

## Editorial

It's been a busy time for the AIR<sup>2</sup> team, with the MEDIRAD Special Issue just published plus this February issue and the Special Issue on the results of the 2<sup>nd</sup> CONCERT Call due out in 2 weeks' time.

We have also been focusing our efforts on the AIR<sup>2</sup>D<sup>2</sup> database. In October 2017, it comprised 54 infrastructures, not all of which are intended to be featured in the AIR<sup>2</sup> bulletin; however some of the 63 infrastructures described in AIR<sup>2</sup> were not in AIR<sup>2</sup>D<sup>2</sup>. In fact, only 27 were common to both. So, we started a reminder campaign asking everyone who had published in AIR<sup>2</sup> to register their infrastructure in AIR<sup>2</sup>D<sup>2</sup> in order to complete/validate the data. To date, our database comprises 74 infrastructures. Our thanks to all of those who responded. For those who haven't yet done so, please enter your data quickly so that all radiation protection researchers can have a better tool!

**Dr Laure Sabatier, CEA**

## The floor to...

A robust scientific ecosystem must be capable of conducting demanding experimental activities to validate new breakthrough ideas and create new technologies for the benefit of society. At the core of these experimental activities are flexible and active research infrastructures, offering scalable solutions to meet needs

ranging from basic science to pre-industrial scale. MINECO-AEI, the State Research Agency of the Ministry of Economy, Industry and Competitiveness of Spain, provides support to singular scientific and technological infrastructures in all fields, and is responsible for funding their use by national public research groups and universities.

MINECO-AIE manages the State Plan for Scientific & Technical Research, as well as Spain's participation in co-funded activities within the European Union and non-EU countries. Co-funded activities, including those of the EJP-CONCERT project, are very interesting initiatives for the harmonisation of European research and the achievement of deeper integration of European administration and agencies.

In the case of EJP CONCERT, MINECO-AIE's participation is two-fold:

1) As a Programme Owner Manager (POM) providing financial support to Spanish universities with Third Party (TP) status.

2) As a contributor to WP4.

Under the leadership of the French National Research Funding Agency (ANR), MINECO-AEI has actively participated in managing the evaluation process for CONCERT calls for proposals, providing its experience at national and international level for both EJP and ERA-NET co-funded activities. We consider that a transparent and serious evaluation process for these calls is a key factor for the successful and efficient use of public resources.

Moreover, collaborations with our colleagues from the ANR, FCT (Portugal) and SSM (Sweden) have been very positive.

The implementation of high quality projects in existing research infrastructures is of paramount importance to maintain the functionality and capacities of these installations as well as European competitiveness in science and technology, and to promote a knowledge-based society.

**Dr Alberto Abánades Velasco**  
**MINECO-AEI**  
**CONCERT WP4**



Photo: MINECO-AEI

**National support to international activities are critical for the harmonization of the European Research policy**



### Future events:

**16<sup>th</sup> February 2018**

[Stakeholder consultation](#)

**20<sup>th</sup> February 2018**

[Open Information and Networking Day of the European Radiation Protection Research Platforms](#), Munich, Germany

**21<sup>st</sup> February 2018**

- CONCERT MB Meeting  
- Extraordinary and ordinary MELODI EOGA and General Assembly, Munich, Germany

### WP 6 News:

#### AIR<sup>2</sup>D<sup>2</sup>:

- Please complete the online form(s) to register your infrastructure(s) in the database.  
- A new option to feature your infrastructure is now available: [add document](#).

Follow [STORE](#) on Twitter: [@STOREDatabase](#)

### Contents:

Exposure platforms [UNIPI-AmBe](#)

Databases, Sample banks, Cohorts [Greek interventional cardiologists cohort](#)

Analytical platforms, Models, Tools [SNAP](#)

### Next issue

March 2018



# Exposure platforms

## UNIPI neutron irradiation facility

Neutron irradiation room with AmBe and gamma sources

The University of Pisa's neutron irradiation facility (UNIPI-AmBe) has been in operation since 2010, and consists of an irradiation room for fast neutrons and gamma exposures designed to minimise neutron scattering. The facility, which is part of the Nuclear Measurement Laboratory of the University of Pisa, has been performing nuclear measurements for over 50 years.

