia (ERSA) and the first of three mass exams was held in Melbourne last February, with the next scheduled for August in Queenstown. One of the two annual European EBIR exams is being held during ECR 2016 – we wish all candidates the best of luck!

RADIATION SAFETY

A major quality assurance issue for CIRSE is present is radiation safety. While patient safety has always been a key concern for any qualified radiologist, staff safety has often lagged behind. This is of particular significance in the interventional field, where extended fluoroscopy or CT exposure can mean that staff members face worryingly high cumulative doses. To counter this, CIRSE is running a sustained radiation protection campaign. Initially launched as a poster campaign at CIRSE 2013, it was expanded to encompass an interactive radiation protection pavilion at CIRSE 2014, with extensive information materials and two ophthalmologists on hand to check visitors for radiation-induced cataract formation.

The RADIATION PROTECTION PAVILION 2015

Due to an enthusiastic reception, the pavilion was repeated at CIRSE 2015 in Lisbon, and attracted massive support from eleven industry partners. In addition to the info-booths, eye-checks and industry info-booths featured in 2014, the pavilion offered two radiation safety simulators, where delegates could try out their skills with real-time visualisation of their radiation exposures. There were also interactive tools and games showcased by our industry partners, and a prize-draw for state-of-the-art protective devices.

CIRSE was particularly happy that the ESR’s EuroSafe Imaging campaign took part, with an information booth where delegates could find out more about the campaign’s call for action, and test the radiation protection modules of the ESR’s eLearning platform, Education on Demand.

Visitors also had – and still have – the opportunity to self-assess their knowledge of radiation protection and dose management issues with the online quiz, which was composed by CIRSE’s radiation protection experts.

Added to this, a series of twenty mini-talks gave exhibition visitors valuable tips and updates in easily-digestible chunks. These were delivered by both reputed experts and industry representatives, and are still available online at www.cirse.org/tppp.

LENS OPACITIES

The eye-checks not only helped visitors to keep an eye on their own ophthalmological health, they also enabled CIRSE to gather valuable data on cataract formation amongst interventional radiologists. A total of 79 eye-checks were performed, lens opacities were detected in 17% of all eye-checks, with a total of 7% of participating members having lens opacities in both eyes, and 6% in one eye. Among these, even very young participants were found to have opacities. More detailed information is presented in a EuroSafe Imaging poster on display in the ECR 2015 poster area (ECR Online & EPOS™ Lounge).

ECIO 2016

Naturally, CIRSE is involved in a great many other research and educational activities throughout the year. Our next major event will be the Seventh European Conference on Interventional Oncology, which will be held in Dublin from April 17-20. The programme will cover the full spectrum of interventional oncology, including such staples as hepatocellular carcinoma, colorectal liver metastases, lung cancers and the clinical management of patients, as well as newer clinical territories such as immunotherapy, neuroendocrine tumours and cholangiocarcinoma.

For more information on our activities in 2016 and beyond, please consult our website, or visit us at our society booth in the exhibition. ‘We look forward to meeting you’!

www.cirse.org/tppp
www.ecio.org/2016

Moving with the times: spotlight on The Royal College of Radiologists

The Royal College of Radiologists (RCR) continues to develop and build the support it gives to Fellows and members throughout their careers. The College’s total membership now numbers almost 13,000. During 2015, there was a focus on developing leadership skills with the first multidisciplinary leadership course launched and proceeding very successfully. This was introduced alongside offering mentoring support to newly qualified radiology consultants to help them in the early years of their careers, as they take on new responsibilities and challenges.

The clinical value of radiology in advising other clinicians, and on occasions directly interacting with patients, brings with it the demand to build and maintain non-technical skills. The RCR is developing a new programme to look at how these skills (radiology non-technical skills or RaNTs) can be embedded to complement the clinical development of those training to become radiologists so that they are fully equipped to deliver safe, effective and patient-focused care. The College believes the more we understand how the environment and the systems in which doctors operate can affect their clinical effectiveness, the more we are likely to avoid discrepancies and events which can sometimes adversely affect patient care and safety. For a few years now the College has had the Radiology Events and Discrepancies (READ) initiative which is a way of confidentially sharing events and discrepancies as learning opportunities; there are further initiatives in train to develop this important strand of activity. Alongside these initiatives, the College is in the process of appointing a patient safety adviser and a human factors advisor to complement the radiology safety advisor who has already been appointed.

All of this support is essential at a time in the UK when there remains a very serious shortage of radiologists continued on page 21.
Having advocated CDS as a tool to increase the use of imaging referral guidelines and make imaging utilization in Europe more appropriate, the development of the ESR iGuide Committee saw the potential for using CDS to improve quality and safety in radiology. Since ECR 2015, things have moved fast with the development of European imaging referral guidelines and the set-up of infrastructure for effective deployment.

The ESR iGuide is a common project in Europe. In the context of the implementation of the revised Euratom Basic Safety Standards Directives, the ESR iGuide initiative comes at the right time and offers healthcare providers a tool to address challenges in providing radiology services in differing national settings.

Following an agreement with the ACR in 2014 that enabled the ESR to use their well-established Appropriateness Criteria, developed over the past 25 years by expert panels, an ESR-appointed team of specialists from various areas of clinical radiology conducted a scientific review of the ACR’s criteria in order to adapt them for use in the European setting.

Led by a dedicated methodologist, the ESR’s European Imaging Referral Guidelines constitutes a common set of standard guidelines for use in Europe in a format that enables users to localize the guidelines according to national requirements or institutional circumstances. This Paper’s process carried out in 2015 is the first step towards the ESR and ACR’s shared vision of developing a joint set of global, evidence-based guidelines in the future.

With ACR Select, the CDS system distributed in the United States by the ACR and NDSC since 2012, is installed at more than 400 US sites and pilot implementation in several European countries starting in 2015, the ESR also made the necessary preparations to review user feedback and keep the guidelines up to date. The ACR’s Rapid Response Committee, which is charged with these tasks, also became a joint committee, with the ESR’s guideline experts becoming full members of the RRC. In addition, the ESR turned the ESR iGuide project team into a formal working group under the umbrella of its Quality, Safety and Standards Committee. This will allow the ACR and ESR to work together more effectively. The review process even more robust and provide a wider range of user experiences from both sides of the Atlantic from which to learn and update the criteria, improving the quality of the guidelines.

