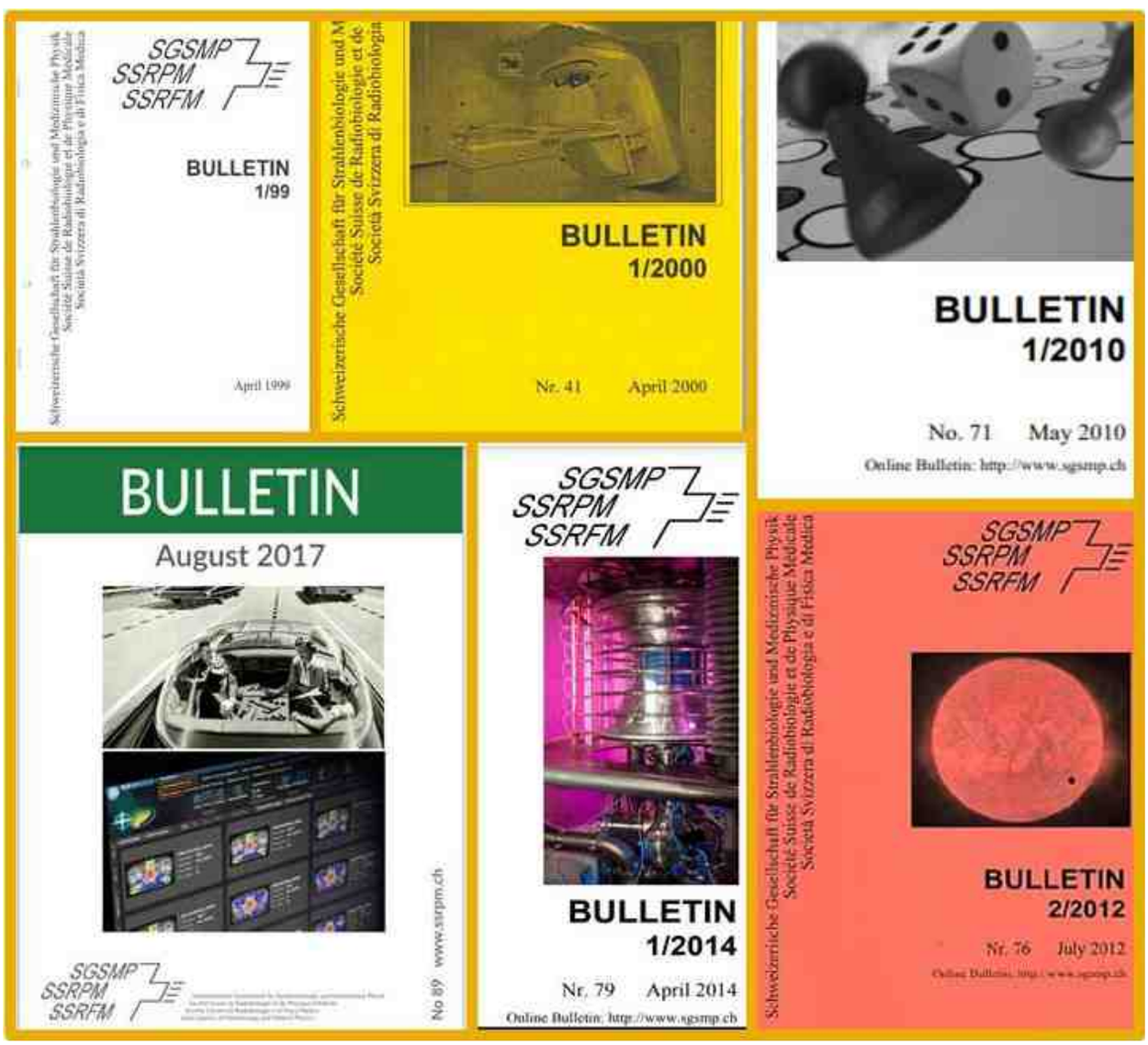
BULLETIN 100

August 2021



SGSMP
SSRPM
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Schweizerische Gesellschaft für Strahlenbiologie und Medizinische Physik
Société Suisse de Radiobiologie et de Physique Médicale
Società Svizzera di Radiobiologia e di Fisica Medica
Swiss Society of Radiobiology and Medical Physics

No 100 ssrpm.ch

Editorial

Letter from the Editors

Dear SSRMP members,

as editorial team we are very pleased to take part in assembling and publishing the Issue Nr 100 of our society's journal! We wanted to mark this anniversary including some special "celebrative" content and introducing even some small layout changes.

What's in there for celebrating?
The SSRMP News hosts two articles that revisit the Bulletin's history: one of them is an English translation and slight adaptation (adding the latest developments regarding the communication tools of our society) of the article initially published for the celebration of the 50th anniversary of the SSRMP (*SGSMP-Jubiläumsbroschüre, November 2014*). The other one reports the experience of one of the former editors.

The Issues of Interest presents interviews with three peers in our profession with the main goal of revisiting the changes and evolution that have occurred over the last 30 years to better understand the "status-quo" of the role and tasks of a medical physicist in the clinic today, its interaction with the other professional figures, the patients, the vendors; and of course to try getting a glimpse of the future ...
Having conducted one of the interviews in person myself has been educative, refreshing and has led me to question some of my personal approaches in my day-to-day job. The core questions came out through a joint effort with the board's members and we thank them for their contribution, ideas and even support in physically conducting the interview (the second interview being conducted by Raphaël Moeckli). Of course we thank also the peers for their availability and opening up on their experience, opinions and views. Sharing one's own personal experience is never obvious … isn't it a bit like handing a small gift?

Even though not connected to the Bulletin 100 celebration, we also propose a new mini-series submitted by the colleagues in Fribourg: ***The weekend of Hacking***. If you are looking for some brain-challenging hobby for the rainy weekends and for a barometer with up-to-date data acquired by météosuisse, go and read the first article of this new mini-series!

Alongside the novelty and celebrations we can still find one of the traditional articles, the SpotLight On, and a report from the AAPM Annual Meeting (focused on Machine Learning and Artificial Intelligence), not lacking of an interesting critical perspective. We again encourage you to share with us your impressions on the conferences you attend over the year!

Francesca Belosi,
On behalf of the Editorial Team.

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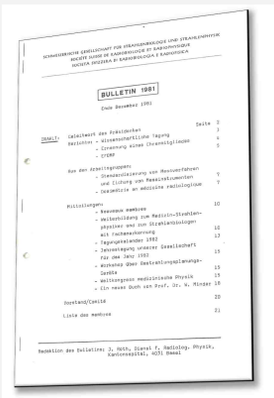
BULLETIN 100 - August 2021

Cover Image: collage of Bulletin's covers from previous years

PRESIDENT'S LETTER

Dear colleagues,

all spectators were absolutely silent, a breathless suspense in their faces focused on the large table in the middle of hall. In the sport arena you could have heard a single needle falling on the floor, maybe one of Buffon's needles. All fully concentrated on the balls lying on the table. Then suddenly a big applause echoed in the arena, the sports reporter, holding his breath a second ago, let it all out at once with an emotional statement: "*Yes, a century break!*" (a score of 100+ compiled in one visit of the table). I guess you know what I am talking about. Indeed, this is about snooker and it came to my mind, when I realized that our bulletin reached the century issue! This is a huge achievement for which many of our past and current members deserve gratitude. While in snooker this has to be achieved within a single frame, the bulletin needed many years of continuous efforts and creative ideas from our members. Though there again, there is a similarity to snooker, where a lot of effort, exercise and creativity is needed in order to place the balls neatly for the next shot potting them in an allowed sequence to reach the century.



BULLETIN 1981

Ende Dezember 1981

All started with the first issue launched in December 1981, typewritten and edited by our honorary member **Jakob Roth** and with a preface from then president Guelfo Poretti: *the aim of the bulletin*, as stated in that preface, *was to have – apart from the annual general assembly – another instrument to improve and ease the communication from the board to the members, but also between the society members themselves*.

This is still valid for the current bulletin in 2021. Amongst others, the content of the first issue included announcements of interest for the society members, reports from conferences as well as from the SSRMP working groups, a list of all SSRMP board members, conference calendar. Basically, all of these contributions are still part of today's bulletin issues.

However, there were also things that have changed over the years. Actually, the layout changed many times during these years. Originally without any cover, the first one was added with the April 1994 issue edited by **Horst Nemec**. But this layout was temporary, as the planned layout with a new logo was delayed because of numerous responses and suggestions for such a logo from the members.