the storage box and positioned inside the room, at a specified distance from the device/detector to be irradiated. At the end of the irradiation, they are stored again in the repository. There are

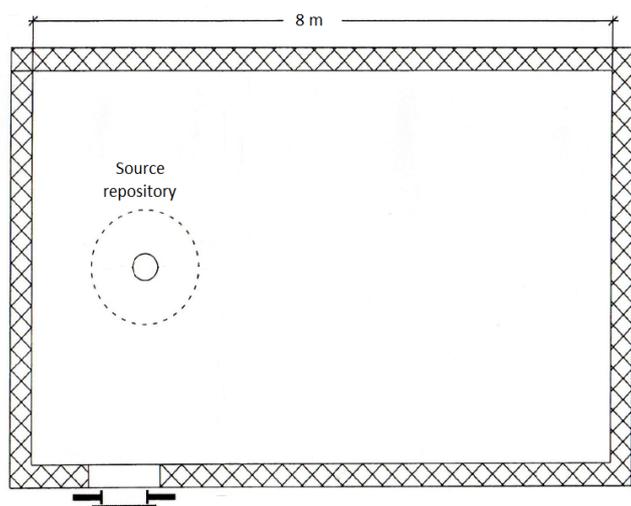


Photo: R. Ciolini/Pisa University

**Dr Riccardo Ciolini**

no particular restrictions on the items to be irradiated; only size limitations due to the dimensions of the room and the entrance door. The duration of each exposure is normally within an interval of 0–24 h, but longer time intervals are possible. The facility is protected by a controlled access security system. All irradiation procedures and instrument calibrations are performed according to the facility's ISO 9001 standard certification.

The UNIPI-AmBe facility includes ancillary equipment such as a Bonner sphere spectrometer system, 30 cm x 30 cm x 15 cm ISO phantoms, supports for objects to be irradiated, and Rem counters and gamma dose rate meters for environmental gamma/neutron monitoring. The facility is mainly used for nuclear measurement research, instrument calibration (dose/dose rate meters) and radiation protection measurements, but also performs teaching activities (Nuclear and Biomedical Engineering Master's degree courses). In addition to offering exposure and calibration services, the facility welcomes research collaborations with metrological or scientific institutions.



**Top view of the neutron/gamma irradiation facility**

It consists of an open space (5 m x 8 m x 2.5 m) with concrete walls, no windows and only one access door. Located in a 2 m deep ground repository, it houses two radionuclide AmBe neutron sources with a total nominal activity of 14.2 GBq, and a  $^{60}\text{Co}$  source with a nominal activity of 1.1 GBq. The reference neutron dose rate  $H^*(10)$  is 9.4  $\mu\text{Sv/h}$  at 1 m neutron source distance. Moreover, a  $^{60}\text{Co}$  calibrated source (dose rate 0.53 mSv/h at 1 m free in air) is available in the source repository, to be used for personal gamma dosimetry calibration or together with neutron sources to investigate the response of the detectors to mixed radiation fields. A broad range of neutron and gamma dose rates can be obtained by varying the distance between the source and the irradiated device.

An air conditioning system maintains the room temperature at a constant value during the exposures. The radioactive sources are extracted from



**View of the irradiation room**

Photo: R. Ciolini/Pisa University



### ID Card:

**Exposure type:**  
External

**Source:**  
AmBe and  $^{60}\text{Co}$

**Dose rate:**  
9.4  $\mu\text{Sv/h}$  at 1 m (neutron) and  
0.53 mSv/h at 1 m (gamma)

**Irradiation type:**  
Neutron, gamma

**Irradiated organism type:**  
None

**Address:**  
Bruno Guerrini Laboratory  
Department of Civil and Industrial  
Engineering (DICI)  
University of Pisa  
Via di Torretta  
I-56122 San Piero a Grado  
Pisa, Italy

**Access:**  
Subject to prior agreement with  
the management staff

**Supporting lab:**  
Nuclear Measurement Laboratory  
Department of Civil and Industrial  
Engineering (DICI)  
University of Pisa  
Largo Lucio Lazzarino 2  
I-56126 Pisa, Italy

**Internet link:**  
[www.dici.unipi.it](http://www.dici.unipi.it)

**Contact:**  
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**Related to:**  
EURADOS

## Greek interventional cardiologists cohort

### Estimation of eye lens doses in Greek cardiologists

The Greek Atomic Energy Commission is the national regulatory authority for radiation safety, and is responsible for maintaining the National Dose Registry (NDR) for workers occupationally exposed to ionising radiation.