Meanwhile, NDSC established a European office in 2015 so that it can effectively deploy the ESR’s guidelines within the ESR iGuide system. With the support of the US team, who have experience of more than 50 implementations under their belt, NDSC can use their expertise to ensure the ESR’s guidelines are delivered to European healthcare settings with maximum effect. Since its establishment in October, NDSC Europe has recruited pilot sites for the implementation of ESR iGuide in several European countries in 2016, and has started working with electronic health record (EHR) providers to allow users to benefit from ESR iGuide’s features to the fullest extent.

Make sure you attend the ECR session on CDS today and visit the ESR iGuide booth in the entrance hall of the Austria Center Vienna. More information: www.esriguide.org

At the European Congress of Radiology (ECR) 2015, the European Society of Radiology (ESR) introduced its clinical decision support (CDS) system, ESR iGuide, developed in cooperation with the software firm National Decision Support Company (NDSC) and using imaging referral guidelines based on the appropriateness criteria developed by the American College of Radiology (ACR) and used in ACR Select.

At the ESR Congress, delivering the best imaging referral guidelines at the point of care

and limited expectations as to growing the numbers in training to build the future workforce. The College sees this as a number one priority and constantly interfaces and lobbies workforce planning bodies across the UK, those who run the UK National Health Service (NHS) and the Government. Alongside such policy and political activity, the College has developed models for networking radiology services which have the potential to provide more effective and efficient structures for training greater numbers of radiologists, as well as providing services, particularly in specialist areas such as paediatric imaging over a wider population base, which is a way of using scarce resources effectively.

To help those facing the real demands of practice today, the College has commenced a series of advice and guidance documents to ensure that working as a radiologist remains a sustainable and stimulating career. These series entitled A sustainable future for diagnostic radiology already comprises seven documents. These will be added to and reviewed regularly to bring together good ideas from Fellows and members around the UK.

The UK has no option at the moment but to look outside its borders to attract radiologists from other countries to work in the UK. At the same time, there has been a highly successful Working in the UK workshop which brought together those in the UK who wish to recruit from overseas with those seeking to work in the UK, particularly those from the European Union. Building on that experience, there will be two Working in the UK workshops at ECR 2016 on Thursday, March 3, 2016 (16:00–18:00) and Friday, March 4, 2016 (16:00–18:00). If you are looking to work in the UK and would like to hear practical tips and insights about moving to work and live in the UK, as well as meet prospective employers, please register to attend one of the workshops. Similarly, if you are someone looking to recruit from overseas, the workshops are also for you. There is a wealth of information generally on Working in the UK on the College website: https://www.rcr.ac.uk/clinical-radiology/working-in-the-uk.

The College looks forward to participating fully in ECR 2016 and, as always, will have its booth in the Societies area where you can obtain more information and meet our helpful staff.

References

« Chairmen’s introduction
L. Donoso Bach, Barcelona/ES
« What is a clinical decision support system?
P. Sandanelli; San Donato Milanese/IT
« Imaging referral guidelines in Europe
M.G.M. Hunink; Rotterdam/NL
« An effective clinical decision support system
G. Roland, Boston, MA/US
« Cost-effectiveness of clinical decision support
P. Mildenberger; Mainz/DE
« Panel discussion: Is CDS really adding value to healthcare in addition to radiation safety?
This session is part of the EuroSafe Imaging campaign.
European musculoskeletal radiologists partner with colleagues

The ESSR encompasses all radiologists who are members of an organisation that is engaged in diagnostic imaging and intervention in the field of musculoskeletal radiology. It is a family of radiologists committed to improving the care of patients through education, research and innovation. The ESSR encourages and actively promotes adherence to these principles for the benefit of patients, and the ESSR actively promotes adherence to these approaches.

### European Musculoskeletal Imaging Award

The ESSR encourages and supports efforts in the field of the research, awarding publications with high impact in musculoskeletal imaging, for diagnosis or therapy. For example, Prof. Martinelli’s paper entitled ‘Musculoskeletal ultrasound: technical guidelines’, published in Insights into Imaging in 2015, was awarded the Insights into Imaging Most Downloaded Paper Award for receiving the second highest number of downloads.

More information about ESSR can be found at: www.esrr.org

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**BY GIUSEPPE GUGLIELMI**

### French Society focuses on youth, research and innovation

Radiology is an ever-changing medical discipline: new technologies, new management strategies, new organizations all pave the way to evolutions, and sometimes revolutions, in both diagnostic imaging and interventional radiology. Since its introduction in clinical practice by Antoine Béclère in the early 1900s, research and innovation in imaging have triggered significant advances that directly impact patient care.

Supported by its strong history, the French Society of Radiology (SFR, www.sfradio.org) is moving forward. Investing in youth with renewed training programmes and promoting research and innovation are now key aims of the SFR.

The French Academic College of Radiology (ECFR, www.cerf-edu.org) is in close partnership with the SFR and radiologists’ unions, favouring training and increasing numbers of radiologists. In 2015, 272 medical students selected radiology as their sole medical specialty in France, accounting for a 4% increase compared to the figures from 2011. An integrated training programme combined with national examinations dealing with physics, research, and professionalism, along with radiology organisation and the national charter of teleradiology, is now in place in France. Joint academic training sessions are provided by radiologists and nuclear medicine physicians, aiming at bringing together and realising the potential and knowledge of both disciplines. Continuous efforts have been made by the SFR, together with the CERF, to promote research for young radiologists. Every year, and in addition to national institutional research grants, close to 20 residents and fellows benefit from specific SFR-CERF grants, allowing Master M2 degrees and PhD research programmes to be carried out, whether in France or abroad.

Imaging platforms available across the country have been identified and are presented on an annual basis to young investigators willing to conduct preclinical or clinical research. Clinical research programmes, whether academic or industrial, are currently being nec-

## INSIGHTS INTO IMAGING AWARD

The ESSR encourages and supports efforts in the field of the research, awarding publications with high impact in musculoskeletal imaging, either for diagnosis or therapy. For example, Prof. Martinelli’s paper entitled ‘Musculoskeletal ultrasound: technical guidelines’, published in Insights into Imaging in 2015, was awarded the Insights into Imaging Most Downloaded Paper Award for receiving the second highest number of downloads.