PRESIDENT'S LETTER

Finally, the logo along with a new layout was presented with the bulletin issued in December 1994.
The next phase started when **Werner Roser** and **Roman Menz** took over the editorial responsibility from Horst Nemec starting with bulletin number 41 in April 2000. For the next four years the background color changed on a yearly basis from yellow (2000), to green (2001), dark orange (2002), blue (2003) followed by an orange color for several years (2004 to 2013), when **Regina Müller** was part of the editorial team with **Angelika Pfäfflin** (until 2010), **Shelly Bulling** (until 2013) and with **Nathan Corradini** since late 2013. Finally, Nathan Corradini replaced Regina Müller after 10 years and with it, the color of the bulletin to no color in 2014! The latest layout had its first issue with bulletin number 89 in August 2017 with **Francesca Belosi**, Nathan Corradini and Shelly Bulling as editorial team. Even this short list presented here shows the large number of members who left their footprint in our bulletin and I would like to thank them all for their outstanding work. In addition, I would like to take this chance to thank **Jean-Yves Ray**. For many years he is just awesomely working in the background for the bulletin!

Not only the editorial team deserves a big thank you, but also all of you. Those who provided articles, reports, creative ideas, funny spotlights, personal stories in the personalia etc. and of course all the readers. Overall, the bulletin demonstrates a successful and well-balanced mix from robust continuous contributions and new ideas, integrating fresh and modern aspects, which could serve as good example for many issues to come. Something more to think about. Needless to say, I cannot finish without a call for further support of the bulletin, especially for engagement in the editorial team: create your own layout and footprint. You are all very welcome.

As a last short notice, I would like to address another success story linked to printed issues, namely our SSRMP journal: **Zeitschrift für Medizinische Physik**. Just recently the new impact factor of 4.82 was announced, higher than Medical Physics and PMB! This is an absolutely outstanding and historic number, made only possible owing to a hard-working team of editors, reviewers and authors. I just congratulate all of you for this achievement!

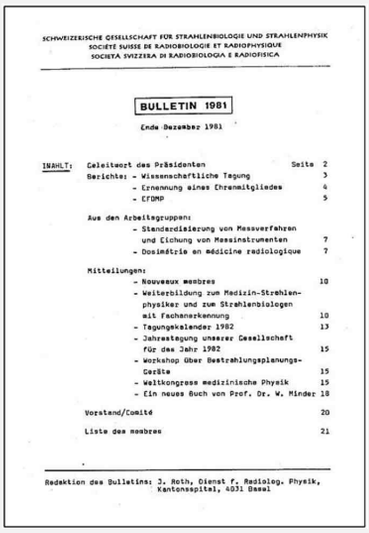
Now take some time, get inspired by reading this century issue. Again the editorial team put together a nice collection of articles. Enjoy and still take care in these times!

Michael K Fix
SSRMP president

BULLETIN 100

Looking back at the history of the SSRMP Bulletin

The first issue of the SSRMP Bulletin in paper-form was printed in 1981 and it has been published since then without interruptions.



SCHWEIZERISCHE GESELLSCHAFT FÜR STRAHLENBIOLOGIE UND STRAHLENPHYSIK
SOCIÉTÉ SUISSE DE RADIOBIOLOGIE ET RADIOPHYSIQUE
SOCIETÀ SVIZZERA DI RADIOBIOLOGIA E RADIOFISICA

BULLETIN 1981

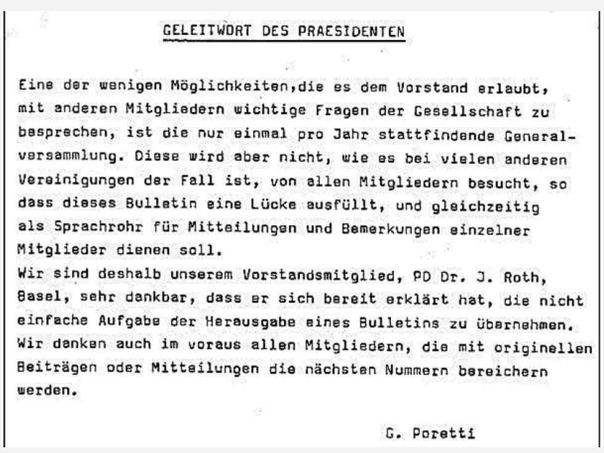
Ende Dezember 1981

INHALT:

Redaktion des Bulletins: J. Roth, Dienst f. Radiolog. Physik, Kantonsspital, 4031 Basel

From 1981 to 1984, the Bulletin was issued once a year; twice a year from 1985 to 1993; finally three times a year since 2010 till now. From 2008 the Bulletin has also been available online in the SSRMP webpage: https://ssrpm.ch/publications-and-communication/bulletin/.

The contents of the Bulletin include reports, results from dosimetric intercomparisons, personal information about our colleagues and suggestions on the literature.

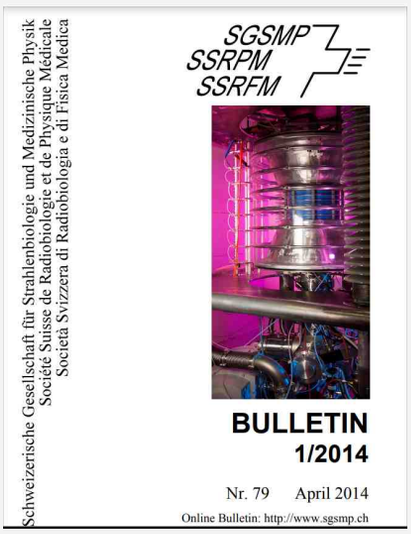


GELEITWORT DES PRAESIDENTEN

Eine der wenigen Möglichkeiten,die es dem Vorstand erlaubt, mit anderen Mitgliedern wichtige Fragen der Gesellschaft zu besprechen, ist die nur einmal pro Jahr stattfindende General-versammlung. Diese wird aber nicht, wie es bei vielen anderen Vereinigungen der Fall ist, von allen Mitgliedern besucht, so dass dieses Bulletin eine Lücke ausfüllt, und gleichzeitig als Sprachrohr für Mitteilungen und Bemerkungen einzelner Mitglieder dienen soll.
Wir sind deshalb unserem Vorstandsmitglied, PD Dr. J. Roth, Basel, sehr dankbar, dass er sich bereit erklärt hat, die nicht einfache Aufgabe der Herausgabe eines Bulletins zu übernehmen. Wir danken auch im voraus allen Mitgliedern, die mit originellen Beiträgen oder Mitteilungen die nächsten Nummern bereichern werden.

G. Poretti

This exchange of information now takes place in conjunction with the more recent digital platforms introduced between August 2018 and June 2019 (website, newsletter and biweekly news).
While at the very beginning the editors could only rely on a writing-machine, the editorial and distribution tools of today are definitively without barriers. Since 2014 (Bulletin Nr 79), the Bulletin is published in colours!



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1/2014

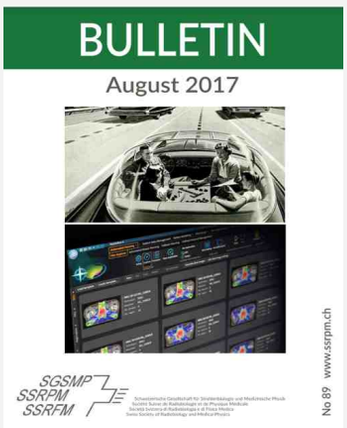
Nr. 79 April 2014

Online Bulletin: http://www.sgsmp.ch

Some sections have remained throughout the years to today: the president's letter, conference reports, reports from the working groups, Personalia, the conference calendar. Some were introduced more recently: the Spot Light On (Bulletin Nr 79, 2014), the PhD Platform (Bulletin Nr 91, 2018). Finally, some articles disappeared that were there at the very beginning: advises on interesting readings, reports from the SSRMP Board meetings. Used languages have been German, French and English.

Until 1993, the cover page consisted of simply the table of contents. As of 2000, each issue has its own cover image (images from the clinical work, cartoons, famous printings, photos …).

BULLETIN 100



After a yearly change of the background colour from yellow to green, from orange to blue, since 2014 the main colour has been changed back to white with a colour picture.

From 2017 (Bulletin Nr 89), a completely revised, new layout has been found for the journal and used ever since. Many positive feedbacks about it reached the editors from the SSRMP community.

It has been a pleasure to see that over the years there have always been members eager to take over the editorial work for the Bulletin. This activity requires a lot of commitment and engagement. Of course the Bulletin could keep up with interesting and up-to-date contents only thanks to the many authors from the society who more or less voluntarily have contributed to it over time.
It is to be hoped that the SSRMP Bulletin can continue to exist in its paper-form, on-line form, with cover images, as a tool for spreading information on the society's activities, and for establishing contacts among the members.