Eye lens doses seem to be of great concern, especially for staff working in interventional cardiology, due to a decrease in the eye lens dose limit for occupational exposure, as set out in the latest European Basic Safety Standards Directive 2013/59/EURATOM. For this reason, efforts have been made in the present cohort to retrospectively estimate the eye lens doses in interventional cardiologists, based mainly on the whole body dose data kept in the NDR since 1989.

1990s. The use of lead glasses is also increasing; however 30% of the cardiologists are still not using lead glasses.

- Whole body doses seem to have increased over the last 15 years (from 5.3 mSv to 10.6 mSv). The estimated eye lens dose values indicate that the new annual eye lens dose limit has been exceeded in some cases.



Photo: EEAE

Dr Eleftheria Carinou

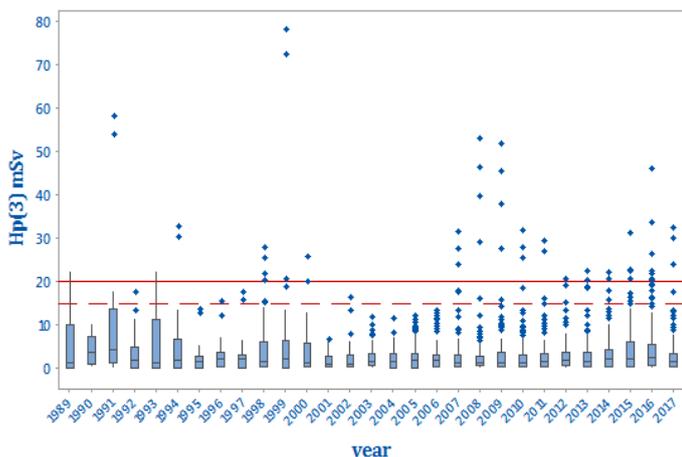
- The maximum cumulative eye lens dose is estimated at 700 mSv.

The present approach used for estimation of the eye lens doses has the advantage that is based on individual measurements (i.e. whole body doses) for each cardiologist; however, there are also serious disadvantages, mostly related to the constant use of the personal dose meter in the past, and to its position on the worker's body.

Moreover, the findings in the present cohort underline the importance of keeping an NDR, which has proved to be a powerful tool for the retrospective estimation of eye lens doses in interventional cardiologists.

The research leading to these results has received funding from the European Atomic Energy Community's Seventh Framework Programme under grant agreement n° 604984.

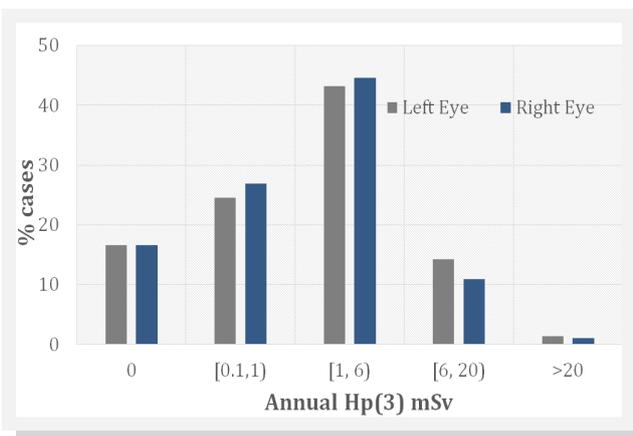
Photo: EEAE



Box plots showing the evolution of the annual Hp(3) in mSv.

A short questionnaire has also been used to collect data on the type and number of procedures, the X-ray system configuration and the use of protective measures during the respective exposure periods. All the relevant data for active interventional cardiologists in the cohort have been extracted from the NDR. Of the 530 cardiologists contacted, 150 completed the questionnaire. The eye lens dose was estimated using the second approach developed in the EURALOC project (OPERRA). For each cardiologist, the distribution of the possible cumulative eye lens doses was estimated individually and separately for each eye. The above graph shows the evolution of the annual Hp(3) dose for the cohort since 1989. From the questionnaires and the estimated eye lens dose values, it can be concluded that:

- The use of personal protective equipment is increasing. More specifically, an increase in the use of protective shields was noted in the



Distribution of the estimated annual Hp(3) for both eyes.



