

IMCZ NEWS



JANUARY – MARCH 2022

EDITORIAL

A happy New Year to all IMCZ members. I wish you all a healthy and happy 2022. I hope we'll see the end of the pandemic phase of SARS-CoV-2 and move into the endemic phase so we can move on with our lives more normally. Fingers crossed.

There's an interesting landmark this year. On 2nd February at 10:22 pm the date will be 22:22, 2.2.22, or even 22:22:22, 2.2.22 if you count the seconds. Rather obviously, this doesn't happen very often. Don't miss it.

The winter sport season has started again. The weather has been a bit strange. We had up to 15 C in the alps over the holidays. But the snow has now returned and normal service has been resumed. I was brought up in Glasgow, Scotland and, during the winter months the sky was uniformly overcast and it rained a lot. One of the great things about Switzerland is the ability to go into the mountains and experience winter sun. It's good for the soul. Whether skiing, snowboarding, snowshoeing or just wandering around, time spent in the breathtaking scenery pays dividends. And even better, it's right on our doorstep. For most of us in Zug, less than an hour can take you to one of many local mountain resorts. I encourage all newcomers to Switzerland to try it.

Lastly, my apologies for the lateness of this Newsletter. The fault is all mine. I've been sick for a few weeks and was unable to deal with the Newsletter promptly. Still, here it is – with grateful thanks to all contributors.

Alan



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FUTURE EVENTS

Our planned events are shown in the Events Calendar at: <https://imcz.com/Club-Events>
This is where you will find all the information you need to find out what's happening and to register (if needed).

The next big events planned are the New Members Reception which will take place on 3rd November in the Pulverturm, and our annual Burns Night. You'll also get emails to tell you what's happening, but keep an eye on the Events Calendar for the latest information.

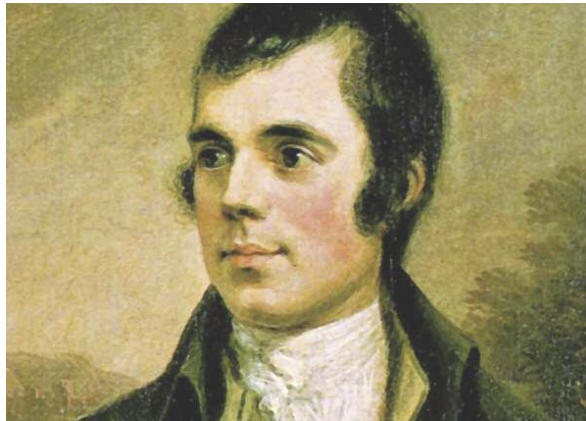


PAST EVENTS (Contributed by Bill Lichtensteiger, IMCZ President)

We are holding our regular Stammtisch events weekly in the Gotthardhof Restaurant in Bundesplatz on Thursdays. All members are welcome.

Special Stammtisch

On 9th December Wayne Clarke held a Special Stammtisch "Meet the author" where he gave a presentation of the book he has written. Feedback is that it went really well. Our thanks to Wayne for his presentation.



Burns Night

On 29th January we will be holding our annual Burns Night celebration in the Wirtschaft Brandenburg near the Stierenmarkt. (See the advert later in this Newsletter.) This is a fun event which is always very popular. We hope as many of you as possible will attend. Please register on our club website to reserve your place.



STAMMTISCH
Every Thursday from 18:00–20:30
We meet at different venues – please check our website for the location:
<https://imcz.club/Club-Events>

IMCZ BOARD MEMBERS Thumbnail biographies of board members can be found on our website www.imcz.club under 'About Us' section	PRESIDENT Bill Lichtensteiger 079 378 63 26 president@imcz.club	NEWSLETTER EDITOR Alan Cattell 079 340 25 51 newsletter@imcz.club	SECRETARY Geoff Watson 079 946 37 27 secretary@imcz.club	TREASURER Lindsay Johnston 079 276 78 03 treasurer@imcz.club
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Coffee pulp recycling as a forest restoration strategy?

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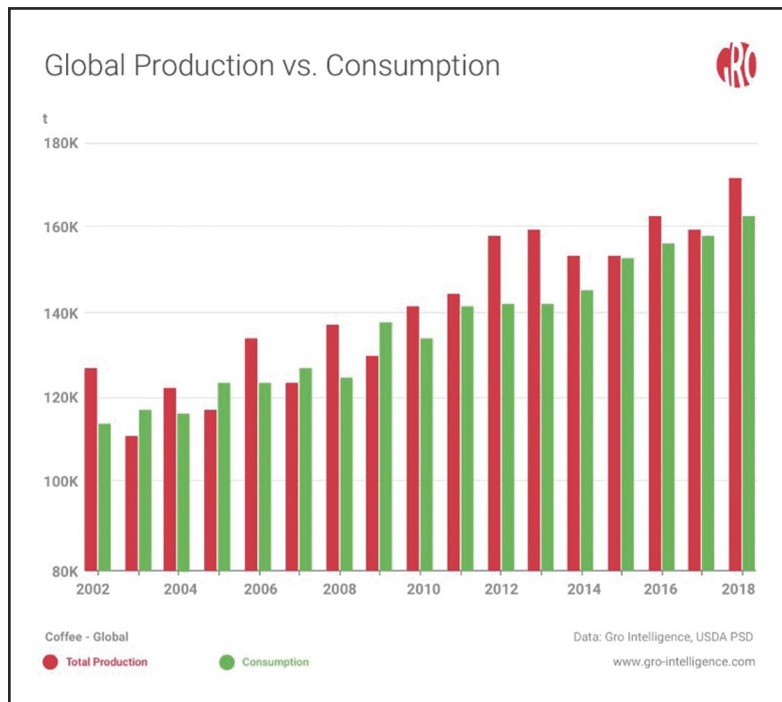
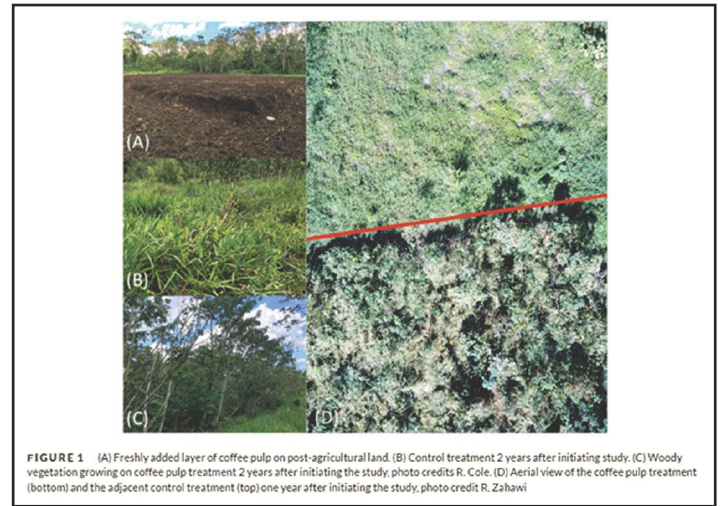


Global coffee production and consumption has been constantly growing for many years. This has several reasons; a growing world population with increasing disposable income and emerging markets besides regular coffee consumption. This, of course, demands expanded cultivation area and/or improved yields of coffee fields. Consequently, the pressure on increased soil use and wild forest areas is also growing.