More information about ESSR can be found at: www.esrr.org

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**BY ALAIN LUCIANI AND JEAN-YVES GAURIT**

The European Society of Skeletal Radiology (ESSR) is an organ-based subspecialty society and is the biggest subspecialty within the ESR. It also works in close cooperation with the European School of Radiology (ESOR) to provide education and training courses in musculoskeletal radiology.

### BEST EVIDENCE IN SKELETAL RADIOLOGY

Musculoskeletal radiology is a field that has experienced an extraordinary increase in knowledge in recent years, leading to an expansion from plain radiographs to computed tomography, from ultrasounds to magnetic resonance; these imaging techniques are powerful, but also potentially dangerous. In fact, accuracy, appropriateness and avoiding unnecessary radiation exposure are the leading ways to guarantee the best care for patients, and the ESSR actively promotes adherence to these approaches.

### CHINESE MUSCULOSKELETAL SUMMER SCHOOL

Last year the first ESSR Summer School in musculoskeletal radiology was held. The course, organised and directed by Prof. Giuseppe Guglielmi, was attended by more than twenty participants from around the world. In Italy, at the San Giovanni Rotondo hospital lectures and practical activities were held. Guna Allen, David Wilson and Giuseppe Guglielmi gave lessons on several topics from degenerative bone and joint diseases, to trauma, and metabolic disorders to oncology, as well as infections and forensic musculoskeletal radiology. The enthusiasm of the participants, the pleasure of sharing clinical experience, the expertise of the lecturers and the venue framework were the key to combining knowl-

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**ECR TODAY | THURSDAY, MARCH 3, 2016**

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**myESR.org**
Stroke is considered the third most common cause of death in industrialised nations, after cardiovascular infarction and cancer, and is the single most common reason for permanent disability (intracranial atherosclerotic disease (ICAD)) accounts for 8–10% of these patients in North America and 10–15% in Asia, making it one of the most common causes of stroke worldwide. Furthermore, the risk of recurrent stroke in this population approaches nearly 25% after two years of follow-up. Therefore, the role of angioplasty/stenting as a primary prevention strategy with endovascular intervention was prematurely terminated, since recruitment in the SAMMPRIS trial recently reported findings, patient eligibility based on the WASID (Warfarin-Aspirin Symptomatic Intracranial Athero- sclerotic Disease) trial.

The SAMMPRIS (Stenting vs. Aspirin for Preventing Recurrent Stroke in Intracranial Stenosis) trial was designed to determine the role of angioplasty/stenting as a primary prevention strategy with endovascular intervention. Hence, the role of angioplasty/stenting as a primary prevention strategy with endovascular intervention was prematurely terminated, since recruitment in the SAMMPRIS trial recently reported findings, patient eligibility based on the WASID (Warfarin-Aspirin Symptomatic Intracranial Atherosclerotic Disease) trial.

In our study, we assessed the plaque enhancement with non-contrast MR imaging studies, which is opposed to our community. Reimbursement levels in Israel are already substantially below the levels in most Western nations. The economic pressure on ISRA, our radiologists, and our medical centres is unrelenting, as is the case in many other countries. The Ministry of Health has changed this policy and there is a plan to decrease waiting times down to three days! This will be solved in part by doubling the number of licenses for MRI scanners, but increased patient access will also require a larger number of radiologists with expertise in the interpretation of MRI studies. The national curricula for radiology training is based on a five-year residency with the great majority of young physicians going on to subspecialise. The first 120 years and we wish radiology continues to be a full review by this prestigious body of the ESR. ISRA also participates in all ESR activities.

Academic activity on a national level centres around ISRA’s Annual Meeting, which is an international English-language forum consisting of parallel sessions of peer-reviewed scientific presentations together with invited lectures by radiologists of international standing in their subspecialties. The next meeting will be held November 9–10, 2016 in Eilat, on the Red Sea. We invite our European colleagues to join us for this high-level meeting in a beautiful coastal resort. Setting November 8, 2015, the International Day of Radiology, our profession is 125 years old. In Hebrew we say to our friends and dear ones that we hope for them to live 125 years. Our profession has had an excellent first 125 years and we wish radiology another successful and prosperous 125 years.
Radiology in Georgia takes steps closer to Western European standards

The Swiss Society of Radiology (SGR-SSR) has 850 members and supports doctors who are training and working in radiology. This article provides an overview of those radiological issues that are currently most relevant to our society.

**SWISS HEALTHCARE POLITICS**

With several recent laws, the Swiss federal health authorities have started to restructure the healthcare system in Switzerland. There will be more central government control. New ideas often have their roots in Germany and are then adapted to Swiss conditions.

Rising health costs remain a hot topic. Radiology is perceived as a major cost driver with unnecessary examinations being performed at excessive costs. New regulations will strengthen support for general healthcare providers at the expense of specialists. In these discussions the SGB-SSR has had little support from the Swiss Medical Association. Our society is fighting in many political committees in the interests of radiology. In these discussions it has become obvious that many decision makers have little, or even misleading, information on the radiologist’s daily business. In order to take corrective actions, the SGR-SSR is leading a proactive communication strategy with the goal of providing the decision makers with the necessary information to understand the specific needs of radiologists.

**RECERTIFICATION OF RESIDENCY PROGRAMMES**

According to Swiss law, residency programmes have to be recertified every seven years. This process consists of a self-evaluation, where each specialty has to prove that its programme is in accordance with the general rules for residency programmes. The self-evaluation is reviewed by a panel of experts, followed by roundtable discussion before report writing and recommendations. Since these general rules relate to the programme for general practitioners, adaptation to the radiology programme can be difficult.

The funding of residency programmes is an increasing problem. Nowadays, most Swiss states support training institutions with 15,000 Swiss francs (approx. 43,700€) per annum, per resident. This will soon decrease to 12,000 Swiss francs (approx. 31,500€). This is against a background of increasing requirements that institutions must fulfill to retain their teaching status. Therefore, many institutions are reconsidering whether to continue their training programmes.

**SUBSPECIALITY PROGRAMMES: SWISS SOCIETY OF NEURO-RADIOLOGY**

The European Society of Neuroradiology (SSN) wishes to reduce the duration of training for interventional neuroradiologists. Today, the total duration of the subspecialty programme for this small group is eight years (four years general radiology plus two years of diagnostic neuroradiology). The SSN issues a new curriculum and proposes a one-year course of general radiology to one year, with four years of neuroradiology and one year of clinical neurosciences. The SGR-SSR prefers to maintain a single training programme for all radiologists with subsequent subspecialisation in different fields, similar to the ESR European Training Curriculum. In order to accommodate the needs of interventional neuroradiologists, a modular solution has been proposed by the SGR-SSR and is currently under discussion.