Editorial teams:

- 1981 – 1987: Jakob Roth (Basel)
- 1987 – 1993: Peter Häfeli (Winterthur)
- 1993 – 1999: Horst W. Nemec (Basel)
- 2000 – 2003: Roman Menz (Winterthur), Werner Roser (Villigen)
- 2004 – 2009: Angelika Pfäfflin (Basel), Regina Müller (Villigen)
- 2010 – 2013: Shelley Bulling (Genève), Regina Müller (Villigen)
- 2013 - 2014: Nathan Corradini (Lugano), Shelley Bulling (Genève), Regina Müller (Villigen)
- As of 2015: Francesca Belosi (Zurich), Shelley Bulling (Genève), Nathan Corradini (Lugano)

BULLETIN 100

The editorial board from 2000 to 2003

In the years from 2000 to 2003, Werner Roser and I were in charge of the editorial task to take care of our interesting communication tool.

At that time when Werner and I took over the task being editor of the bulletin on the brink of the 21st century, I was a newly certified medical physicist with no big network within the community of SSRMP. This changed rapidly during that time and by the way, it was for sure one good argument for me to decide to do it. I got the unique opportunity to build up a network among colleagues, which turned out to be of great usability. I could, or better, I had to follow quite closely the activities of the society and the topics and issues of medical physics that had been important at that time. Therefore, I was always up to date. On the other hand it turned out to be quite a tough job sometimes to collect articles from colleagues who had more "important" things to do than writing articles for the bulletin.

During the time I was involved with the editorial work, the highlights and issues that came out with relevance within the community and the medical physics profession, were the following:

- a **new scheme of continuous education** in order to keep the certification in medical physics up to date was introduced in 2000. It was based on EFOMP recommendations. After every cycle of 5 years the certification has to be renewed;
- the introduction of the new technology in the field: **intensity modulated radiotherapy (IMRT)** was applied into clinical practice and a lot of articles and discussions had been dedicated to this topic;
- Werner and I wanted to introduce an **online edition of the bulletin** to be published on the SSRMP web page, which started in 2002;
- also in 2002, a controversial discussion within the community took place about how the **certification** could or should be gained in the future, what should be the basic requirements and finally whether engineers FH could be offered a way to get there as well;
- 2003: foundation of a **professional association of medical physicists** as a subgroup of the SSRMP. The goals were to strengthen the role of our profession within the clinical environment and to represent our interests with respect to the federal authorities as well as to other professional societies as FMH, SGR, SGBT, etc. One central issue was the promotion of our still rather unknown profession through public relations. A structured education to become medical physicist was another important point. Unfortunately this association did not exist very long due to a lack of support of a large part of the SSRMP community and because of the apprehension of creating to many redundances when creating this "sub-society".

Shortly before the end of our editorial time, we had the opportunity to publish the **50th edition** of this bulletin with the report of a former editor about the origin and the history of it. After four years, due to our increasing involvement in different activities within the SSRMP, we decided to hand over the editorial board to new colleagues willing to put their enthusiasm into this informative and valuable communication tool of our society.

Now that we just got the **100th edition** ready, I realize how quickly time passes by!

Roman Menz

Former Editors of the bulletin: Horst Nemec: 1994-1999; Werner Roser & Roman Menz: 2000-2003; Regina Müller: 2004-2013, Angelika Pfäfflin : 2004-2009

AAPM 2021 - 63rd Annual Meeting: Creative Science. Advancing Medicine.

Virtual, 25th - 29th of July

This year's American Association of Physicists in Medicine annual meeting and exhibition took place virtually from July 25th to the 29th.

Hot topics

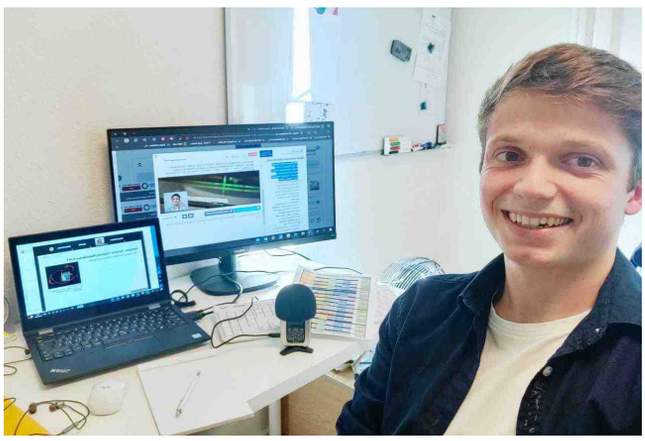
Bearing in mind that research in the last 1-2 years was limited by restricted access to laboratories and hospitals due to the Covid-19 situation, it is not surprising that the majority of the research focused on computational methods and working with existing data. Therefore, the "hot topics", or rather the "hot topic" of this year's conference was **Machine Learning & Artificial Intelligence** (ML&AI). Presenters underlined that ML&AI can be of great support in the daily clinical workflow, especially in the field of image analysis, particularly in image reconstruction (e.g. to generate a "good" CT image from a few projections), image registration and segmentation and auto-contouring of organs in CT or MR images. They also showed that ML&AI has the potential to outperform their human counterpart in these fields. Next to the field of imaging, research on dose prediction, and on adaptive treatment workflows based on ML&AI methods were presented.

It has to be noted however, that unfortunately a great part of these presentations gave the impression of applying existing (sometimes just slightly modified) ML&AI models to medical physics problems, without having proper understanding of the ML model in use. This was particularly evident with the various 3D dose prediction methods: the goal was here to predict a "deliverable" dose distribution from a structure set and a CT. Basically all models used convolutional neural networks with a UNET structure of varying depth.

A clear motivation of why using a certain UNET depth, different filters or pre-processing, was often missing, as well as a test of these models on robustness against data outliers.

Having said that, I want to mention a counter example: the winner of the AAPM Grand Challenge: "*Deep Learning Sparse-View CT and DBTex – To develop data-driven solutions to the inverse problem for reconstruction of sparse-view CT data*" (**Maximilian März et al.**). They successfully connected several ML methods dedicated to solve a single task, almost one for each of the mathematical steps in the reconstruction. Furthermore, they specifically focused on the robustness of the model, which consequently allowed them to win the competition. Similarly, the outstanding research presented in the John R Cameron Early-Career Investigator Symposium on "*Intentional Deep Overfit Learning for adaptive radiation therapy*" presented by **Jaehee Chun et al.** testified a great understanding of applying ML&AI and presented an interesting new method in the field of adaptive radiotherapy.

My personal highlights



Next to the ML&AI dedicated topics, FLASH, Quality Assurance and Radiobiology were presented at this conference. I personally liked the presentations in the sessions on "*Novel Treatment Delivery and Verification techniques*", as well as the "*Principal Investigator Scientific Highlights*". Here the title of this conference – Creative Science. Advancing Medicine – was represented really well. The first time color imaging of Cherenkov emission in vivo during radiation therapy presented by **Petr Bruza et al.** was outstanding (also marked as **BEST IN PHYSICS (THERAPY) abstract**). Furthermore, seeing the combination of different techniques and the exploration of new ones in the field of imaging, radiation therapy (such as the combining electrons and photons), FLASH and GRID therapy, rejoiced my heart as a researcher.

Of course, I was also really honored to be invited to give my first two talks at an international conference. I presented our team's and my research on robustness and on the influence of freedom in table rotation for dynamic trajectory treatment plans.

On a personal note, I have to say that the virtual format of the conference can also have its advantages. Of course, the time difference, the incomparable social program and the limited discussions in the Q&A sessions are a clear downside, but the accessibility of talks and posters also after the presentation are a non-negligible advantage.

Motivated by the world slowly gaining back control over the Covid-19 pandemic and the outstanding presentation of **Bruce Tromberg** on "*Physics and Bioengineering: Converging Disciplines with Creativity and Impact*", I am looking forward to exciting future research and in person conferences.

Hannes A. Loebner
Inselspital, Bern

The Weekend Of Hacking: BME680 to acquire pressure data

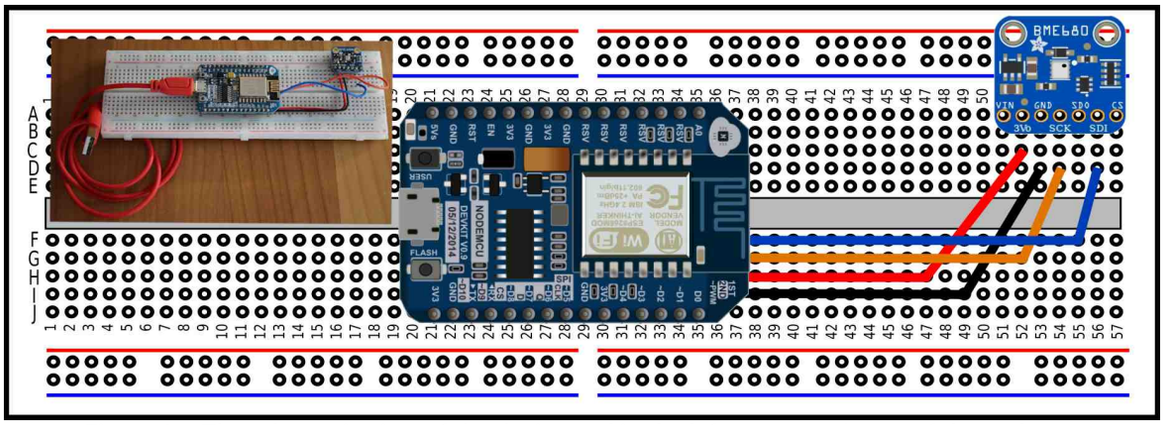


Figure 1 – The schematic view of the device and in the left corner a picture of the real one.