As a coffee consumer and with an average understanding of environment and nature you probably know that garden-owners sometimes use to recycle their coffee grounds as fertilizer in their garden. However, the grounds, i.e. the ground coffee bean "waste", constitute only about 50% of the coffee fruit harvest. The other 50% comprise the left-overs after separating the seeds from the remaining fruit components. This nutritionally rich fruit pulp consists of carbohydrates, crude protein and fibres making it a valuable compost. However, in the past coffee pulp was seen only as a waste by-product of coffee production and was not sustainably recycled (fertilizer) and upcycled (e.g. pectin production).

A 2021 study from ETH in Zurich showed that treating abandoned pastures in Costa Rica with coffee pulp resulted in a 80% coverage (vs. 20%) and 4 times taller canopy formation compared to an untreated area after 2 years. Soil quality also improved thanks to the nutrient-rich pulp. Still, to get these impressive results a half-metre layer of coffee pulp was required, which succeeded in eliminating invasive pasture grasses, and allowed seeds from native tree species to take hold and grow on its low-pH medium. After 3 months, the layer of coffee pulp reduced by 50% in depth and small herbaceous plants started colonizing the surface. Excavation to ground level showed that the underlying grass had been asphyxiated and was starting to decompose. By the end of 2 years, the layer of coffee pulp resembled the underlying mineral soil and had reduced to 5–10 cm depth.

As promising these experimental trials may be in the view of endangered native forests, there are obvious limitations in this technique, such as distribution on uneven and steep terrains, transportation feasibility and costs. In this respect, it remains to be evaluated if large scale reforestation strategies based on coffee pulp can be successful. In coffee-cultivating regions it is certainly worth a serious attempt. And given the sheer volume of coffee produced every year a sustainable management of the pulp waste becomes increasingly important and presents a challenge to coffee producing regions as coffee demand grows globally. If badly handled, it can have a major impact on water, soil, flora and fauna. Alternatively, coffee pulp can also be used as a fertilizer, as animal feed and by biotechnological upcycling, for example for vinegar, enzyme and pectin production, in the food and chemical industry.



"Regular coffee?
What's regular coffee?"



CoVid-19 / SARS-2

Below is a “snapshot” of the blog on the current status of SARS-CoV-2 by Roger Brooks. You can find the latest version of his blog on the club website in the News section: <https://imcz.club/news>. The newsletter is only updated quarterly so the website will have the most current information. (Editor)

2021-12-28 09:00 **Roger Brooks (Administrator)**

Due to the increasing caseload of CoViD patients in hospitals and the recent discovery of the more infectious Variant of Concern (VOC) “omicron”, the Federal Council has successively strengthened measures to slow the circulation of the Corona virus. In its media conference on Friday, December 17th, the Federal Council announced new measures effective Monday, December 20th. An [overview](#) is provided on the website of the Federal Office of Public Health (FOPH). A summary of the changes can be found in [this press release](#). Key changes are the resumption of home office for those who can work from home, the requirement of a certified recovery from or vaccination against CoViD-19 for access to public indoor spaces and the requirement to wear masks in secondary schools. Answers to Frequently Asked Questions (FAQ) can be found [here](#). There is also a Federal information hotline: [+41 58 463 00 00](tel:+41584630000).

Masks

Masks are now required in all publicly accessible indoor spaces and in public transportation. In addition access to public indoor spaces is limited to those certified as vaccinated against or recovered from CoViD-19 (2G). Exceptions ***to the mask-wearing requirement*** include:

- Children under 12
- People sitting in bars and restaurant to eat or drink
- Groups of less than 30 which meet regularly
- Singers rehearsing or performing, if 2G+ is applied (see below)
- Speakers at events
- Venues (other than workspaces) with a 2G+ requirement, (2G certificate + negative test if recovery or vaccination is more than 4 months ago).

See [this FOPH page](#) for details.

Certificates

A certificate is now required for all publicly accessible indoor spaces, excepting private venues. Even for private venues, certificates are recommended for groups of more than 10. Certificates are also required for those over 16 at outdoor events with more than 300 participants.

Certificates for a negative antigen test are now valid for only 24 hours. Certificates for a negative PCR test are valid for 72 hours, but the results may take up to 36 hours to process. Most venues now require certificates which are based on vaccination or recovery from CoViD-19 (2G), excluding certificates based on negative CoViD tests. In general, the wearing of masks is also required (see above). In addition they may require a negative CoViD test if the last vaccination or recovery from CoViD is more than 4 months ago.

Further information on the CoViD certificate can be found on [this page](#). The certificate can be obtained on paper or registered in the “Covid Cert” app, which is available in the [Apple App Store](#) (for iPhones and iPads), in the [Google Play Store](#) (for Android smartphones and tablets) and also in the [Huawei AppGallery](#). Like the COVID Certificate app, the COVID Certificate Check app is also available for download free of charge from the [Apple App Store](#), [Google Play Store](#) and the [Huawei AppGallery](#).

Obtaining the certificate itself is managed by the individual Cantons. In Zug it is obtained as follows:

- Those who have recovered from CoViD or were vaccinated abroad should fill out and submit a [BAG form](#).
- Those who have already received two vaccinations before June 21st should have been notified by post or by SMS how to obtain a certificate.

- Those who receive their second vaccinated on June 21st or later will receive a certificate onsite directly upon vaccination.
- Certificates for negative antigen or PCR tests will also be issued onsite upon testing as of June 21st. No certification is available for self-tests.
- Those who haven’t received the certificate for their vaccinations in the Canton of Zug or who have problems with the federal form for recovered patients should fill out [this form](#) from the Canton of Zug.

Details of the procedure in Zug are available on [the Zug Health Department website](#).

Vaccination

Zug offers first vaccinations to everyone age 12 and above, including non-residents (e.g. commuters who work in Zug) without appointment at the vaccination center in Baar, which is open from 12:00 to 18:30, seven days a week. You can also register for an appointment. In addition, if you are over 16 and your original vaccination(s) are more than 4 months old, you can register for a booster shot. Vaccinations with Pfizer/Biontech have been approved for children over 5. However, vaccination of children aged 5 to 11 is currently recommended only for children with risk factors, although millions of children in this age group have already been vaccinated in the U.S. without ill effects. More information and links to registration forms can be found [here](#). For information about vaccinations for young children in the Canton of Zug, please telephone [+41 41 531 48 00](tel:+41415314800). For vaccinations elsewhere in Switzerland, please consult [this page](#). The Federal information hotline for vaccinations is reachable at [+41 58 377 88 92](tel:+41583778892).