**RADIATION SAFETY**

To date, the SGR-SSR Radiation Safety Section mainly focuses its work on two topics to improve patient safety: the implementation of clinical audits and the installation of a national CT dose registry.

In the year 2015 the entire process of a CT examination will be reviewed by the auditors with special attention on the justification of the study, the use of diagnostic methods. Different modern quantitative and functional methods are used by radiologists of interventional neuroradiologists, a separate new curriculum, reducing general radiology to one year, with four years of neuroradiology and one year of clinical neurosciences. The SGR-SSR prefers to maintain a single training programme for all radiologists with subsequent subspecialisation in different fields, similar to the ESR European Training Curriculum. In order to accommodate the needs of interventional neuroradiologists, a modular solution has been proposed by the SGR-SSR and is currently under discussion.

**THE SWISS CONGRESS OF RADIOL OGY**

The Swiss Congress of Radiology is the biggest radiological meeting in Switzerland. It is held by the SGR-SSR and its associated societies, as well as the Swiss Society of Nuclear Medicine and the Swiss Association of Radiographers. The congress offers a very attractive programme. Every year, there is a different targeted programme for radiologists, nuclear medicine specialists and radiographers.

The international faculty, as well as the fact that English is the main congress language, makes the meeting very interesting to an international audience. This year’s congress will be held in Davos from May 19–21, 2016, offering an ideal platform to catch up with old friends and to make new ones. Find out more at our booth at ECR 2016 or consult our website www.radiologiekongress.ch.

More information about the congress can be found at www.sgr-ssr.ch.

Medical radiology in Georgia has a long history going back to its roots in the community of key specialists during the Soviet era. The new community of radiologists in Georgia began with the establishment in the early 1990s of the Research Institute of Clinical Medicine (formerly the Research Institute of Radiology and Interventional Diagnostics) which is the umbrella institution of the Georgian Association of Radiology. Radiology has also made huge progress in recent years. Starting with one CT unit in a country with 35 hospitals, the field has grown to become one of the most developed branches of medical service in Georgia. Most hospitals are equipped with modern CT, MRI and digital x-ray facilities; for instance the Research Institute of Clinical Medicine (which is also the clinical base for two state medical schools) has five MRI scanners, two of them high-field 3T MRI scanners; four multislice CT scanners, one which can generate 64 slices and perform cardiac investigations; two E-Cats; two linear accelerators; and more. This year a few CT/ECG unit will be installed as well.

The installation of new diagnostic tools has also raised the demand for communication between specialists. The Georgian Association of Radiology helps its member departments to establish telemedicine in different parts of the country. Consultant support is provided by the members who are from the highest professionals in the country as well as from abroad. The increased workload makes it essential to have modern digital tools for reporting and archiving the medical data. In Georgia, a new PACS system has been installed in the Research Institute of Clinical Medicine. Radiologists and other specialists now have the ability to easily access multiple modalities, archives and non-radiological data. Radiology is one of the most rapidly developing fields in medicine as it is very important for the diagnosis and treatment of different diseases. The education system needs to be flexible to the demands of the new needs. The Georgian Association of Radiology is working closely with the Government of Georgia, with the Ministry of Health and Labour, to modernise postgraduate medical diploma education in radiology. There is an overall tendency in Georgia to make higher education comparable with the European education system. The same is also true for the residency programmes in medicine, which are based on high standards. Radiology residencies in Georgia are four years for the diagnostic modalities and additional year for several subspecialties. Young radiologists are actively involved in the everyday work of the diagnostic and clinical departments. The Georgian Association of Radiologists supports the participation of young specialists in various international meetings and training programmes. Radiologists and radiologists in the early years of their careers regularly take part in such international conferences as the ECR and the RSNA, tutorials and different teaching courses organised by the European Society of Radiology, the European Society of Magnetic Resonance in Medicine and Biology, International Society for Magnetic Resonance in Medicine, etc. For deepening their knowledge and to get experience in new techniques several young specialists visit radiology departments abroad.

The installation of modern diagnostic tools has established a good base for advanced research work. A number of young specialists are performing basic research work with the use of radiological methods. Diffusion tensor imaging, MR spectroscopy, quantitative imaging are actively used in different ongoing academic projects. The papers and talks by Georgian radiologists were presented all over the world, for example the imaging of new imaging in epilepsy, quantitative imaging in neurodegenerative disease and multiple sclerosis are the focus of recent research works. The high standards of radiological service in Georgia can also be characterised by the high number of international multicentre clinical trials running with the help of our radiological departments. Rapid progress in the field of radiation therapy and the installation of new up-to-date radiation therapy systems has already changed the management quality of the oncology patients in Georgia. This field is developing in close cooperation with diagnostic imaging departments. Several radiologists have trained in radiation therapy at the leading clinics in Europe in order to switch to this field. This knowledge in diagnostic imaging is helping them a lot in correct treatment planning. The development and introduction of radiotherapy departments made oncological imaging a main emphasis of Georgian radiologists last year.

The recent progress in diagnostic imaging in Georgia influences different fields of medicine and it urges us all to foster and maintain the relevant level of medical service in the country.

Different modern quantitative and functional methods are used by Georgian radiologists for diagnostic investigations and research work. Figure 1 illustrates an invasive measurement of liver function in liver structure with MR imaging. (Provided by Prof. Fridon Todua)
A new feature at ECR 2016: The Voice of EPOS™

Prof. Maria Argyropoulou is head of the Department of Radiology, Medical School at the University of Ioannina, Greece, and EPOS Editor-in-Chief.

For the first time, all poster presenters at ECR 2016 will have the chance to take the stage and present their posters in person to an international audience.

Presentations will take place hourly (between 09:00 and 17:00 on Wednesday to Saturday, and between 09:00 and 13:00 on Sunday) in our new EPOS™ Arena and will also be broadcast online via the ECR Online streaming service. There will be sessions for organ-based topics as well as sessions grouped by language, giving participants a chance to present in their mother tongue.

ECR Today spoke to Prof. Maria Argyropoulou from Greece, who has served as EPOS™ Editor-in-Chief for the past two years. Prof. Argyropoulou shared with us the past achievements of the platform, and talked to us about the new initiative The Voice of EPOS™.