1. Introduction

Until the early 2000s, it was possible to follow the *Linux Weekend Mechanic* column in the "Linux Gazette" magazine. It is in this spirit that I thought of launching a mini-series that I hope others will join in our wonderful Bulletin. We'll call this mini-series "The Weekend Of Hacking" and for the recent rainy or indoor weekends we've had, it's a good time to hack as many projects as possible.

This small electronic assembly does not require any special skills. It just uses available means that are sometimes relatively complex to implement, just because they require a great reading ability and time. Here, by describing all the steps one by one, it should become possible for those who are interested to take a flight into *ethical hacking*.

We have been using such a system in Fribourg for years to obtain the pressure data necessary for our work as medical physicists. We now hope to show you what can be done with very little means (low costs), but amazing results.

2. Material

The assemble itself contains four parts (see fig. 1):

- **the board**: note the coordinates (raws: A to J, columns: 1 to 57)
- the detector or sensor: a **BME680** from Adafruit
- a micro-controller: a **nodeMCU v0.9** (2014)
- 4 **wires** (red, black, orange and blue in this case)
  - red is 3V connection from H21 to C52 (according to displayed coordinates on board);
  - black is ground (GND) from I22 to D53;
  - orange is SCL (clock signal for I^2C transfer of data) from G34 to D54;
  - blue is SDA (data signal for I^2C bus) from F33 to D56.

Add to this the **USB cable** that will power the circuit and provide a connection to read data from a computer. Basically the assemble is finished. We have connected the micro-controller and the sensor. The sensor is powered by the 3V source of the micro-controller (red and black wires) and the data will be transferred via the I^2C [1] connection (orange and blue wires). It remains to add some explanations about what we just did and used.

2.1 NodeMCU v0.9 (2014)

It didn't take long to choose this micro-controller. It is just that we had it in some drawers. It is not expensive (less than 10.- CHF) and can be found on many electronic sales sites. We would add that the fact that it is powered by the USB cable connecting it to the computer makes the solution particularly elegant. On the other hand, it includes an internal clock (RTC) and a Wi-Fi connection is possible.

For this experience, it allows defining a Wi-Fi network (a smartphone transformed into an access point) and as soon as it is able to connect, it sets its internal clock and can deliver data correctly dated.

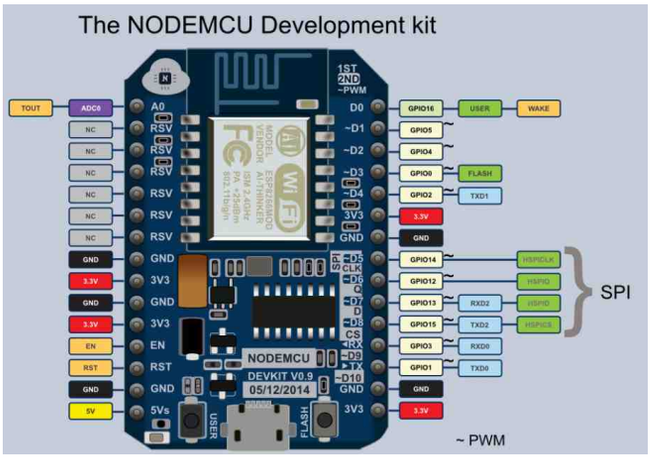


Figure 2 – The pinout of the NodeMCU v0.9: The General Purpose Input Output (GPIO) 4 and 5 are used (which are by default - and it was hard to find at least for me - the I C SDA (GPIO4) and SCL (GPIO5)).

2.2 BME680

The BME680 sensor (see fig. 1, upper right) is a multi-functional unit that allows the measurement of temperature, pressure, humidity, and volatile organic compounds (VOC) gas. It has precision for humidity of ± 3%, barometric pressure of ± 1 [hPa], and temperature of ± 1.0 [°C]. The gas portion is an overall volatile organic sensor that can detect ethanol, alcohol, carbon monoxide, amongst other VOC gases. Due to the BME680's versatile qualities, it can be used in multiple different types of applications. In our case, the goal is to get the pressure for medical physics needs. We adjusted the device to reach a very good precision in the source code (compiled and then uploaded to the micro-controller). For the BME680 we recommend to buy a good manufacturer product even if it costs more than 20.- CHF. The sensor is developed by the German manufacturer: Bosch[2]. We bought it from Adafruit and used the associated C++ library[3].

2.3 Arduino Create

Arduino Create is an integrated online platform that enables makers and professional developers to write code, access content, configure boards, and share projects[4].

[1]The link is: https://en.wikipedia.org/wiki/I%C2%B2C

[2]The BME680 sensor: https://www.bosch-sensortec.com/products/environmental-sensors/gas-sensors-bme680/

[3]Library for BME680 sensor: https://github.com/adafruit/Adafruit_BME680

[4]Arduino cc website is: https://www.arduino.cc/

3. The IDE

3.1 Arduino 1.8.13 (a part of Arduino Create)

The open-source Arduino Software (IDE)[4] makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java using also other open-source software. A download is available from the Arduino Create platform.

In the Arduino environment, we had to add the NodeMCU to the known board[5] and the library dedicated to the BME680[3]. All of this is mainly performed from the "*mouse and click*" environment in Arduino IDE itself.

3.2 The code

The full source code in C++ for this project is available for download or in the full version of this report [6]. Here we will just mention the most important parts related to this project. In summary to get the same as what we have in Fribourg, you just need to open the given file in Arduino 1.8.13. Having USB-connected the device from fig. 1, you just press the upload button from IDE and you will see the messages of compiling process, then of uploading to the micro-controller. When finished, the micro-controller boots by itself and from the serial monitor of Arduino, you will see the first measurement appearing and then each ~20 seconds the next set of values.

In the code, these two lines are indicating the NodeMCU and the library for BME680:

#include <ESP8266WiFi.h>
#include "Adafruit_BME680.h"

Then this part verifies that the sensor is present:

```
if (!bme.begin()) {
Serial.println("Could not find a valid BME680 sensor, check wiring!"); while (1); // The no end loop ;-)
}
```

The data are then extracted from the sensor via the methods of the *bme* instance: *bme.temperature*, *bme.pressure*, *bme.humidity* and *bme.gas_resistance*. Please note the use of the ***OFFSET*** defined for Fribourg when adjusting to values of other sources of pressure data:

```
#define OFFSET -0.81      // [hPa] Offset (calibration)
pressure = (bme.pressure / 100.0)+OFFSET// pressure in [hPa]
```

[5]Board NodeMCU: https://randomnerdtutorials.com/how-to-install-esp8266-board-arduino-ide/

[6]The full report with more details is available: https://physmed.net/TWH/Part01_BME680/

4. Host computer (Linux Desktop)

One event (each ~20 seconds) produces those two lines emitted by the serial device through USB connection (datetime, temperature, pressure, presssure@sea level, humidity, VOC).

We connected this device to a linux desktop workstation (always powered on and at 696 meter of altitude).

 # 80030999 [ms] ctime:(UTC+60mn) Thu Jan 21 10:14:23 2021
20210121101423 | 23.11 [°C] 696.00 [m] 924.81 [hPa] 0 [m] 1015.56 [hPa] 44.45 [R%] 21.387 [kOhms]

5. Results

In blue, the curve measured by the detector and in green with the error bars the data of météosuisse brought back to the altitude of the radiation oncology building. So the benefit is that this detector is always compared to the history of acquisitions and also data provided by météosuisse. This helps us in our daily work. For example if the slope is very steep, it is not a good idea to start measuring absolute doses at the TrueBeams.

6. Words of conclusion

We hope you found this reading interesting and will get into it. The possibilities are almost infinite. If in a next column under this same theme of *The Weekend Hacking*, we will talk about opendata and météosuisse, in the pipe-line there is also a sensor measuring the distance that allows for a few more bucks (around 10 CHF) to do respiratory coaching with a patient before a real acquisition at the 4DCT scanner.