The Swiss Health Department (Bundesamt für Gesundheit, BAG) has extended the recommendation for CoViD-19 vaccination to pregnant women (in the 2nd and 3rd trimesters) and nursing mothers. The available evidence clearly indicates that the benefits of vaccination for both mother and child far outweigh any risks. There is no clear contraindication for vaccination during the first trimester of pregnancy, but the data for this group is not yet extensive enough for an official recommendation.

Two vaccines have received temporary approval for use in Switzerland. The [New England Journal of Medicine \(NEJM\)](#) has published [extensive information about the available vaccines](#). It is possible that the seasonal flu vaccine will provide some cross-immunity, particularly for those who have received the vaccine annually over a long period of time.

Testing

In addition to certification of recovery or vaccination or recovery (2G), indoor events or venues where mask-wearing is impracticable also require a negative CoViD test if the infection or vaccination is more than 4 months ago. Venues may also require tests in addition to 2G certification at their own discretion. School children are tested regularly in the Canton of Zug, and the federal government is still funding individual PCR tests for anyone with symptoms as well as pooled tests organized by camps, schools, employers etc. You can be tested at [the Andreas Clinic in Cham](#), at [the Zuger Kantonsspital in Baar](#), at many family physician’s practices or at one of the following pharmacies, but an appointment must be reserved in advance.

- Apotheke Drogerie Moll in the Zugerland shopping center in Steinhausen and in Unterägeri
Reserve an appointment at www.covidtestcenter.ch
- Amavita Apotheke Zug
Reserve an appointment [here](#) or by phone ([058 878 24 50](tel:0588782450))

[The OneDoc website](#) can help you find other test centers and reserve an appointment.

The Federal Council has stopped funding individual tests which are not motivated by symptoms, a doctor’s recommendation or an exposure notification from the CoViD app effective 10 October. Please see [this Health Department web page](#) for further details.



Further Information

For the latest news and authoritative information on CoViD-19, please consult the websites of the [Federal Office of Public Health \(FOPH\)](#) and the [World Health Organization \(WHO\)](#). [COVID-19 Information for Switzerland](#) has excellent visualizations of the latest available data for Switzerland. Another good source of statistics for Switzerland is [this page](#) (in German) from the [Tages-Anzeiger](#), which is updated daily. A good source of visualizations of international data is [Our World in Data](#).

The Federal Office of Public Health (FOPH) has also launched a [website summarizing the recent statistics](#). **An overview of the current measures and a list of FAQ are posted here.** More detailed information on Federal regulations and recommendations can be found [here](#). There are also [restrictions which apply to those arriving from other countries](#).

Many misconceptions about the virus and measures against it are in circulation. Please refer to [the WHO Myth-Busters page](#) and the Wikipedia page, “[COVID-19 misinformation](#)” for details. The independent British fact-checker [fullfact.org](#) is also a good source of [verified information about CoViD-19 / SARS-CoV2](#). Their website also includes some good [tips for assessing the veracity of information yourself](#).



Battery Technology

Contributed by IMCZ member, Alan Cattell

Coming up to Christmas I was thinking about what to write when inspiration struck. One of the bigger stress factors at this time of year is ensuring that all the presents have the correct batteries and that you’ve got enough to keep the gifts working until the shops open again. It’s always a challenge – and failure can lead to tears and tantrums (not always just from the kids).

Battery technology is increasingly important in our daily lives. The growth of electric vehicle sales, the use of mobile electronics, storage for solar power collection and many other applications are driving the development of improved batteries at an pace – but there’s still a lot of improvement potential.

The development of better batteries is a complex, multi-disciplinary task which involves electrochemistry, materials science, manufacturing, electrical control design and many other disciplines. There is also the issue of safety. Batteries need to be safe to handle and safe in the event of accidents. This is not trivial as the energy density in a current lithium ion battery can approach 1 MJ per kg. For comparison, the explosive C4 has an energy yield of around 6 MJ per kg, not massively higher. Of course, batteries don’t usually explode – but it’s still a lot of energy to manage in the event of an accident so safety has to be designed in from the start.

So what is a battery?

In this article I’m going to focus on rechargeable batteries for power applications. With the dramatic improvement in power electronics over the last 20 years, the ability to use batteries as a reliable power source for delivering kW (or more) of energy is now routine. But battery design for power applications is much more challenging than battery design for mW power consumption.

So what is a battery? It is made up from electrochemical cells. As shown below, these cells comprise a cathode (+ve electrode), and an anode (-ve electrode) made from specially chosen materials. When the battery is charged, a chemical reaction takes place at each electrode and the resulting material builds up on the electrodes. When the battery is then connected to a load, it discharges and the material built up on the electrodes is converted back to its original state. So a battery is nothing more than a means of converting electrical energy to chemical energy stored as chemical compounds on the surface of electrodes. A key part of the chemical cycle is the (normally liquid) electrolyte in which the electrodes are immersed. This electrolyte allows conduction of +ve and -ve ions to complete the battery circuit. It may also contain some of the compounds required to support the chemical reactions which create the electrode coating which stores the energy. Of course, the chemical coatings on the electrodes need to be able to conduct ions and / or electrons or the coating will just insulate the electrode, degrading battery performance.

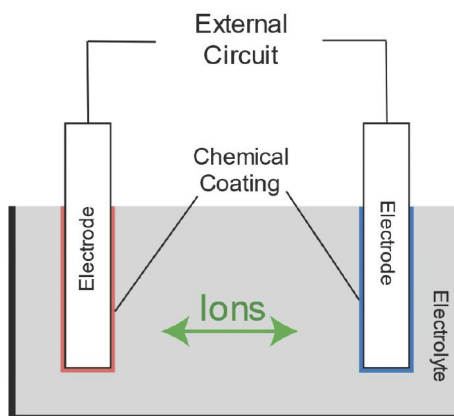
Depending on the materials used, the voltage of an electrochemical cell is typically less than 4 V. Significantly higher voltages are not possible for a single cell (a consequence of quantum mechanics). So to make a battery, multiple cells are connected in series (to increase voltage) and / or parallel (to increase power storage) until the required battery capacity is reached. (This is the reason for the use of the word “battery”. It is derived from its older use meaning “a number of pieces of artillery used together”. The word was taken over to mean “a number of electrochemical cells used together”.)

This rather abstract description of a battery is better understood based on specific examples.

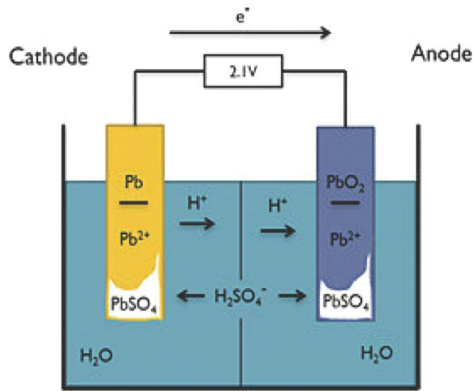
The lead-acid battery?