ECR Today: What is the overall purpose of EPOS™ and why is an educational platform such as this so important these days?  

Maria Argyropoulou: EPOS™ aims to provide an easy and direct platform to facilitate knowledge dissemination among the radiological community worldwide. Keeping pace with the latest advances and best practices in radiology is imperative in today’s fast-evolving medical environment. EPOS™ helps the radiologists to keep their competitive edge by staying informed and up-to-date.

ECRT: How does EPOS™ work? Are the posters available all year round and freely accessible?  

MA: The abstracts are submitted for the congress every year, and the accepted posters receive a DOI (digital object identifier), making them fully citable. The double-blinded peer review ensures that only high-quality research and educational exhibits are accepted. In order to allow as many people as possible to access EPOS™, all posters are freely and permanently available online. In addition to this, since 2014 the posters have been published under a creative commons license, which means that the material can be re-used for educational purposes, provided that it is properly acknowledged.

EPOS™ offers the unique possibility of combining a presentation at a renowned congress with subsequent publication of the work.

ECRT: How has the platform developed, regarding usage and available posters?  

MA: EPOS™ has been steadily increasing in submissions each year since it was introduced in a fully electronic form in 2013. It is an excellent platform for authors to expand their scientific and publication skills, and offers an extensive library of over 12,000 scientific and educational posters. This service is highly appreciated and the page is visited worldwide by 50,000 unique users each month.

ECRT: The new ESR initiative, the Voice of EPOS™ will be launched at this ECR, how was this idea born and how has it been received?  

MA: The Voice of EPOS™ is a new feature that gives authors of posters the opportunity to present their findings in person at the ECR. As many authors are keen to participate in the congress as speakers, we decided to provide this unique opportunity for a direct scientific exchange. The authors of the best-rated posters were invited to present their work to an international audience in moderated poster sessions.

The new session format has been very well received - more than 80% of EPOS™ submissions have selected the option to present their poster in person at ECR 2016. The sessions are based on subspecialty topics, and there will also be foreign language sessions, providing a platform for an international and multilingual scientific community.

ECRT: What do you see for EPOS™ in the future and what has motivated you to devote your time to this project?  

MA: It has been my pleasure to serve EPOS™ as an Editor-in-Chief for the past two years and experience firsthand the high-quality intellectual output of our vibrant and thriving community. My motivation was and still is to ensure the bright future of this community, especially its youngest members, by helping them to improve and become skilled and competent radiologists. EPOS™, as an online database of scientific and educational presentations helps college members develop scientific presentations and research skills. In the future I see a gradual turn from the simple PowerPoint-like presentation to a platform allowing users to create, deliver and experience rich multimedia and interactive content and directly exchange information with the scientific community. The Voice of EPOS™ at ECR 2016 is a first step in this direction and I am sure similar steps will follow.
Its two main goals are still to assist in harmonising radiological education throughout Europe, by supporting the implementation of the European Training Curriculum, and to raise the scientific profile of radiological education.

The past nine years of ESOR have been marked by an outstanding growth in a wide range of modular activities, including visiting schools, seminars, tutorials, visiting professorship programmes, visiting scholarships, exchange programmes for fellowships and full one-year fellowships. So far, ESOR has delivered structured continuing education for almost 15,000 residents and board-certified radiologists worldwide.

Furthermore, ESOR has gradually evolved into a major, if not the major, international provider of comprehensive radiological education in Europe. With its expanded outreach programmes, the ASKLEPIOS Courses, the AIMS Courses, the Visiting Professorship Programmes and the intercontinental scholarships and exchange programmes for fellowships, ESOR is able to respond adequately to the actual needs of radiologists in the developing world following agreements between the ESR and corresponding member societies. The importance of ESOR’s contribution to this end can be better appreciated if one considers the statistics from the past few years. Out of the 1,700 yearly participants in ESOR activities, 80 percent are coming from the radiologically developing world, while over 20 percent of the scholarships, along with 70 per cent of the exchange programmes for fellowships, were granted to applicants from Eastern Europe, Latin America, China, the Middle East and Africa.

In addition to impressive numbers, ESOR is proud of being instrumental in mobilizing the resources available for radiological education in Europe and the world, and for creating a long-term educational commitment and structured network – the ESOR community – throughout partnership. All of this hugely appreciated use of teaching resources has been implemented with the unlimited support of highly esteemed and renowned lecturers, tutors, mentors, volunteer reference training centres, local organizers, subspecialty and national societies, academic institutions, and valued industrial partners. ESOR is greatly indebted to them all.

In 2010, ESOR is enriching its portfolio by offering an additional ASKLEPIOS course in Russia, in cooperation with the Russian Association of Radiology and a Visiting Professorship Programme in Uzbekistan, while re-introducing nine ESOR courses for ESR and a Hybrid Imaging Course. In addition, ESOR is moving forward to implement a new series of courses on Hallmarks in Cancer Imaging in cooperation with the Champalimaud Foundation in Lisbon, while offering, for a second year, a small number of structured, competitive and certified full one-year fellowship programmes in major radiology departments in Europe.

I would like to encourage all of you to participate in and benefit from all ESOR programmes, to use the opportunities offered for exchange and interaction, and to share the knowledge and skills needed to meet the requirements of today and tomorrow. I am confident that ESOR will maintain its leading role in serving our vibrant community for years to come and will continue to deliver successfully, connecting the world of radiology.