Pierre-Alain Tercier
Radiation Oncology, HFR Fribourg

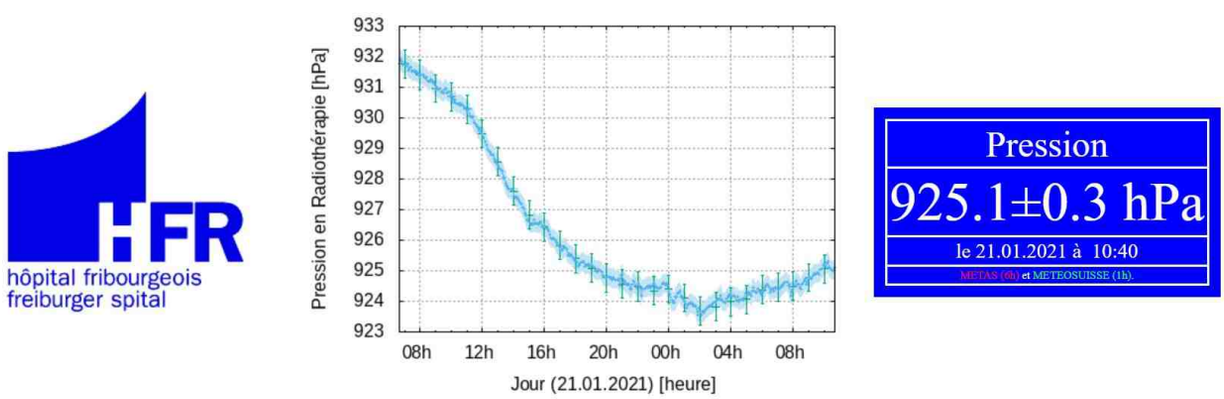
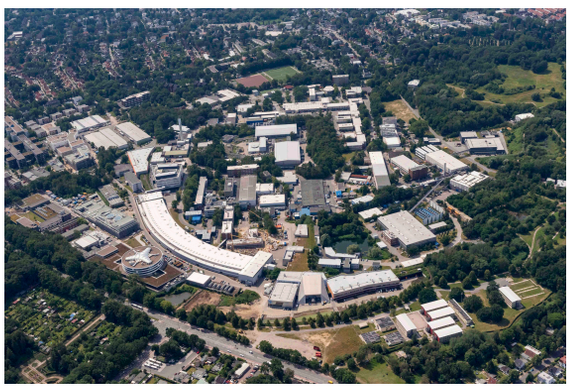


Figure 3 – A screenshot showing in real time what we see from this detector on the front page of our own internal hospital (radiation oncology) website.

Understanding the present to envision the future: interview with the peers

In the context of celebrating issue Nr 100 of the Bulletin, we considered it a nice opportunity to better understand the ways we work and interconnect in our profession today and to better envision our future by looking back at how the different pieces composing today's puzzle of the medical physicist's role has developed over the years. To do this we have sought the help of three peers in our profession: **Hans Neuenschwander** (head medical physicist at Lindenhofspital, Bern), **Roger Hälg** (head medical physicist at KSA-KSB) and **Koutsouvelis Nikolaos** (head medical physicist at Genève University Hospital).

Roger Hälg (R) has a background in particle physics and high energy accelerators, like the DESY accelerator in Germany where he did his diploma thesis. He switched to medical physics in 2008 starting with a PhD position (Triemli & Hirslanden) followed by a Post-Doc (PSI, Loma Linda University in California, USA & Hirslanden). He got his certification in 2011 and he is head medical physicist at KSA-KSB since October 2020.



2019: Aerial view of the DESY campus in Hamburg

Hans Neuenschwander (H) came from a past made of cosmic rays studied in the astonishing and beautiful location of the Jungfrau laboratory. When the laboratories in Davos didn't offer him an opportunity to dig himself into avalanche research he finally had to leave the high mountains as a "hobby" ground and switch to medical physics as potential ground for a career. He also started with a PhD (Inselspital, 1986-1989) and after few years as medical physicist in Luzern and Inselspital, he got his certification in 1991. Between 1992 and 1993 he was Post-Doc in the Dept. of Medical Physics, at the University of Wisconsin Comprehensive Cancer Centre (Madison, USA). As of 1995 he's head medical physicist at Lindenhofspital, Bern.

Jungfrau Research station

Koutsouvelis Nikolaos (N) came from a past made of applied mathematics and physics, with a specialization in nuclear and laser physics in Athens Polytechnic. He had the chance to discover the field of medical physics very early, during his undergraduate studies. He entered the field directly with a master degree in Grenoble (Université Joseph Fourier) and Lausanne (Lausanne University Hospital - Institute of Radiation Physics), and the medical physics certification in France (2010) and Switzerland (2012). He started as a medical physicist at the Clinique des Grangettes in 2011 and is chief medical physicist at the Geneva University Hospital since March 2020.

Polytechnique University of Athens

Part I – Milestones

What were in your experience the milestones that boosted or slowed down the field of medical physics bringing it to its current state?

H: The most important boost was certainly provided by the rapid development of IT. When I started working as medical physicist some 30 years ago, the available TPS at Inselspital had 32Kbyte of memory. We used a wire to model the patients' outline and digitize this contour into the TPS for dose calculation. What we can do now, we couldn't dream of 30 years ago.

Indeed I have a bit of a feeling we kind of reached the top level and there is not that much space for development and improvement any more.

H: I'm very confident that there is! You probably can't imagine what's coming in the next 10 years. It's almost impossible to answer the question "*how we envision the next 10 years*" of medical physics. As I said, in the past we couldn't dream of what we have available now. And now, I think it's hard to imagine what the future will be. For treatment preparation in the 80s we only had a TPS, a conventional simulator, and access to a CT. The CT data were imported into the TPS via magnetic tapes. However, many patients didn't receive a CT scan. Some were contoured by using a wire (in one "slice" of the body), and for many the setup was defined at the conventional simulator and manual dose calculations were done based on the patient thickness which sometimes was measured with large calipers. So, IT definitively was what brought forward radiation therapy immensely.
Then, I think that specifically in Switzerland, what brought forward medical physics as a profession has been the fact that our involvement with ionizing radiation in medicine is required by law!

R: Do you think we progressed as a profession and are more involved today because that is what we have been trying to achieve or because that is what we have been pushed to do by the law and by the society?

H: In the field of Radiation Oncology the increasing involvement of physicists in the clinics has occurred a long time ago and seemed logical due to the technical complexity of the field. Our position was further strengthened by medical physicists being mentioned in the legislation. I think our involvement in diagnostic imaging was accelerated to a great extent by the "infamous" Art. 74 of the old StSV. Therefore, the recognition of the value of the Medical Physicist in the field of Radiology has occurred more recently. This recognition had to be earned, too, as in the beginning some radiologists suspected Art. 74 to be a "physicists plot" to profitably expand their field of work.
I think these discussions are more or less behind us and our contribution is appreciated in all areas concerned with ionizing radiation. The MAS with the choice for the two tracks in the field of ionizing radiation, Radiation Therapy and Imaging, has helped a lot in this respect, too.

R: I think it is important what you are saying. There is a big difference between the perceptions of being controlled versus being supported. That was a process that had to happen. In my opinion, the imaging field is where we still have some potential for development and expansion - in the future. Currently, the machines and the technology are at a very high level. The big steps forward now are not coming from hardware, but from software development. For instance machine learning is everywhere at the moment.

H: Software development was the motor also in the past.

N: In the clinical environment, in my opinion the recognition of our profession has improved over the years, especially because of the increased technical complexity of modern treatments. From colleague physicians of previous generations I hear that before, in case of emergency, physicians alone could irradiate patients, doing everything on their own, from turning on the machine, to setup and irradiate the patient. Nowadays this is not possible and the necessity of medical physicists is not discussed compared to the beginning of my career.

Concerning the imaging field, I feel there are maybe some steps to be taken to further ameliorate the recognition, encouraging the recruiting needs. I'm not the expert in the field, but I often hear of one single physicist hired for huge imaging parks with a very important number of devices in his/her charge. Less physics presence may make recognition more difficult, and this matter is in my opinion important to be discussed with our colleague experts in the field.

Certainly the technology played a major role in driving the application in the clinical environment. How has the communication with vendors and companies changed over the years?

N: I have not been in this field that long, but I feel that in the past, when a new technology was acquired, physicists where very implicated to technically implement, deeply understand and maintain/debug that technology. Actually the number of new technologies produced has increased a lot, and the new norm is "black-box/technical support", as maintenance contracts are an important part of the business model of the industry.
A boost for the medical physics profession: given the increased pace of technological advancement, there is less time for savant organizations to produce guidelines, making the local medical physics team very important for the safe and efficient implementation of new technologies. Furthermore, with increasing automation, and with the **industry being more present for resolving problems**, the physicist is spared from time-consuming debugging.
A potential slow down: there is a big trap though on this direction, as we physicists can become comfortable and rely on technical support for every problem. Beside the fact that this can decrease the physicist's value in the department, we risk of losing our intellectual sharpness. It is up to us to understand how the new technologies/algorithms work and mediate them, and keep the physicist's value high in a department, offering efficient problem solving, procedural or technical. We need to keep the human deep learning sharp!