Lead-acid batteries are the type of “power” battery most familiar to us. Almost every motor vehicle has one or more. They are used to start the engine (and for ancillary equipment) and can deliver 100’s of Amps of current, normally at 12V (6 cells) or 24V (12 cells), for this purpose.

They consists of metallic lead plates immersed in concentrated sulfuric acid. The negative electrode is normally porous (or spongy) to maximise surface area in contact with the acid. Both have a coating of lead sulphate. When the battery is charged, the lead sulphate on the negative electrode is converted to lead. At the positive electrode, lead sulphate is converted to lead oxide. So electrical energy is converted to chemical energy “stored” in lead and lead oxide. When the charged battery is connected to a load, the process reverses and electrical power is delivered as the lead at the cathode converts back to lead sulphate and the lead oxide at the anode reacts to become lead sulphate again.



Schematic of single electrochemical cell



So what factors influence the battery performance? Some of the key topics are:

- Amount of accessible “charge” material which can be captured at the electrodes. Ideally the lead sulphate should be porous, but extended discharge results in growth of larger lead sulphate crystals which can’t be converted back to lead, reducing the effective area of the electrode.
- The mechanical stability of the “charge” material. If “charge” material does not adhere well to the electrode or degrades over time, this leads to reduced battery performance.
- Reversibility of the reactions. Any “side reactions” which don’t create the “charge” material desired are a problem. For example, if a lead-acid battery is charged too quickly, or at a higher voltage, then the water at the electrode will be electrolysed, creating hydrogen and oxygen gas. Over time, this damages the electrodes and reduces the amount of water in the battery. There’s also a potential safety risk from hydrogen gas release.
- Internal resistance of the battery. Since the current is carried by ions in the acid, the internal resistance can be significant unless care is taken to design the battery properly. This resistance is just a loss – when charging and discharging. It reduces the ratio of energy stored to energy delivered.

Many of these issues can be mitigated by very precise control of the charging voltage and current over time, and taking battery temperature into account. Others are mitigated by battery design. One common approach is to use an Absorbent Glass Mat to hold the sulfuric acid in a gel form between two plates of lead, tightly pressed together (AGM Batteries). This produces “sealed” batteries with better life.

Lithium Ion Batteries

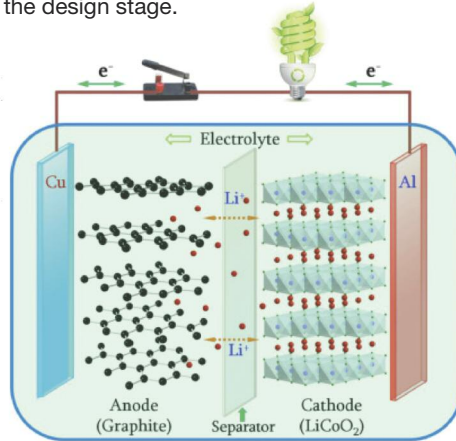
One of the obvious disadvantages of a lead-acid battery is its weight. Lead has a density of 11,342 kg per cubic meter. (A 140 Amp-hour 12V AGM battery weighs around 45 kg). Lithium, by contrast, has a density of 534 kg per cubic meter which means potentially large weight savings.

Lithium batteries were first investigated in the 1960’s. Their development has accelerated

rapidly with transport needs. Today a typical lithium ion cell consists of a cathode of lithium doped cobalt oxide and an anode of graphite. These are immersed in a liquid electrolyte which consists of lithium salts in an organic solvent. Unlike the lead-acid battery, the electrolyte is chemically inert, playing no part in the reaction at the electrodes. Its sole job is to allow lithium ions to move between the electrodes.

During charging, the chemical reaction at the cathode is the conversion of Lithium Cobalt Oxide (LiCoO_2) to Cobalt Oxide, a lithium ion and an electron ($\text{CoO}_2 + \text{Li}^+ + e^-$). The lithium ion is transported to the anode through the electrolyte where it combines with the graphite to form LiC_6 ($\text{C}_6 + \text{Li}^+ + e^- \rightarrow \text{LiC}_6$). A schematic of such a cell is shown on the right.

There are some specific key issues with lithium ion batteries which need to be addressed at the design stage.



Lithium Ion Cell Schematic [1]

Cell balancing

When a battery with multiple cells in series is charged, there will be differences in the charge state of the different cells. Unless this is managed, the imbalance will grow over time. The battery is only as good as its weakest cell, so overall performance will degrade. With lead-acid batteries, slight “overcharging” corrects this tendency so the cells are self-correcting.

In modern lithium batteries this problem is dealt with by having electronic control of charging built into each cell in a battery. The control electronics diverts “excess” charge from a cell to other cells which still require charging and therefore keeps the battery balanced.

Thermal runaway

A runaway chain reaction leading to a battery fire is possible with lithium batteries. At temperatures above a given threshold (between 60°C and 100°C, depending on battery design), thermal runaway can result in temperatures getting to 400°C within a fraction of a second, leading to a battery fire.

This can be triggered by

- an internal short-circuit, for example caused by impact damage to the battery
- an external short-circuit leading to excessive current

- overcharging the battery or use of excessive charge / discharge currents

These problems are mitigated by continuous monitoring of the temperature of each cell in the battery and control of the current (in or out) accordingly, the design of the battery to optimise thermal performance and the use of cooling fans. Careful design of thermal behaviour is critical. Cells are typically thermally insulated from each other to ensure a cell which overheats does not overheat other cells. Cells are also thermally bonded to head conducting structures to keep their temperature low. Thermal management is a complex topic which is a major part of battery development.

Future Battery Technology

Now that the commercial pressure for high reliability, safe, low cost mobile power storage is growing strongly, the amount of R&D being focussed on battery improvement is immense. The work is very diverse, and most of it is commercially sensitive so not in the published literature. However, there are some clear signs of the technologies being explored.

Electrode materials

Eliminate or reduce Cobalt. This element is one of the most significant cost factors in battery production. Cobalt is costly, and difficult to source. 70% of it is mined in the Democratic Republic of Congo in very difficult circumstances (for all concerned). Most Cobalt refining is in China. So dramatically reducing the use of Cobalt by careful engineering of the cathode material is highly desirable.

A lot of the work seems to focus on the more precise engineering of cathode structures, using surface coatings (to reduce migration of electrode materials and growth of unwanted dendritic structures which limit battery life) and precision doping of tailored compounds of structured electrodes which contain oxides of nickel, manganese and cobalt in precise ratios. In this way it is expected that the storage capacity of the cathode can be increased while unwanted “side” reactions which limit battery life can be reduced.

For anodes, there is a strong focus on silicon or silicon / graphite materials. We know that the theoretical lithium storage capacity of $\text{Li}_{15}\text{Si}_4$ is almost 10 times higher than that of LiC_6 , so silicon based anodes would be a big step forward. Unfortunately, there is the problem of the volume expansion of silicon when Li ions are inserted – and this causes cracking / adhesion problems of the lithium doped silicon on the electrode surface. This leads to unacceptably low numbers of recharging cycles. To address these issues, researchers are looking nanostructured silicon electrodes with enough “free space” to accommodate the volume expansion without mechanical damage.