### ID Card:

**Cohort type:**  
Interventional cardiologists  
530 contacted; 150 replied

**Age/follow-up:**  
Age at exposure: 30-67 years old  
Data extracted from the National Dose Registry database starting from 1989

**Biobank available:**  
N/A

**Access:**  
Contact E. Carinou for possible external use of the cohort data

**Internet link:**  
<https://eeae.gr/en/>

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**Related to:**  
EURADOS, MELODI

Photo: EEAE

## The Severe Nuclear Accident Program (SNAP)

A Norwegian model for nuclear emergency

The Norwegian Meteorological Institute (MET) is responsible for modelling atmospheric dispersion of radioactive debris in the event of a nuclear emergency related to a nuclear accident or detonation. An additional task of the MET in a nuclear emergency is to identify unknown sources of radiation indicated by elevated levels of measurement. The basic tool used by the MET for such events is the Severe Nuclear Accident Program (SNAP).

The SNAP model can be run in different domains, ranging from the local



Dr Jerzy Bartnicki

Dr Heiko Klein

Photo: Jan Terje Rausand/MET

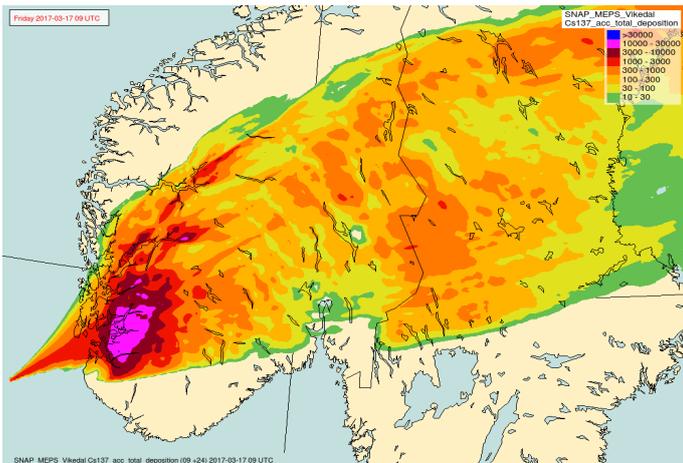


Photo: H. Klein /MET

### SNAP dispersion results from a hypothetical accident on a floating nuclear powerplant transported along the Norwegian coast.

The SNAP model was developed at the MET in 1994 as a Lagrangian particle model. The present version is fully operational at the MET and takes into account atmospheric transport and deposition of gases, noble gases and particles of different size and density emitted during nuclear accidents or explosions. SNAP can also be run remotely by experts from the Norwegian Radiation Protection Authority (NRPA) where the Norwegian Crisis Committee is located.

In the event of a nuclear accident, the source term for the model runs is usually provided by NRPA. This source term includes the magnitude of release which is time dependant, the elevation, time profile of release and the nuclides released. In the case of a nuclear explosion, the source term depends on the explosive yield. In this type of event, radioactivity is transported mainly as particles of different sizes. A large variation of the particle size in the initial cloud is represented by 10 discrete classes with a characteristic particle radius ranging from 2  $\mu\text{m}$  to 200  $\mu\text{m}$ . All meteorological input is available on-line at the MET from different operational Numerical Weather Prediction (NWP) models, e.g. from the ECMWF forecast or from the regional Norwegian/Swedish MetCoOp Ensemble Prediction System (MEPS).

domain with a resolution of 2.5 km to the hemispheric domain with spatial resolution of approximately 10 km. Once released into the air, radioactive gases and particles are subject to advection, turbulent diffusion and deposition (dry and wet). In the model calculations, the advection process is immediately followed by the diffusion process. A random walk approach is used to parameterise horizontal and vertical diffusion. When large and dense particles are released, gravitational settling is more effective than vertical diffusion and this process is taken into account. The effectiveness of dry deposition is mainly a function of atmospheric stability which is calculated based on the Local Richardson Number. Wet deposition is a function of precipitation intensity and type, as well as particle size.