H: I have a lot of experience with Varian. It is my impression that when I started in the field the center of attention rightfully was the accelerator as the most important system in charge of providing the technical solution to do accurate and complicated treatments. In the beginning of the 90s, the focus shifted. The vendors realized that they can't only provide the treatment machine. They have also to provide **integrated and database driven control/ verification/information systems**. That was a major change for these companies. And, with the change of the focus, in my impression came a change of attitude: they would better listen to what the clinics needed and what's happening in the clinical workflow.
Specifically in Switzerland, a major boost was that they (Varian) moved a lot of their development from the US to Baden. So, we knew these people, and had direct contact with them. We could communicate ideas. In Baden the developers gathered together physicists and clinicians, showed what they had and asked for input: "*what do you like and don't like*".

R: With this development, they are not just a company that sells you something, but they become a **real partner**. They work with you and need to be involved in finding solutions.
One issue I see is with products that are initially developed by start-up companies and then are bought by large companies. With the structures of large companies, the contact from the user to the developer and experts might get lost. This can slow down the development of the product and makes it harder to get optimal support. In the worst case, if the company does not see the commercial benefit of the product, it can be abandoned completely.

Part II – Medical Physicists and the rest of the world

Has the recognition of the medical physics profession changed over the years? Are there more steps that should be taken?

N: Our profession is still not very known in the society, and I think there are steps we should take to better

promote the profession in the education, by adding at least some lectures early enough in the physics fields in the universities. Students (at least in the French speaking part of Switzerland) still have to search by themselves to discover the existence of our field.
I would also be happy to see more and more collaborations between medical physics organizations, joint meetings and principally a way to simplify and homogenize medical physics recognition procedures between countries. I know I am a dreamer, but I hope I am not the only one…!
Another important aspect is the collaboration with federal authorities: from the beginning of my career in Switzerland in 2011, the exchange with the authorities was quite human and I was positively surprised. There were some issues with the system, but a big step forward was the delegation of clinical audits to peers. It is a great opportunity of exchange between colleagues who understand the practical problems of the daily practice and the application of the law in the clinical routine. It is far more constructive than the simple filling of a checklist. We have to get the maximum out of the exchanges during these audits.

H: Physicists are much more involved in clinical work than 30 years ago. Consequently, there's much more interaction of physicists with the other professionals. I think this involvement has brought with it a lot of recognition of the importance of the work we do. However, the Medical Physicist is not officially recognized as a health care professional, a fact that certainly does not help with the public recognition of the profession. The question is whether we really need/want this.

R: The recognition of the profession has definitely changed over the years and we are now more involved in clinical duties. Besides being accepted as a health care profession, one possible way to increase the recognition would be, if we, medical physicists, could do the billing on the technical part, similar to how doctors have their own billing. Then, we would be at the same level as health professionals.

H: I don't think it's a matter of reimbursement. And I believe a change of reimbursement policy is not going to happen in Switzerland. For example, we as physicists would never get the necessary support to re-design the reimbursement system for radiation oncology. If ever, this should have been done in the early 90s when the TARMED was constructed. It was then that we had to determine infrastructure costs and staff costs that went into the reimbursement calculations … that would have been the moment.

R: I doubt, as well, that the reimbursement system will change.

H: I see doctors and physicists in complimentary roles. Doctors know all about radio-oncology and the clinical part, but they do know also a little bit of the technical stuff; and that's the same for us. We know all the physics, and we have some knowledge of the clinical data. Even though I think, from my experience, that the physicist checks way more on the clinician's work than the other way around.

R: I see that too. We check and do many things that are outside of our core competencies. I think in radio-oncology it is important that all professions understand what the others are doing.

H: As an example, the core competences of a doctor in treatment planning are drawing the GTV/CTV, to define the prescription and dose constraints, and to verify that the plan he chooses fulfills all requirements. As a physicist I make it my task to also check these points as far as I'm able to and to get back to the physician if there's something I don't understand or am not comfortable with. This often results in interesting and fruitful discussions, and I have the impression that the doctors also rely on these checks.
On the other hand, physicians rely on us completely for the machine to be calibrated and QA'd correctly, which is part of our core competence. So there might be some "imbalance" there.
But of course the physicist is not in the public view. The patient doesn't know the physicist. That's OK with me. But it probably doesn't help the recognition of our profession if it remains invisible to the public.

This leads me to a new question: how has our relation with the patient evolved? Do you think the medical physicist's future role should see more interaction with the patient?

N: In my experience the contact with the patients is quite missing in our profession, and we often lack of understanding of the human part of the irradiation, the stress felt by the patients, the impact of the secondary effects in their lives. I practiced before in my career meetings with patients in order to explain the technical parts of the preparation of their treatments and answer their questions, and I understand that some patients can benefit a lot from an interaction with physicists. Showing them how the technology assures their treatments reduces significantly the stress of some patients and thus the outcome of their treatments. I think in the future consulting with a physicist should be proposed by the physicians or the nurses, for those patients who have the curiosity to further understand the functioning of their treatments.

R: When I talk to patients and explain what is happening from a technical point of view, they do appreciate it a lot.

H: Do you talk regularly with them?

R: This depends a bit on the mindset of the department. Usually when patients ask many questions and the questions become more technical, they are offered to talk to a medical physicist.

H: In my experience most patients understandably care mainly for their own well-being and are not interested in the technical details. For me, a direct interaction of the physicist with each and every patient is not the way to go. I have the impression that most patients are primarily interested in having their illness “fixed” and get over with the treatment. They don’t want to know all the details.

R: But some clearly are. Some patients I talked to, were fascinated to learn about the machine and how the treatment plan is personalized; they are usually not aware of that. In my experience, patients who are scared of the treatment, can benefit from our explanation.

H: But maybe you don’t need a physicist for this. Well trained therapists are very good at that as well. Most of what the patients will be asking will be medical questions! A patient will never ask a question about calibration. I understand and see that clinicians spend an incredible amount of time in discussions with patients and answering their questions, but we cannot be the ones taking over the load. We’re just not well enough trained in medicine for this task. If I have to be involved in the whole treatment of the patient, then I would want to be able to respond to everything. We have to keep the two areas separated.

What about the interaction with therapists? I find that the level of education of this professional figure has increased significantly. How has this influenced your interaction with them?

R: I believe therapists are more educated now because they have to manage machines that are more sophisticated. They also have to make decisions about the patients' treatment that are more complex. Therefore, they have to learn and understand more. The technological development has brought physicists and therapists closer together.
We have to build a strong level of trust. It is not that medical physicists have to check their work, but rather that we have a collaborative relationship.

H: We have more team-work than 30 years ago. At my beginning at Inselspital, we were not involved at all in the clinical workflow. We were there only for the machines’ calibration, the QAs, the technical tasks. Doctors and therapists did not think they needed to see physicists. This has changed for the good.

R: I agree, I think it is beneficial to have a close collaboration with the therapists and doctors.

N: I want to believe that teams should get closer to face the new technological challenges. Every team has

its responsibilities and competencies, and one team can offer useful feedback and advices to the others to help better understanding the application of a technique from a different point of view. For example therapists have the day to day experience of patient positioning, and their feedback is very important on how some technologies could be applied in order to offer the best outcome for patients.

H: I think the physicist has to earn his recognition by bringing additional value to the clinical process. We have to be a bit familiar with the clinical side: anatomy, fractionation schemes, prescriptions, constraints. I talk a lot with the doctors and they're mostly open to critical remarks. But I had to earn this recognition. It's important that everyone talks to each other and on the same level.
One other important point in order to be recognized is that you make yourself available.

What about the communication within the medical physicists group itself? Most of the departments host quite diverse groups of medical physicists, with different education, culture and background: how does this multi-cultural aspect impact on the dynamic of communication and collaboration within the same group?

N: Getting staff members together and to correctly communicate offers a huge force in a RT department. With the increased number of techniques and colleagues, communication is extremely important, so every member is updated on every aspect of the clinical life of the department. It takes a lot of time, but it is a necessary investment.
Diversity is also a strong and enriching point in a team. Every team should try to keep a diversity in ages, sex, educational and cultural backgrounds, to keep members complementary. It is a puzzle often not easy to solve but in my opinion critical for an optimal team functioning.

Let's talk about research. How has the interconnection with the research field evolved? Is research well aligned with the evolving patients' and clinical needs and does it try to target them?

H: There are 2 types of research. The fundamental research: this takes a long long time to get to the results and then to get these results implemented. Then there is the research related to clinical projects: often interesting only for your department with its own procedures and types of patients. If somebody tries to apply your results to their clinic, they may not be valid anymore. Or, as an example for R/D, when we started with respiratory gating in 2006, we had to develop our own solution for video coaching (Varian had nothing at the time). This is not research, but it's development focused to improve patients' care. We contribute with our expertise to respond to the clinical needs.