There is huge investment in these topics – but, as with most materials science, it’s trial and error and a complex mix of chemistry,

engineering, physics and manufacturing. This normally means steady progress rather than major breakthroughs.

Novel Electrolytes

In order to improve battery performance, particularly charging speed and battery lifetime, there's a lot of focus on the electrolyte. There's a European Battery initiative supported by nine countries (including Switzerland) looking at developing self-healing batteries based on thermotropic ionic liquid crystal electrolytes together with a special separator between the electrolyte and the electrodes. This holds the promise of 50% increased energy density and improved life if it can be made to work in real-world situations.

Longer term, the goal is to develop solid-state electrolytes to eliminate the flammable electrolyte from batteries. The focus is on using porous / structured ceramic materials as the electrolyte. Laboratory prototypes have been demonstrated, but currently the biggest problem is the number of charge cycles. Recently there has also been a report of the benefits of using sulphide solid electrolytes (together with silicon anodes). Laboratory demonstrators showed good energy density and reasonable life. From the work to date, it seems clear that the combination of novel / solid electrolytes together with tailored interfaces between the electrodes (especially the anode) and the electrolyte hold great promise. I think that 3 to 5 fold increases in energy storage density with 1000's of charge cycles lifetime are realistic expectations.

Alternative chemistry

Alternatives to lithium based batteries are also being investigated. Sodium based batteries

have been demonstrated with promising performance. It remains to be seen if such batteries can overcome the barriers to commercialisation. However, using sodium rather than lithium and cobalt would be a big step forward from an environmental point of view. Sodium is readily available without the need for expensive mining operations.

Amount of material used in batteries

Current batteries trade lifetime against the amount of material used. This means that chemical degradation of the battery is less noticeable. However, it increases cost and has higher environmental impact than is desirable. Careful engineering of all the different components in a battery and the introduction of more sophisticated manufacturing methods hold great potential to reduce the material used without sacrificing performance. The bigger the scale of manufacturing, the more this will be the focus of future developments.

Electrical Energy Supply – the Grid

Obviously, mobile battery technology is only a part of the solution to reducing dependence on fossil fuels. Batteries allow you to store and move the energy you need – but it still needs to come from somewhere. Since renewable sources of energy are often not continuously available, large scale power storage technologies are being looked at. Tesla has already provided grid storage solutions in Australia based on their lithium ion technology. They pre-package this in "Megapack" blocks of up to 3 megawatt hours of storage and 1.5 megawatts of inverter capacity. These can be connected together to create the storage required.

However, there are a lot of alternative storage technologies being developed. A battery for grid storage does not need to be lightweight or extremely energy dense. Far more important are the lifetime and capacity issues and the life-cycle costs. Lots of alternatives are proposed – from novel to more traditional:

- Flow batteries based on circulated electrolytes
- Compressed air or liquid air storage
- Pumped hydroelectric systems (used extensively today)
- Stacked blocks – using thousands of stacked blocks of many tonnes each. Lifting them to store energy and release them to generate power (a classic use of potential energy). The company Energy Vault is building their demonstration "battery" in Castione in Ticino^[2] and has attracted significant interest.

Summary

The potential of batteries for power applications is considerable. Batteries which are dramatically cheaper, more reliable, longer lived than those available today are being developed. These will also have substantially higher energy storage capacities. I expect substantial progress over the next few years as major industrial players focus on this market.

References

1. lithium ion cell schematic: Liu, Neale and Cao, [Materials Today 19\(2\): 109-123](#) - Free to use (non-commercial) subject to attribution. No warranty supplied.
2. [Energy Vault Article](#)



Sleep, both in quality and quantity, is important for a good physical and mental health.

HOFKLINIK

Wach- & Schlafmedizin

Snoring, sleep apnea, restless legs are just a few of the many possible problems to disrupt our sleep and reduce our daytime functioning.

Hofklinik für Wach- & Schlafmedizin
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The Douro Vila Nova de Gaia

Contributed by IMCZ Webmaster Roger Brooks with photos courtesy of Margareta Pfander

Panoramic View of Porto, taken from the AmaDouro in Vila Nova de Gaia



On the last day of our Douro cruise, we returned to Porto or, more precisely, to our berth in Vila Nova de Gaia. We had some free time to buy some port for ourselves and for our friends back home, then spent the rest of the day exploring Vila Nova de Gaia, which didn't get as much attention as Porto at the beginning of our trip. The weather was much friendlier on our return than it had been at our departure, so Vila Nova de Gaia offered some spectacular views of Porto, as evidenced in this panorama taken by Margareta.

Jardim do Morro

After disembarking, we walked along the waterfront, pausing briefly to admire the Chapel of Our Lady of Mercy (Capela de Nossa Senhora da Misericórdia), a small church whose façade is tiled with azulejos. From the end of the Dom Luis I Bridge we walked up the winding streets along the steep hillside until we reached the Jardim do Morro (Garden of the Hill). The Jardim do Morro was established in 1927. The semi-circular park contains a small lake and many species of plants. The hill that it occupies is almost the highest point in Vila

Ponte Dom Luis I



Jardim do Morro



Chapel of Our Lady of Mercy

Nova de Gaia, topped only by the neighbouring Serra do Pilar on which the former Monastery of Serra do Pilar was built.

Monastery of Serra do Pilar

The monastery was established in the 16th century and was dedicated to St. Augustine. However, it was rebuilt during the 17th century, at which time its most notable feature, the circular church Igreja Serra do Pilar was also constructed. Due to their completion during Spanish occupation, the monastery and church were named after the miraculous appearance of St. Mary ([Nuestra Señora del Pilar](#)) to St. James. However, some Portuguese refer to the ridge where it is located as the Serra de São Nicolau instead.

In the early 18th century, General Arthur Wellesley (later Duke of Wellington) is said to have used the monastery as a base from which to retake Porto from Napoleonic troops during the Peninsular War. It also figured in the later Siege of Porto in the [Portuguese Civil War](#). When Portugal became a secular state following the Civil War, the monastery became state property and has since been used for military rather than ecclesiastical purposes.

Church of Serra do Pilar

The church's circular shape was inspired by the Church of Santa Maria Redonda in Rome and is matched by a circular cloister of the same diameter within the monastery. With its 36m height and imposing location, the church dominates the Porto skyline, especially at night, when it is brightly illuminated. It is clearly visible at upper right in the photo "Porto by Night" accompanying the first article in this series, published in the August 2020 IMCZ newsletter.

The church took over 70 years to build, largely due to problems caused by the [Portuguese War of Independence](#). It was declared a national monument in 1910 and has been listed as a UNESCO World Heritage site since 1996. Neither the monastery nor the church was open when we were there, but we enjoyed fabulous views of Porto from the plaza in front of the church (Largo Aviz).