The SNAP model has been used both for simulations of historical events (e.g. nuclear detonations in Novaya Zemlya, Chernobyl Accident) and real time simulations (e.g. Fukushima accident). It was tested in the ETEX experiment and showed good agreement with observations (ETEX 1). It has also been used for tracing unknown sources of radioactivity (e.g. recent  $^{106}\text{Ru}$  case). SNAP is the dispersion model currently used by the MET in the CONFIDENCE project and also in CERAD CoE.

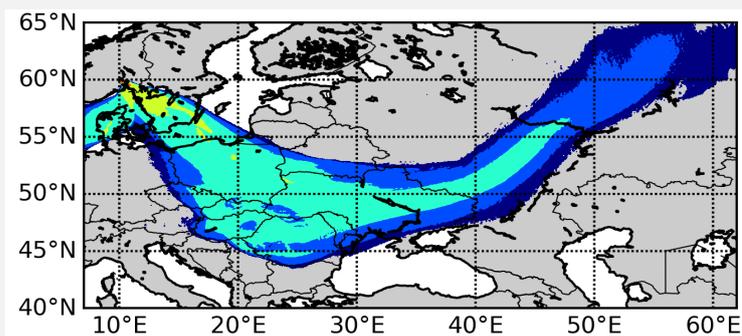


Photo: H. Klein/MET

Inverse SNAP dispersion calculations (-156h) of  $^{106}\text{Ru}$  measurements in Oslo on 2/10/2017.

### ID Card:

#### Purpose:

Atmospheric dispersion of radioactivity

#### Use:

Needs a specialist

#### Housed at:

Norwegian Meteorological Institute (MET)

#### Training proposed on the software:

None

#### Address:

Norwegian Meteorological Institute,  
Henrik Mohns Plass 1  
0313 Oslo, Norway

#### Access:

Open source

#### Internet link:

<https://github.com/metno/snap>

#### Contacts:

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Jerzy Bartnicki  
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#### Related to:

NERIS

## Future events:

### CONCERT Short Courses

**5-9 February 2018**

Emergency and recovery preparedness and response

National Center of Radiobiology and Radiation Protection, Bulgaria

**Contact:**

Nina Chobanova  
[n.chobanova@ncrrp.org](mailto:n.chobanova@ncrrp.org)

**19-23 February 2018**

Radiation Protection:  
Basics and Applications  
Forschungszentrum Jülich, Germany

**Contact:**

Ralf Kriehuber  
[r.kriehuber@fz-juelich.de](mailto:r.kriehuber@fz-juelich.de)

**5-16 March 2018**

Assessment of long-term radiological risks from environmental releases: modelling and measurements, Technical University of Denmark

**Contact:**

Kasper Andersson  
[kagan@dtu.dk](mailto:kagan@dtu.dk)

**12-16 March 2018**

EURADOS Training course on Application of Monte Carlo Methods for Dosimetry of Ionizing Radiation, KIT, Germany

**Contact:**

Bastian Breustedt  
[Bastian.breustedt@kit.edu](mailto:Bastian.breustedt@kit.edu)

### Other Events

**5-8 February 2018**

[EURADOS AM2018](#), Lisbon, Portugal

**27-28 February 2018**

[ISBER European Biospecimen Research Symposium](#)

International Society for Biological and Environmental Repositories, Luxembourg

**11-15 June 2018**

[EPRBioDose 2018](#), Munich, Germany

**22-25 August 2018**

[ERR 2018](#), Pecz, Hungary

**1-5 October 2018**

[3rd ERPW](#), Rovinj Rovigno, Croatia

[See also on CONCERT website](#)