Mariana-Mirela Gersak, MSc, Cluj-Napoca/Romania

Iztok Caglic, MD, PhD, Siena/Italy

Sonja Butorac, MD, Zagreb/Croatia

IN EUROPE

SCHOLARSHIP PROGRAMME 2014 IN EUROPE

Gloria Bettini, Siena/Italy

Matka Bradal, Matibor/Slovenia

Sonja Butorac, Tirana/Albania

Erik Caglić, Zagreb/Croatia

Adriana Mirela Călin, Cluj-Napoca/Romania

Rika Csanák, Budapest/Hungary

Anna Lucija Falkenfelt, Basel/Switzerland

Bert Geerts, Gent/Belgium

Marina-Mirela Gersak, Cluj/Napoca/Romania

Teodor Gheorghe, Târgovişte/Romania

Elena Elena Isacachi, Donostia/Spain

Olga Kucheruk, Moscow/Russian Federation

Lazar Lazovic, Ni/Serbia

Rabi Philip Mathew, Mangalore/India

Carmelo Messina, Milan/Italy

Elvira Miglia, Latina/Italy

Ahvoru Mauricio Morales Vargas, Madrid/Spain

Murat Alp Dirik, Antalya/Turkey

Diana Penha Pereira, Lisbon/Portugal

Rodin Peters, Groningen/Netherlands

Vasileios Rafailidis, Chania/Crete/Greece

Nikolaus Ritzke, Athens/Greece

Hristiyan Sabotka, Sofia/Bulgaria

Frederik Strobl, Munich/Germany

Maladina Brindusa Szep, Cluj-Napoca/Romania

Franceca Tona, Roma/Italy

Tom Verstraeten, Gent/Belgium

Maxim Szturak, Tartu/Estonia

SCHOLARSHIP PROGRAMME 2015 IN USA

Matthew Beal, Basel/Switzerland

Loreno Kavur, Zagreb/Croatia

Ahanko Vitez, Bilbao/Spain

Matthias Benz, Basel/Switzerland

Luca Carbonaro, San Donato Milanese/Italy

Lucas Gennaro, Cuatia/Brazil

EXCHANGE PROGRAMMES FOR BREAST IMAGING FELLOWSHIPS (IN PARTNERSHIP WITH MUSCOOP)

Tugba Alcinli, Diyarbakir/Turkey

Irma Bjørsve, Riga/Latvia

EXCHANGE PROGRAMMES FOR CARDIAC RADIOLOGY FELLOWSHIPS (IN PARTNERSHIP WITH ESR)

Andreas Chatzis, Crete/Greece

EXCHANGE PROGRAMMES FOR MUSCULOSKELETAL RADIOLOGY FELLOWSHIPS (IN PARTNERSHIP WITH ESR)

Nea Larkman, Leeds/United Kingdom

Justyna Wajda, Wroclaw/Poland

EXCHANGE PROGRAMMES FOR NEUROIMAGING FELLOWSHIPS (IN PARTNERSHIP WITH ESNR)

Prashanth Kumar Mondel, Mumbai/India

EXCHANGE PROGRAMMES FOR PEDdiATRIC RADIOLOGY FELLOWSHIPS (IN PARTNERSHIP WITH ESR)

Roman Huizenga, Amsterdan/Netherlands

Shahid Shehazer, Varamin/Iran

EXCHANGE PROGRAMMES FOR THORACIC RADIOLOGY FELLOWSHIPS (IN PARTNERSHIP WITH ESTO)

Prem Ansari, Allahabad/India

Archana Rai, Bangalore/India

EXCHANGE PROGRAMMES FOR NUCLEAR MEDICINE FELLOWSHIPS (IN PARTNERSHIP WITH ESNR)

EXCHANGE PROGRAMMES FOR PAEDIATRIC RADIOLOGY FELLOWSHIPS (IN PARTNERSHIP WITH ESR)

Dinar Sabine Chirita Chapareanu, Barcelona/Spain

Vitor Rodriguez Leval, Madrid/Spain

Claudia Lobetean, Sânt-Marie/Romania

Roman Rubețaru, Nikolaev/Ukraine

Eduardo Xavier Zarco Contreras, Barcelona/Spain

The certificates will be awarded during the ESR Session today at 14:00 in Room N.

Nikolaus Gourtsoyiannis is the Educational & Scientific Director of the European School of Radiology (ESOR) and chairman of the ESR ESOR Committee.

We proudly present the ESOR scholars and fellows 2015
The European Board of Radiology (EBR) has successfully implemented the Common European Board of Radiology (CEBR) and has new examined more than 1,000 candidates. The examination will be made available and the candidates will provide structured written reports. They will also be asked to present specific cases related to different imaging procedures, management, and any further imaging. This will be a new module and will be piloted at EBR 2016 with a modified oral exam running in parallel. It is anticipated that the new skills exam will be implemented in summer 2016. The EBR has had several dry runs using the new platform, including recent ESR holders, and has satisfied the board and shareholders that the new format will be successful.

Capacity constraints mean the oral exam has had to change and standardisation of cases will make it easier to deliver larger candidate numbers. The whole cohort will now see the same cases. It should also be possible to deliver the examination at more sites, including at multiple sites simultaneously. This will save candidates time and money and will give us the opportunity to extend the examination to new countries. The whole exam can be delivered in one day rather than spread out over multiple days.

The new format will consist of 24 short cases and a multiple response questions, as well as six to eight longer written cases. The EBR will decide on the final number of cases after EBR 2016. The whole of the radiological curriculum will be sampled. Different modalities will be tested as well as a range of diagnosis. Many of the questions will be marked by the computer but the process will be overseen by experienced examiners, who will make allowances for minor spelling and typographical errors. The examination will be more consistent, as the candidates will all be assessed by the same examiner applying the scoring methodology. These changes have been brought about by the continued success of EBR and the need to expand the capacity of the EBR to meet this demand. Examples of the cases will be provided on the EBR website, so please visit the site to see what has been done.

The ESR closely monitors EU legislation and initiatives and has over the last few years successfully built relationships with relevant EU institutions and authorities in order to contribute to the development of EMF-related legislation. In order to guarantee a high standard of patient care, it is essential to ensure that the European policy on EMF is coherent and that it supports the development of EMF evidence. As a major stakeholder in EU health and safety policies and to be involved in consultation processes for new legislative initiatives in this field, this requires not only fostering a continuous dialogue, but also developing and strengthening relations with politicians and policymakers on the European and national level. Therefore, the ESR is active in several different policy areas.

**PUBLICIATION OF THE NON-BINDING GUIDE TO GOOD PRACTICE FOR IMPLEMENTING DIRECTIVE 2013/35/EU ON ELECTROMAGNETIC FIELDS**

One of the first policy areas the ESR became actively involved in was the EMF Directive setting minimum safety requirements in the exposure of workers to risks arising from electromagnetic fields (EMF), which at the time posed a serious threat to all sectors, including healthcare. This Directive has been successfully closed.

**ESR’s QUALITY AND SAFETY AGENDA**

The ESR continues its efforts to raise awareness of patient safety and quality of care at EU level. Improving safety and quality of care for patients is one of the top priorities of the ESR, which has led to the development of initiatives such as the ESR،Safe Imaging Campaign to promote radiation protection, as well as the ESR Action Plan for Medical Imaging, which was launched at the European Parlia-ment in June 2012. The ESR Action Plan addresses issues that are of key importance to the ESR, such as the harmonisation of training requirements for radiographers, radiologists, and research.