Fernandine Wall

The view that interested me most was that of the Fernandine Wall and the Ribeira district East of it. We had previously visited the Ribeira district West of the wall, but hadn't taken the time to explore the Wall or the region to its East. The wall replaced more modest earlier fortifications in the 14th century and was initiated by King Alfonso IV because of the increasing size of Porto. However, they are named after the later king, Dom Fernando, during whose reign most of the construction was finished. There were many modifications over the centuries, and the picture shows the best-preserved (and most visible) section, the Guindais da Muralha Fernandina. There is a funicular running up from the Dom Luis I bridge and along part of the Trecha Guindais as well as a staircase along part of the wall. I look forward to exploring it on a future visit to Porto!



Igreja Serra do Pilar



Porto from the Largo Aviz



Ribeira of Porto by the Fernandine Wall

Further Information

- <https://www.visitportugal.com/en/content/mosteiro-da-serra-do-pilar>
- https://pt.wikipedia.org/wiki/Mosteiro_da_Serra_do_Pilar
- <https://catholicism.org/our-lady-of-the-pillar.html>
- https://pt.wikipedia.org/wiki/Serra_do_Pilar
- https://en.wikipedia.org/wiki/Siege_of_Porto
- <https://agendaculturalporto.org/muralhas-fernandinas-do-porto/>
- <https://traveler.vacations/walk-the-fernandina-wall-one-of-portos-best-kept-secrets/>
- <http://portoenvolto.com/2016/05/12/porto-medieval-wall-history-and-access-visit-a-muralha-fernandina-do-porto/>
- https://en.wikipedia.org/wiki/Fernandine_Walls_of_Porto

A Dark Winter, but a *wheel* to ski

Contributed by IMCZ Sports' editor Joseph Dow



Mach Skis - and Matterhorn in background

Here we go again, another ski season under the cloud of Covid-19. So far, as of this writing, we are still allowed on the mountain, even we, the wretched unvaxxed. I will try to stick to sports and stay away from the politics, but this virus and government responses seem to make all things collide. Lukas Engelberger, the president of cantonal health directors, seems to have a particular obsession against allowing people to ski. Despite skiing being an outdoor activity, the spectre of spontaneous shutdown, especially during peak times like the Christmas week and New Year's, remains a very real threat. Let's try to keep an upbeat outlook and hope the slopes will stay mostly open like last season. That worked out well for us with no blame for negative events pinned on skiing. I'm rooting for more of the same.

With that said, I've already made it down to Zermatt for the ski test weekends and everyone seemed in high spirits and the weather was quite good. I managed to try out some new equipment including **Skimover** and some fine Swiss skis from Mach. If you remember my *Ski Hacks* column a while back (April 2018), the Skimover would have been a top gadget to put on that list. Skimover is a Swiss compact, modular system that adds wheels to your skis for transportation. These devices really caught my eye as I always travel by train



skimover.ch 



to ski and that involves a lot of walking and hauling of relatively heavy equipment, especially for a multi-day trip. This is an innovative, clever idea, but a cheap, flimsy execution of the design just wouldn't work. Skimover does not disappoint and brings a high-quality, sturdy product facilitating a much more comfortable and smooth journey to and from the hotel and/or the lifts.

I put the Skimovers to the ultimate test in Zermatt. Being well before the season, the ski test weekends do not have all the usual services such as regular shuttle buses to the Matterhorn lift station. A long walk up a hill, in ski boots, from the hotels in town is practically required and it's a real drag. Not having to shoulder the skis for the trudge up to the gondolas was a joyous occasion. The Skimovers worked exceptionally well with their rubber tires easily moving over snow/slush and moderately broken ground, even some curbs.

The Skimovers come in a number of different designs and a range of wheel colors. I used two versions, the *Speed* and the *Easy*, on three different weekends. The *Speed* is the most compact version with parts that disassemble and have the skis riding perpendicular to the road, whereas the slightly larger *Easy* has the skis parallel to the ground and is secured to the skis using an elastic shock cord instead of an adjustable Velcro strap. Both worked well but the *Easy* is a bit easier and still small enough, especially if you have a pack.

The biggest question, especially if you are taking the Skimover to the lifts, is what to do with a dirty wheel set when you are ready to ski. Skimover's answer is a waterproof carry pouch. Just drag them through some fresh snow or rinse off the set in the bathroom sink, pop off the wheels, put them in the pouch and stow them in your pack or even a larger pocket of your ski jacket. For pulling the skis along and getting a good grip, I would probably add some kind of string lasso to cinch over the ski tips. The thick Faststrap tip tie that I used in addition to the one that



Chesa Valesse Hotel



Hotel Parnass



Walliserkanne Restaurant

comes with the Skimover was useful in providing some additional hand grip on the skis. Overall, I was extremely impressed with the Skimover and felt it made a real difference when schlepping skis on foot.

Mach Skis are fantastic, handmade Swiss skis. I particularly enjoyed the Falcon slalom ski and Raptor race carver. Both models were fast and responsive, yet well behaved, with the Falcon particularly nimble. Make sure to try each model in a number of different lengths, as the same model ski can be quite dissimilar in character just one length different.



As I mentioned the Zermatt ski tests, I will put links down below for some of my recommended hotels (*I've stayed at many over the years*) and favorite restaurant in the town. So, let's again keep our fingers crossed, anticipate an uninterrupted ski season, and get ready to hit the slopes.



My latest recommended list of gear to make your days up on the mountain as comfortable as possible:

SKI GEAR CHECKLIST

Skis & Bindings (Swiss skis: *Mach*, *RTC*, *Radical*, *XO*, etc.)

Ski Boots

Ski Poles

(*carbon shafts - superior shock absorption & wrist pain relief*)

Ski Outfit – Ski Jacket (insulated) & Dedicated Ski Pants

(*Top Brands: Toni Sailer, Frauenschuh, Mountain Force, Kjus, J.Lindeberg, etc.*)

Mid-layer Top (something with a full zip provides versatility)

Zip-Jacket, Vest, or Sweater

Down, Merino Wool, Fleece or other Synthetic

Base Layer (top & tights)

Merino Wool / Microfleece

Accessories

Helmet & Hat

Goggles & Sunglasses

Neck Gaiter / Scarf & Facemask (Livinguard)

Ski Gloves

Ski Socks & Liner Socks

Ski Daypack

Cable Ski Lock

Tip Ties & Boot Carrier

Skimover wheeled ski transportation system

Lightweight Waterproof Approach Shoes

Sun Protection / Lip Balm

Additional Information:

Skimover Transport Systems: skimover.ch

Mach Handmade Ski: machski.ch

Livinguard Mask: livinguard.com/fitness-mask

Restaurant Walliserkanne Zermatt (great pizza and more): www.walliserkanne.ch/home-englisch

Hotel Chesa Valse Zermatt (cozy luxury): chesa-valse.ch/en/

Hotel Parnass Zermatt (quality at a reasonable price): parnass-zermatt.ch/

Lukas Engelberger:

www.archyde.com/lukas-engelberger-the-president-of-the-cantonal-health-directors-calls-for-action/