Issue	Exposure platforms	Databases, Sample banks, Cohorts	Analytical platforms, Models & Tools
<b>Published to date:</b>			
Oct 2015, #1	<a href="#">FIGARO</a>	<a href="#">FREDERICA</a>	<a href="#">RENEB</a>
Nov 2015, #2	<a href="#">B3, Animal Contamination Facility</a>	<a href="#">The Wismut Cohort and Biobank</a>	<a href="#">The Hungarian Genomics Research Network</a>
Dec 2015, #3	<a href="#">Pulex Cosmic Silence</a>	<a href="#">STORE</a>	<a href="#">METABOHUB</a>
Feb 2016, #4	<a href="#">SNAKE</a>	<a href="#">French Haemangioma Cohort and Biobank</a>	<a href="#">Dose Estimate, CABAS, NETA</a>
Mar 2016, #5	<a href="#">Radon exposure chamber</a>	<a href="#">3-Generations exposure study</a>	<a href="#">PROFI</a>
Apr 2016, #6	<a href="#">Biological Irradiation Facility</a>	<a href="#">Wildlife TransferDatabase</a>	<a href="#">Radiobiology and immunology platform (CTU-FBME)</a>
May 2016, #7	<a href="#">CIRIL</a>	<a href="#">Portuguese Tinea Capitis Cohort</a>	<a href="#">LDRadStatsNet</a>
Jun 2016, #8	<a href="#">Mixed alpha and X-ray exposure facility</a>	<a href="#">Elfe Cohort</a>	<a href="#">ERICA Tool</a>
Jul 2016, #9	<a href="#">SCRS-GIG</a>	<a href="#">RES<sup>2</sup>T</a>	<a href="#">CROM-8</a>
Sep 2016, #10	<a href="#">Facility radionuclides availability, transfer and migration</a>	<a href="#">INWORKS cohort</a>	<a href="#">France Génomique</a>
Oct 2016 #11	<a href="#">LIBIS gamma low dose rate facility ISS</a>	<a href="#">JANUS</a>	<a href="#">Transcriptomics platform SCKCEN</a>
Nov 2016, #12	<a href="#">Microtron laboratory</a>	<a href="#">EPI-CT Scan cohort</a>	<a href="#">CATI</a>
Dec 2016, #13	<a href="#">Nanoparticle Inhalation Facility</a>	<a href="#">UEF Biobanking</a>	<a href="#">The Analytical Platform of the PRE-PARE project</a>
Feb 2017, #14	<a href="#">Infrastructure for retrospective radon &amp; thoron dosimetry</a>	<a href="#">Chernobyl Tissue Bank</a>	<a href="#">HZDR Radioanalytical Laboratories</a>
<b>Special Issue</b>	<a href="#">1st CONCERT Call: CONFIDENCE, LDLensRad, TERRITORIES</a>	<a href="#">1st CONCERT Call: CONFIDENCE, LDLensRad, TERRITORIES</a>	<a href="#">1st CONCERT Call: CONFIDENCE, LDLensRad, TERRITORIES</a>
Mar 2017, #15	<a href="#">Alpha Particles Irradiator Calibration Laboratory at KIT</a>		<a href="#">SYMBIOSE</a>
Apr 2017, #16	<a href="#">Changing Dose rate (SU) Low dose rate (SU)</a>		<a href="#">Advanced Technologies Network Center</a>
May 2017, #17	<a href="#">Chernobyl Exclusion Zone</a>	<a href="#">Chernobyl clean-up workers from Latvia</a>	<a href="#">BFS whole and partial body Counting</a>
Jun 2017, #18	<a href="#">MELAF</a>	<a href="#">Belgian Soil Collection</a>	<a href="#">INFRAFONTIER</a>
Jul 2017, #19	<a href="#">MICADO'LAB</a>	<a href="#">Estchern Cohort</a>	<a href="#">ECORITME</a>
Sep 2017, #20	<a href="#">DOS NDS</a>		<a href="#">CERES</a>
Oct 2017, #21	<a href="#">CALLAB Radon Calibration Laboratory</a>		<a href="#">CORIE</a>
Nov 2017, #22	<a href="#">Calibration and Dosimetry Laboratory (INTE-UPC)</a>	<a href="#">German airline crew cohort</a>	<a href="#">Centre for Omic Sciences (COS)</a>
Dec 2017, #23	<a href="#">NMG</a>	<a href="#">Techa River Cohort (TRC)</a>	<a href="#">iGE3</a>
<b>Special Issue</b>	<a href="#">MEDIRAD</a>	<a href="#">MEDIRAD</a>	<a href="#">MEDIRAD</a>
Feb 2018, #24	<a href="#">UNIPI-AmBe</a>	<a href="#">Greek interventional cardiologists cohort</a>	<a href="#">SNAP</a>
<b>Coming soon:</b>			
Mar 2018, #25	To Be Announced	To Be Announced	To Be Announced