Besides its own radiological societies, as well as at EU level, the ESR engaged in a series of other initiatives, including with the European Commission’s Directorate-General for Enterprise, the Euro- pean Parliament and Members State representatives in the course of their respective mandates. The ESR is confident that the constructive discussions held in Brussels will increase the visibility of the professions’ key objectives and will positively affect the healthcare environment for the benefit of Europe’s patients.

**HEALTH AND TELERADIOLOGY**

The ESR takes particular interest in the field of telemedicine and teleradiology reinventing the need for clear regulation of quality and safety aspects, ensuring better quality of care and patient safety.

The ESR is a member of the eHealth Stakeholder Group, calling on interested stake- holders to nominate experts for a mandate of three years, the ESR nominated three experts in response to the renewal of the eHealth Stakeholder Group.

Apart from its active engagement in the dossier mentioned above, the ESR is closely monitoring several other policy areas including the legislative proposal on medical devices, the implementation of the revised data protection legislation. It also advocates the use of clinical decision support systems, as well as referral guidelines in the course of the European Basic Safety Standards Directive.
Radiologists have a key role to play in Sweden’s new cancer patient pathways

The Swedish Society of Radiology (SSMR) is proud to report that most Swedish radiologists are members of our society and that we enjoy wide recognition and support for our work. The purpose of the society is to support the development of medical imaging by arranging courses and congresses with scientific content and providing forums for sharing scientific research results. The society also supports education in medical imaging and acts as an institution for international collaboration on scientific and educational matters. Its purpose is also to support professional and economic interests for those members associated with our society and the Swedish Medical Association. Currently, the work of the society focuses on three major issues:

**Radiology Training Curriculum**

The Swedish Board of Health and Welfare recognised all medical training curricula in 2008, and the fields of radiology, nuclear medicine and clinical physiology became one medical specialty, called ‘imaging and functional medicine’. In 2015, the Swedish Board of Health and Welfare performed yet another reorganisation of the medical specialties, and divided imaging and functional medicine into three separate specialties with a small common trunk. The Swedish Society of Radiology has been heavily involved in many aspects of these reorganisations, including the creation of a new (ESR-compatible) curriculum, as well as in ongoing discussions with the societies of clinical physiology and nuclear medicine on how to best collaborate in the future. While many countries in Europe move radiology and nuclear medicine closer together, they are now moving slightly apart in Sweden.

**Research**

Research by Swedish radiologists is scarce, and we are discussing different ways to encourage, facilitate and support research amongst residents and radiologists. In the two most recent radiology training curricula (also in other medical specialties), a research project is mandatory. We are encouraging radiology residents to present research projects at our national congress and at the ECR, by offering stipends for accepted abstracts, and are hoping that this mandatory research project will lead to new research interests. We also distribute research stipends from our Society each year, to promote young radiologists to pursue research projects. This is one of our main concerns for coming years, and suggestions on how to increase the interest in research are welcome!

**Cancer Patient Pathways**

As previously done in Norway and Denmark, Sweden is now developing standardised cancer patient pathways, in which signs and suspicions of certain cancer diagnoses will follow a pre-defined track of care. This includes diagnostic visits and examinations, as well as work-ups with radiology, pathology and laboratory tests. So far, in Sweden, 26 cancer types have been selected for cancer patient pathways, and more are in line. The rationale for creating standardised pathways of work-up, treatment and follow-up for cancer patients is to make the standard of care equal across the country. Sweden has a tax-funded, public health system, which is supposed to be equal and fair for all citizens, but this has not been the case for cancer patients in the past.

Radiology often plays a decisive role in the course of determining whether patients have a malignancy or not. Radiology is also in most cases the tool used when evaluating treatment effects and follow-up, which means there is an important role for the Swedish Society and the radiologists in Sweden to play in the multidisciplinary national groups creating the standardised patient pathways. The big challenge is then for the different healthcare regions in Sweden to implement the pathways, which also calls for the participation of radiologists.

The opinion of the Swedish Society of Radiology is that the cancer patient pathways are useful and can make it possible to create equal care across the country. However, the shortage of radiologists and in some areas radiology equipment (mostly MR and PET/CT scanners) is a challenge, as is meeting the relatively short lead times for the radiological part of the pathways.
Do you know the real radiation risks and what to teach students as well as junior doctors? Are you uncertain answering questions from concerned patients? Have you ever heard of ‘hormesis’ or ‘adaptive response’? If not, then please read below an interview with the expert Prof. Peter Vock, professor emeritus at the University of Bern and senior consultant radiologist at Inselspital University Hospital in Bern, Switzerland. He chaired the Institute of Radiology of the University of Bern from 1989 to 2012, and his research interests focus on chest imaging, CT, and particularly radiation protection. He is Deputy Editor for radiation protection and radiation risks of the Undergraduate Curriculum.

ECRT: Could you explain the concept of radiation protection and radiation risks? What’s your view of the theory of ‘hormesis’ and the concept of adaptive response?

Peter Vock: A number of studies have observed similar findings of an increased brain tumour rate in patients (mostly children) having undergone CT scans of other body areas. The types of tumours encountered, the latency period, and the most sensitive, age at exposure. Nonetheless, such publications have increased awareness of the risk of medical diagnostic uses of ionising radiation.

ECRT: What common misconceptions about radiation are you come across and what are the evidence-based facts?

Peter Vock: Judication of a diagnostic examination using ionising radiation requires that the benefit is more important than the risk. Many of us have difficulties in comparing an immediate benefit with a small but very likely significant risk that only becomes effective after decades. It is my biggest concern that some people get anxious in this situation and reject an important exam even when there is an obvious benefit, whereas others (both reference; radiologists and patients) consider the scientific uncertainty of the risk level at very low doses (below around 0.1 Gy of effective dose) to be an argument for ignoring the risk altogether.

ECRT: Which personal experiences have you had as a patient or accompanying a relative or friend receiving medical care and how have these encounters changed your practice?