SBB Snow 'n Rail program:

sbb.ch/en/leisure-holidays/leisure-offers/snowrail.html

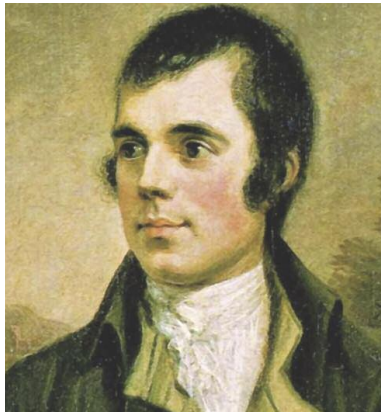
REGA: rega.ch/en/

Swiss ski conditions:

snow.myswitzerland.com/snow_reports

**PRAY FOR SNOW!!! PRAY FOR SKIING!!!
PRAY FOR SNOW!!! PRAY FOR SKIING!!!**

If you have questions about skiwear or equipment or want a recommendation, feel free to send me an email: [jjdow\[at\]hotmail.com](mailto:jjdow[at]hotmail.com).



THE ANNUAL BURNS DINNER

Saturday, January 29th, 2022 at 18:30 hours

**Wirtschaft Brandenburg Allmendstrasse 3 CH-6300 Zug
brandenberg@remimag.ch**

- Less than 200 m from the S-Bahn station Zug Schützengel • Parking available across the street.

The apero shall start at 18:30 hours, and the party shall continue until midnight.

Calling all culture seekers... This is the 26th year that the IMCZ will be celebrating the birthday of Scotland's poet laureate, Robert Burns! We will also be welcoming members of the ZIWC and their guests. It is a unique evening providing an opportunity to taste real Scottish atmosphere.

The evening will feature traditional Scottish fare, including the rousing sound of bagpipes from our guest piper, extracts from the works of Robert Burns, entertaining speeches from our line-up of international guest speakers, people dressed in kilts and liberal doses of Uisge'beah (whisky). The menu starts with the traditional "Cock a Leekie" (chicken) soup and the Scottish haggis, but a vegetarian menu is also available.

For a whole evening of entertainment and a four-course dinner, with plenty of drams of the finest Scottish whisky, this evening is a "gie-away" for just CHF 75 for IMCZ & ZIWC members and their partners, CHF 85 for guests.

We ask that the dress of the evening be in keeping with the traditions of the occasion so a kilt or something similar (or a jacket, tie, etc. if you don't have one) or, as Burns was a man of international outlook, your own national costume (or elements of it).

Remember, the number of guests is limited so please register [online](http://www.imcz.club/calendar) by the 22nd of January at www.imcz.club/calendar. The **IMCZ no-show policy** applies for this event.



Investment Commentary DECEMBER / JANUARY 2022

WAGNER & ASSOCIATES Investment Consulting

Contributed by IMCZ member Christian Wagner

ECONOMICS AND POLITICS

The world economy is showing signs of "long Covid". The US economy only grew by 2% in the 3rd quarter after 6.7% from April to June. The Covid virus creates considerable uncertainty, and rising prices sap the buying power of consumers who were mainly responsible for the recovery. Since real disposable income has been reduced by 5.6% annualized, little improvement can be expected despite the festivities.

BOND MARKETS

The good news first: Fed Chairman Jerome Powell has been nominated for a second term of four years, and confirmation by the Senate should only be a formality. The bad news: US inflation has risen to 6.2% (4.6% without food and energy) which was probably one of the reasons for a reduction in the bond buying program. The ECB warns of high prices in asset categories, high indebtedness and increasing risk appetite but doesn't do anything.

EQUITY MARKETS

Comparisons with historic figures show that an overvaluation currently exists, but its meaningfulness is questionable since it is based on past history. Much more important are future prospects, do they justify the high price level? Optimists are convinced that the central banks will be loath to scotch the economic recovery and that the Covid virus which triggered the correction has been defeated. For pessimists both reasons are more hope than reality.

CURRENCIES

The strong currencies are getting stronger, the weak ones are weakening. In the current environment with uncertain prospects for the world economy and interest rates as well as the Covid danger, security and stability are sought after. CHF and USD fulfil these requirements best, currencies of developing countries worst.

FOOD FOR THOUGHT

After almost two years, the Covid-19 virus is still making headlines. When it first appeared, the whole world panicked since it had not experienced a pandemic since after the First World War. After the first phase with protective measures (including lockdowns) and the first vaccines, the danger seemed to have been averted. In the current, second phase, one hopes that the pandemic becomes endemic but the resistance of societies is delaying everything. We may live in a digitalized world but it functions to a large degree analogue, i.e. according to a simplified mathematical model which cannot really cope with exponential functions like the spreading of the Covid virus.

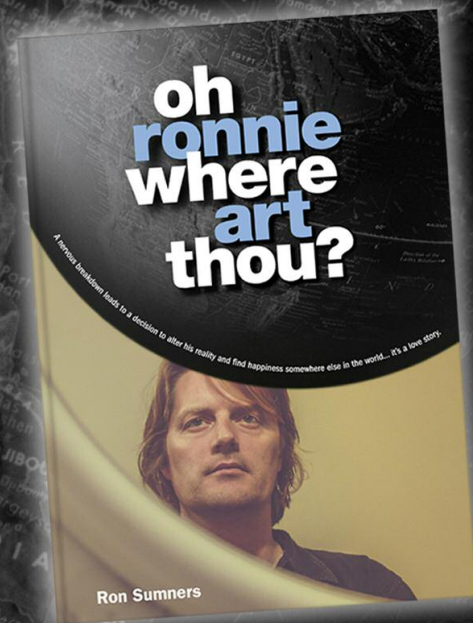
Christian Wagner
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www.ohronniewherearththou.com

Covid Confinement

Home working / schooling has been very stressful for many parents. To illustrate, here is a timetable for home schooling from the US which I found illuminating.



7:00-8:30	Wake Up	Eat something. Do not wake up parents. Do electronics. Don't die.
8:30-8:34	Academics 1	Do work the school sent home.
8:34-9:00	Distraction 1	Stare at squirrel outside. Fight over what to name it. Whine for snack / iPad / TV.
9:00-11:30	Parents Give In	Play on iPad. Floss dance naked in the background of important meeting. Fight with sibling over TV program.
11:30-11:32	Eat	Sit and eat 9.2% of carefully prepared. nutritionally balanced lunch.
11:32-12:30	Whinefest 1	Whine to parents that you're still hungry, but only for cookies / candy / chips / anything without nutritional value.
12:30-13:30	Activity 1	On parents lunch. attempt to take a walk/scooter/bike ride, but It rains so Face Time with school friends using parent's phone as iPad has died. Use swear words so other parents judge your parents.
13:30 – 13:37ish	Academics 2	Do computer based math program from school
13:37-15:00	Distraction 2	Navigate away from school approved work and, although unable to spell correctly, miraculously find Roblox/Minecraft/Non-Kids You Tube. Sneak candy from kitchen. leave wrappers EVERYWHERE
15:00-15:45	Activity 2	Parents out of meeting. they put on Just Dance video game as an attempt to get in some physical activity. Spend 30 minutes fighting over which song to do. Find a way to do least amount of movement necessary to get 5 stars.
15:45-16:00	Whinefest 2	Get bored. Suddenly remember the most unimportant piece of information ever and scream MOM! from outside office door until she ends meeting early. Then whine for nutritionally deficient snacks.
16:00-16:30	Activity 3	Do whatever you want. Just PLEASE let parents work for at least another 30 minutes.