R: The type of research we do in the clinic is usually about evaluating and implementing a new product or feature. A lot of us do not have the resources to do fundamental research. It is a pity. Some things you develop as basic research without a direct application might become useful in 20 years. You never know! It is, as we said before, about envisioning the future: we cannot imagine what will happen in 20 years from now. Same for research: maybe you do not see the applicability of something now, but in a few years it could be useful.

N: In general I think research is quite relevant to improve the patient's care. To me it is very important to give research-time to clinical medical physicists to keep the link between research and practice.
Problem with research? Sometimes research does not lead to findings that really improve treatments significantly. It is complicated to admit that some research "was for nothing", there is a lot of pressure for publication and new product conceptions, sometimes "creating the need" in medical physics. We have to understand the fact that sometimes research can lead to something that will not influence our way of doing things, and stop the efforts early enough when this is realized.

Part III – Clinical workload

The incredible technological developments allowed for a drastic increase of the clinical workload (with the possibility of treating more and more indications, faster and more efficient delivery and therefore many patients a day etc). How has this impacted the capability of the medical physicist profession to still meet the requirements for ensuring safe and accurate delivery?

N: In this context of abundance of solutions and different interferences between systems, physicists must have a larger role in participating in the choice of which technology should be implemented that best fit in the context of the department, and can be integrated safely and efficiently in the workflow. Physicists have great responsibility for accepting new technologies, but refusing them to patients is also a great responsibility.
We have to correctly assess the time, material and the QA procedures we need in order to assure safety but also efficiency at the same time, keeping the physicist's stress at a reasonable level. We have great responsibility to not only keep treatments safe, but also to not cause unjustified delays for patient treatments. In my opinion the best way is to take the time to think and discuss within the medical physics team, to find the golden equilibrium.

H: I'm not sure we are treating more patients per day per machine now than we were doing in the past. We have more tools for sure, but using these tools takes time. Therefore we can't treat many more patients a day than before. For a linac, a normal working day allows us to treat more or less 40 patients. That's almost the same as 20 years ago: we had and still have a 10 minutes time slot for most patients. But we can treat patients better. We can better control the setup and the delivery.

R: In the past, the whole workflow from seeing the patient to start treating included less steps and therefore was shorter.

H: Sure. Today we have more complicated techniques, therefore we need way **more preparation time** than before.

R: Yes, the workload has increased with more preparation needed but the same number of patients.

N: There might be more pressure in the present to reduce preparation time, but it is up to us to claim the time needed to think and test new techniques to produce excellent treatment plans, whenever that is possible.

H: Of course. Maybe 20 years ago the bulk of the physicist's work was QAing equipment. Now, besides QAing even more equipment, we are also much more involved in the clinical workflow and in its management and setup. **Developing workflows** is part of our tasks, as well as QAing them. That was less the case in the past. So, the focus of our work has certainly shifted quite a bit.

How have the day-to-day responsibilities of the medical physicist changed in technology implementation and QA?

N: I have a feeling that actual QA procedures do not follow the real QA needs of the new machines. For some QA procedures we never observe a wrong measurement, for others when we have a wrong measurement, in the majority of the cases, it is the measuring process that is faulty and we are in a point that we no longer test the machines with our QA material, but our QA material with the machines.
In these cases we might have to re-think our QA mentality. An idea could be to propose a tree diagram of QAs, starting from a thorough independent and automatic QA every morning that includes every element of the treatment delivery, and propose more specific QAs when there are doubts, to find out which element is not functioning.

How has the improvement in equipment reliability had an impact on our daily tasks?

N: Our responsibility is to thoroughly test and understand the new technologies during the

acceptance, **produce safe usage protocols** and follow closely the application during the learning phase. Once the learning phase is completed, the role of the medical physicist is clearly reduced as systems are more and more robust and technical support more present.

What happens when you get a leadership role? Does this role play an integral part in the clinics? Or does being a leader implies only bureaucratic and administrative tasks?

R: It depends on the size of the institution. If it is too large, for sure you cannot perform clinical and administrative tasks both at a high level.
For myself, after the adjusting period, where I have to learn and adapt to the new administrative tasks, I hope to go back to more clinical tasks. The clinic needs the expertise of **somebody who has the overview** and leads the group. Also, having to decide what projects should be pursued, who should lead and the budget … that is enjoyable management! In addition, I like that you have to keep the overview on the whole process!

N: Well I have not been in the field for a long time, but generally I feel the medical physics leadership gets more important as the technology advances and systems get more complicated.
Specifically, the leadership in each department is very dependent on each department's personalities and chemistry.
Bureaucracy is of course a huge trap in a manager's life, but a leader should manage this equilibrium as the leadership is critical in the functioning of a department. The leaders are **examples to the teams**, and this can define everything, from the collaboration culture between the teams, to how a team is open to accept new technologies, motivation for research and seek for excellence in the daily routine tasks.

H: Of course it's a lot of work which takes you away time from your "core duties". But a good medical physicist should **remain available**. You can't say "*I have this administrative task and I cannot come to the accelerator now*". You have to be available all the time and take on the responsibility. Then we have of course to worry about also the economical conditions, charging, invoicing, scheduling, organizing the department, workflows, project management. And of course that has changed over the years. Due to the increased involvement of physicists in the clinical process, we have been appointed with the task of organizing workflows, processes etc. It's not pure physics work, but it's also interesting.
It's important that you can split these organizational and administrative tasks. Ideally with the head physician. It's important to be a team and have a partner. You may argue at times, of course, but you're still partners.

N: I've seen departments with the physicist leading even medical affairs, which in my opinion can be dangerous. Whichever has the leadership in each department, physicist or physician, the important thing is to respect the competencies and responsibilities of each team, and not intervene in these responsibilities in a non-constructive way. Advice, help and encouragement to keep the continuous education is the way to interchange between teams so that all staff members can progress together.

R: Having a good relation with your head doctor is very important and benefits the whole department.

What's your view on automation?

N: Advantages: more secure for the patients, more uniform practices between centers, time saving from manual repetitive activities.
Against: it can be very dangerous, as errors can be produced and propagated quickly through the patient workflow. It can make our profession less interesting, as more "black box/technical support" mode takes place.
As said before, we should keep up the interest to really understand the technology and be able to provide safe implementation, quick and efficient solutions to every-day problems, as also to find ways to extend the use of the automation to more and more indications and to further improve the workflow.

H: Automation is here to stay. It doesn't mean we'll have less work. We'll have to QA automation! It may affect other professional groups. Could be … no prognosis now. And anyway you cannot automate everything.

R: We will spend more time **ON** the process rather than **IN** the process.

But that's taking away the fun … isn't it?

R: It depends on your taste I guess. On a technical level, we have such a high standard nowadays that maybe we should think about focusing more on the improvements that could be done in biology, treatment concepts and defining the PTV.

Part IV – Attributes of a medical physicist

How would you motivate young physicists getting into the field? What kind of profile would be beneficial?

H: actually, I ask this question to you. What did motivate you?

Several events led me to do my master thesis at PSI and to start the MAS. But I think the moment I really decided I wanted to be a medical physicist was listening to one of the medical physics lecture there. The way the professor spoke about his job, it made it seem like he was doing something of value. Something important. And I have always been the type who needs to see the results of the job immediately applied and used for something.

R: I did my diploma thesis with high-energy accelerator. I really liked it and it was nice, but I felt like I was only a part of a very big project and I was involved only in a small part of working with the accelerator. Then, I saw a PhD position in medical physics and I saw that I could have an accelerator all to myself! I could be involved in the entire project and not just in a small part. While doing my PhD, I realized that I enjoyed the application of what I was doing: that I could really help somebody.

H: "*You can make a difference*". This is what I would say to a young medical physicist. You'll do important work, you'll enjoy a high degree of versatility. But you have to like to communicate with different people as well. You are not working all by yourself.

N: To me it is the most exciting field of applied physics in the world! Directly applied to cure people. Medical physics is also a great challenge because a radiation therapy department is a very complex environment technically and socially, helping a person to develop a variety of skills.
If a physics student is interested also in biology/medicine and informatics/softwares/networks at the same time, then this is the profession he/she should seek without doubt!

R: I like to be the **glue between the different professions**. I like to be involved in the processes and contribute to the tasks of other professions. I really enjoy being a **problem solver**!

H: **Availability** and being ready to respond, are important qualities as well. Other important aspects: you have to accept **responsibility**, to be able to work under pressure without losing your cool, to accept a lot of daily pressure and live well with it. Also very important: you have to be able to stand your ground.

Which role did SSRMP play in your career? What shall still be changed and improved in the society?

N: SSRMP worked very well from the beginning of my career, promoting the continuous education of its members and their participation in the society. It got much better with the website and communication organization.
SSRMP in my opinion could still make some steps:

i) to better help **promote the profession in the universities** (add medical physics lectures in the physics fields) and **support the practical training** of physicists, by finding sufficient funding from BAG for adequate entities (departments with some variety of practices) to open training posts.

ii) To better encourage colleagues who face difficulties in their departments seek consulting by the most experienced members of the board. That could be useful for who is new in Switzerland, or inexperienced colleagues who happen to have early a lot of responsibilities.