Peter Vock: I have been lucky until now and cannot be summarised in a few sentences. However, important information can be found at the websites of the International Commission on Radiological Protection, ICRP (www.icrp.org), The International Atomic Energy Agency, IAEA (https://www.iaea.org/ crawler3/portal/ContentIndex.htm), the United Nations’ Scientific Committee on the Effects of Atomic Radiation, UNSCEAR (www.unscear.org), and the European Commission (http://ec.europa.eu/energy/energy/nuclear-energy/radiation-protection/radiation-medical-use) Furthermore, ESR e-learning modules cover several different aspects of radiation protection (https://esr.citeline.etschtech.com/library/browse/search/3).

ECRT: Which radiation incidents have these encounters changed your practice?

Peter Vock: As a radiology trainee, I was taught by a consultant that one CT head scan carried a 1 in 3,000 risk of causing a brain tumour. Similar things are mentioned in various teaching files. Is this actually true?

Balthus

Balthasar Klossowski de Rola

An exhibition at the Bank Austria Kunstforum Wien
For the first time in Austria the Bank Austria Kunstforum Wien is presenting a retrospective of the work of Balthasar Klossowski de Rola (1908–2001), called ‘Balthus’, one of the great lone wolves among the painter personalities of the twentieth century. The exhibition casts light on Balthus’s work, starting with his early inspiration from the quattrocento, then going on to the works revolving around Surrealism and Neue Sachlichkeit (‘New Objectivity’) encompassing France, the German-speaking regions and Italy, and finally to his preoccupation with East Asian art. Balthus, who never put representational art to question, remained aloof from all avant-garde developments and cultivated his own style of different Modernism.

His oeuvre is moulded by the intellectual and polyglot environment in which he grew up: Rainer Maria Rilke was his mentor, Wuthering Heights by Emily Brontë inspired him as much as the world of Lewis Carroll’s Alice in Wonderland. He befriended Antonin Artaud and Alberto Giacometti – in later years also David Bowie and Bon Iver. His brother Pierre Klossowski, André Gide’s secretary, is the translator of Friedrich Hölderlin and Walter Benjamin, his preoccupation with de Sade is reflected in several of his writings.

To appreciate Balthus’s consistently structured painting, which shows no expressionist elements whatever, we must discover the mysterious, archaic and also uncanny aura of his pictures, explore worlds that summon up the fantasies and imagination of our childhood – also without sparing ourselves a certain cruelty. The exhibition traces this assessment of Balthus as an artist beyond the pale of normality: Balthus, who by means of subtle nuances sets up a frozen, enigmatic harmony, in his own words: “I have always felt the need to find the extraordinary in the ordinary; to suggest, not to determine, always to leave something enigmatic in my pictures.”

The support of the artist’s family and loans from international collections – Centre Pompidou, musée national d’art moderne, Paris, The Art Institute of Chicago, Tate London, The Metropolitan Museum of Art, New York – underscores the significance of this project.

This exhibition is a cooperation with the Scuderie del Quirinale, Rome and the Villa Medici, Rome.

Bank Austria Kunstforum Wien

Freyung 8
1010 Vienna

Opening hours:
Daily 10 am–7 pm
Friday 10 am–9 pm

www.kunstforumwien.at

Bank Austria Kunstforum Wien

The Kunstforum is a top address for art lovers, especially for classical modern painting of the post-war years. Every year, 310,000 people visit the temporary exhibitions held in this private institution, shows that are unique across the globe. Leading museums present their works here as well as private collectors. Whether van Gogh or Miró, Kandinsky or Chagall, Warhol or Lichtenstein, the great names of art are united here. Since 2000, there have also been exhibitions devoted to contemporary artists.
THURSDAY, MARCH 3, 2016

THEATRE & DANCE

› PLATONOV
by Anton Tchechov
Akademietheater | 19:30
1030 Vienna, Lisztstraße 1
Phone: +43 1 51444 4145
www.burgtheater.at

› MUTTER COURAGE UND IHRE KINDER
by Bertolt Brecht
Burghtheater | 19:30
1010 Vienna, Universitätsring 2
Phone: +43 1 51444 4145
www.burgtheater.at

› FLUGEL
Robert Palfader & Florian Scheuba, two of Austria’s most well-known satirists, try to take the bull by the horns
Rabenhof | 20:00
1030 Vienna, Rabengasse 3
Phone: +43 1 712 82 82
www.rabenhoftheater.com

› IMPERIOR
by Jan-Christoph Gockel & Tobias Schuster, based on the novel by Christian Kracht
Schauspielhaus | 20:00
1030 Vienna, Pertuallgasse 19
Phone: +43 1 970 66 96
www.schauspielhaus.at

› DER GUCKEL
by Georges Feydeau
Theater in der Josefstadt | 19:30
1080 Vienna, Josefstädter Straße 26
Phone: +43 1 518 300 00
www.josefstadt.org

CONCERTS & SOUNDS

› ORF RADIO-SYMPHONIEORCHESTER WIEN, conductor CORNELIUS MEISTER
J. Haydn: Overture ‘Acide e Galatea’ Hob. 1a/5; G. Mahler: Adagio from Symphony No. 10; F. Gersh: Bsll Songs
Konzerthaus (Classical Music) | 19:30
1030 Vienna, Lothringerstraße 20
www.konzerthaus.at

› KHATIA BUNIATISHVILI, PIANO; RENAUD CAPUCON, VIOLIN
A. Dvořák: Romantic Pieces op. 75; E. Grieg: Sonata c minor op. 45; C. Franck: Sonata a major
Musikverein (Classical Music) | 19:30
1010 Vienna, Bösendorferstraße 12
www.musikverein.at

› Akkordeonfestival VESNA PETKOVIC TRIO (SRB/A) / TORI TANGO (SL/A/CU)
Porgy & Bess (Jazz) | 20:30
1010 Vienna, Riemergasse 11
www.porgy.at

OPERA & MUSICAL

› MY FAIR LADY
Musical by Frederick Loewe
Volksoper | 19:00
1090 Vienna, Währingerstraße 78
www.volksoper.at

› IL BARBIERE DI SIVIGLIA
by Gioachino Rossini, conducted by Marco Armiliato
Wiener Staatsoper – Vienna State Opera | 19:00
1010 Vienna, Opernring 2
www.wiener-staatsoper.at

› MOZART!
by Michael Kunze & Sylvester Levay
Raimundtheater | 19:30
1060 Vienna, Wallgasse 18–20
www.musicalvienna.at

Please note that all theatre performances are in German.