H: what does SSRMP for our profession?
o Provides **forums** to meet colleagues (meetings, WGs)
o Establishes standards in Switzerland through **Guidelines/Recommendations**
o Through a close cooperation with BAG, it was instrumental in **establishing the status of medical physicist in Switzerland**; SSRMP has an important influence on legislation (like a PAC), e.g. in the position of medical physics in law (various ordinances concerning Radonc, NucMed and Imaging), the recommendations being mentioned in BAG guidelines ...
o Provides the widely appreciated Bulletin
My wish: each department should at least send a representative to the AMP meetings, so we get to know each other even better.

R: Thanks to SSRMP, I got to know many medical physicists in Switzerland when I was very new in the field. This was extremely helpful and I think our community is part of why I like this profession so much.
Also the structure for **education and training** leading to the board certification has been very helpful for me. The **annual meeting** has always been a highlight and I am missing it now with the Covid-19 restrictions. Having the interaction through SSRMP events makes it easier to reach out to other medical physicists when you need another opinion or help. The recommendations that the society is publishing are in my opinion the formal result of these interactions and are a very important part of the society. They give us a foundation to collaborate and guidelines to do a good job.
I think the AMP meeting is something that we could focus on. Especially young medical physicists should attend more in my opinion. It is not just a meeting for people who are part of a working group.

These interviews were conducted by Francesca Belosi (University Hospital, Zürich) & Raphaël Moeckli (CHUV, Lausanne) with a big support from Jean-Yves Ray (Hôpital du Valais, Sion) and from the board members in defining the topics and questions.

Greatly inspired by three AAPM MP3.0 webinars:
- *Redefining Workflow in Radiation Oncology and the Role of the Clinical Physicist*
- *Why do physicists need high competence in patient interactions?*
- *Does research have a place in the clinical practice of medical physics?*

Kantonsspital Graubünden

1. Introduction

The institute of radiation oncology at the cantonal hospital of Graubünden (KSGR) treats between 800-900 patients a year with external beam radiotherapy and serves the populations of canton Graubünden, canton Glarus and Liechtenstein. Currently it is staffed with five radiation oncologists, two junior clinicians, ten radiation therapists, three nurses, three secretaries, four medical physicists and a medical engineer. This is a multi-national, multi-cultural team of enthusiastic professionals.

2. Equipment

The department has a dedicated CT scanner (GE Optima CT580 wide bore) and two modern linear accelerators. These are latest versions of Varian TrueBeams with photon beams up to 15 MV (with and without flattening filter) and electrons between 6 MeV and 15 MeV. Both linacs are equipped with hardware and software systems for image guidance, optical surface guidance (SGRT using OSMS by AlignRT®), tumour localisation and tracking (Varian Calypso®), respiratory gating (with real-time positon management, RPM) and stereotaxy (cone applicators and HyperArcTM technology).

Treatment plans are created on Varian's Eclipse (v15.6) treatment planning system and checked with Mobius3D. Investigations are underway for the implementation of adaptive radiotherapy with the aid of Varian's Velocity system. The system for patient data management and record and verify for treatments is ARIA (v15.5). ARIA runs on virtual servers on the main hospital Citrix farm and accessed through Citrix.

With the procurement of a replacement linac in 2018, an additional position for a qualified medical physicist was opened and the medical physics team was able to expand and update its tools. We have to our disposal and use a range of modern equipment: ionisation chambers and the synthetic diamond from PTW-Freiburg, diodes from IBA, radiochromic film dosimetry and analysis software by Ashland, Standard Imaging's Exradin® W2 scintillator, detector arrays, the 3D Scanner water tank system by Sun Nuclear Coorporation (SNC), and imaging phantoms from PTW and SNC.

For the commissioning of new planning software, treatment techniques and plan specific QA we use plastic phantom slabs, complex plastic phantoms (Alderson phantom, the IMRT Thorax and SteeV phantoms by CIRS) and the Delta4+ system by ScandiDos. The quality assurance program for imaging and therapy systems is set through the commercial solution of SunCHECKTM by SNC.

3. Clinical service

State of the art radiation therapy arrived at KSGR with the installation of the first TrueBeam linac in 2015. This brought an increase in the number of patients receiving intensity-modulated treatments (IMRT) and the introduction of VMAT in clinical practice. In 2017, the department initiated its stereotactic program seeing an increase in patient numbers receiving stereotactic ablative radiotherapy (SABR) with the installation of the second TrueBeam.

With the patient at the centre of our services, safety, quality and efficiency are key aims. The majority of treatments offered are inverse planned. Almost all

breast patients receive treatment in deep inspiration breath hold (DIBH). Complex irradiation geometries involving the breast, lymph nodes and supraclavicular region are treated using a single isocentre arrangement with a combination of IMRT and VMAT fields. Most prostate patients are localised using gold markers or Calypso® transponders. Cone beam CT imaging is the reference method for IGRT for most treatments. The patient position is monitored during treatment with SGRT. Very small lesions, whenever possible, are treated with stereotactic radiotherapy (SRT) or radiosurgery (SRS) using an irradiation geometry employing dynamic conformal arcs. Larger volumes are treated typically with VMAT. For the treatment of multiple metastasis in the brain, the option of HyperArc technology facilitates the efficient delivery of these long treatments.

Currently our institute participates actively in several national and international clinical studies and has on-going collaborations with other radiation oncology institutes in Switzerland.

4. Development of service

One of the current developments is the expansion of ARIA's integration within the hospitals' IT **infrastructure**. The aim is to improve daily working practices and the management of patient data and documentation related to radiotherapy.

Another multidisciplinary project is to develop the clinical service for radiosurgery to very small benign lesions and other functional indications in the brain using cone applicators. The optimisation of imaging dose and in particular the dose from CBCT exposures is also on going.

In medical physics in particular, we are evaluating the requirements for plan specific QA through the use of appropriate plan complexity metrics.

Our centre is due to relocate to a brand new building within the next four years. This is currently being built and it has been exciting so far to provide input on the necessary shielding and other requirements relating to radiation protection.

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Schweizerische Gesellschaft
für Strahlenbiologie
und Medizinische Physik
(SGSMP/SSRPM/SSRFM)

Printing Press

Valmedia AG
Pomonastrasse 12
CH-3930 Visp
www.mengisgruppe.ch

Call for Authors

Also, you are invited to participate in the construction of our bulletins. Of desirability are all contributions that could be of interest to members of our society, such as

- Reports of conferences, working group meetings, seminars, etc.
- Reports on the work of various committees and commissions
- Succinct results of surveys, comparative measurements etc.
- Short portraits of individual institutions (E.g. apparatus equipment, priorities of work, etc.)
- Reports on national and international recommendations
- Short Press Releases
- Photos
- Cartoons & caricatures
- Announcement of publications (E.g. books, magazines)
- Announcement of all kinds of events (E.g. conferences, seminars, etc.)
- Short articles worth reading from newspapers or magazines (if possible in the original)
- Member updates (E.g. appointments, change of jobs, etc.)

The easiest way to send your document is as a MS Word document via email to one of the editor addresses above.

Deadline for submissions to Bulletin No. 101 (03/2021): 11.2021

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Conference Calendar

CALENDAR 2021

September 2
Rorschach

25th Annual SASRO Meeting
September 2 - September 3
https://www.sasro.ch/2021

September 14
online

SCR' 21 – joint session SSRMP/SGR-SSR
September 14 @19h00
https://congress.sgr-ssr.ch/

September 19
online

Joint Conference of the ÖGMP, DGMP and SGSMP
September 19 - September 21
https://www.medical-physics2021.com/

October 20
online

34th Annual Congress of the European Association of Nuclear Medicine
October 20 - October 23
https://eanm21.eanm.org/

October 24
Chicago IL, USA

ASTRO Annual Meeting
October 24 - October 27
https://www.astro.org/Meetings-and-Education/Micro-Sites/2021/Annual-Meeting

October 25
Bern

SSRMP Continuing Education day
https://ssrpm.ch/continued-education/calendar/

November 15
online

SCR' 21 – joint session SSRMP/SGR-SSRS
November 15 @19h00
https://congress.sgr-ssr.ch/

November 22
Wien, AT

5th European Radiation Protection Week
November 22 - November 24
https://www.euramed.eu/erpw/

November 28
Chicago IL, USA

RSNA 2021
November 28 - December 2
https://www.rsna.org/annual-meeting

November 29
Bern

4th National Day on radiation protection in medicine
November 29
https://www.bag.admin.ch/bag/de/home/das-bag/aktuell/veranstaltungen/strahlenschutztag-2021.html

And please, if you participate in any conference or meeting, think of writing a few lines or sending a picture for the Bulletin.

THANK YOU!