Philosophers breaking up

- Covid has also been hard on relationships.
- It seems that even philosophers are having trouble.
- The Teleologist: We aren't meant for each other.
- The Deontologist: We aren't right for each other.
- The Consequentialist: We aren't optimal for each other.
- The Solipsist: It's not you, it's me.
- The Empiricist: I think we should see other people.
- The Rationalist: I'm not a priority to you any more.
- The Content Externalist: Ever since we moved, you've changed.
- The Continentalist: You've lost that love and feeling.
- The Egalitarian: This is the best thing for both of US.
- The Paternalist: In time you'll come to see that this is the best thing.
- The Foundationalist: We have nothing left to build upon.
- The Kantian: You lied to me!



Things could be worse

I worked for the suicide hotline once, but it was a disaster. Five people called me on the first day, and they all killed themselves. And three of those were wrong numbers.

Who killed Julius Caesar. A principal heard a teacher screaming in his class so he went to ask what was happening the teacher replied to him " it's a disaster I can't continue doing this anymore" The principal replied "what's the problem tell me maybe I can help." The teacher nodded then called a student and asked him "answer me! who killed Julius Caesar?" The student was terrified "I swear it wasn't me, I never even met him." The teacher asked the rest of the class but they all gave the same answer. So he turned to the principal and asked him " Do you think this is acceptable ?". The principal, shocked as he, replied "Are you sure the killer is in this class?"

During lunch at work, I ate 3 plates of beans (which I know I shouldn't). When I got home, my husband seemed excited to see me and exclaimed delightedly, "Darling I have a surprise for dinner tonight." He then blindfolded me and led me to my chair at the dinner table. I took a seat and just as he was about to remove my blindfold, the telephone rang. He made me promise not to touch the blindfold until he returned and went to answer the call. The beans I had consumed were still affecting me and the pressure was becoming unbearable, so while my husband was out of the room I seized the opportunity, shifted my weight to one leg and let one go. It was not only loud, but it smelled like a fertilizer truck running over a skunk in front of a garbage dump! I took my napkin



from my lap and fanned the air around me vigorously. Then, shifting to the other leg, I ripped off three more. The stink was worse than cooked cabbage. Keeping my ears carefully tuned to the conversation in the other room, I went on releasing atomic bombs like this for another few minutes. The pleasure was indescribable! Eventually the telephone farewells signalled the end of my freedom, so I quickly fanned the air a few more times with my napkin, placed it on my lap and folded my hands back on it feeling very relieved and pleased with myself. My face must have been the picture of innocence when my husband returned, apologizing for taking so long. He asked me if I had peaked through the blindfold, and I assured him I had not. At this point, he removed the blindfold, and twelve dinner guests seated around the table, with their hands to their noses, chorused, "Happy Birthday!"

James is walking on a downtown street one day, and he happens to see his old high school friend, Harry, a little ways up ahead.

"Harry, Harry, how are you?" he greets his old buddy after getting his attention.

"Not so good," says Harry.

"Why, what happened?" James queries.

"Well," Harry says, "I just went bankrupt and I've still got to feed my family. I don't know what I'm going to do."

"Could have been worse," James replies calmly.

"Could have been worse."

A month or so later, James again encounters Harry, in a restaurant.

"And how are things now?" he asks.

"Terrible!" says Harry. "Our house burned down last night."

"Could have been worse," says James, again with total aplomb, and goes about his business.

A month later, James runs into Harry a third time.

"Well, how goes it?" he inquires.

"Oh!" says Harry. "Things just get worse and worse."

It's one tragedy after another! Now my wife has left me!"

Harry nods his head and gives his usual optimistic-seeming little smile, accompanied by his usual words: "Could've been worse."

This time, Harry grabs James by the shoulders. "Wait a minute!" he says. "I'm not gonna let you off so easy this time. Three times in the past few months we've run into one another, and every time I've told you the latest disaster in my life. Every time you say the same thing: 'Could have been worse.' This time, for God's sake, Harry, I want you to tell me: how in Heaven's name could it have been any worse?"

James looks at Harry with the same little wisp of a smile.

"Could have been worse," he says. "Could have happened to me."

And sometimes you need to think for yourself

A river valley was flooding fast. A TV news bulletin warned residents to get to higher ground. But as everyone was evacuating, a smug Evangelist stood his ground and declared "I will pray to God to deliver me from this disaster!"

So he prayed.

Some time went by and the floodwaters rose to his knees. An EVAC worker happened upon him and said "Let me show you the way out of the valley." The Evangelist said "No, I'm placing myself in GOD's hands!"

The EVAC worker pleaded, but the Evangelist stood his ground and prayed. Eventually the EVAC worker had to leave him to help others.

More time went by, and the water rose up to his waist. A man in a canoe paddled by and said "Climb in! I'll take you to safety!" The Evangelist said "No! I am placing in GOD's hands!"

Like the EVAC worker, the canoer pleaded, but the Evangelist would not move. Eventually he had to row on by and the Evangelist continued to pray.

More time went by and the water rose up to his neck!

A rescue helicopter flew by and lowered a rope ladder to him. "Climb up and I'll fly you to safety!" "No!" exclaimed the Evangelist. "I will put my trust in GOD to deliver me!"

The 'copter hovered for a while, but the Evangelist would not leave, so it flew away. The Evangelist continued to pray for deliverance.

Finally, the floodwater rises over his head and he drowned.

The Evangelist appears before the pearly gates, stunned that he was not saved, despite his flagrant display of devotion.

God appeared before the Evangelist, who immediately unloaded a torrent of rage. "I PRAYED and PRAYED and PRAYED to you for deliverance! You ABANDONED me in my time of need!"

"What are you talking about?" God responded "I had the TV news send out a bulletin to warn you, I sent an EVAC worker to lead you to safety, a guy in a canoe came to you to row you to safety, and a helicopter to fly you away - Why wouldn't you leave???"





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 Or are you cashing in the half of your stamp
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The Members' Marketplace is reserved for unformatted advertisements of 150 characters (approx. 3 lines) of text. These are free of charge to IMCZ members. Advertisements must be submitted as illustrated below. Longer advertisements cost CHF 30.-

Example: FOR SALE: gorgeous view of Bay of Biscay with stunning sunsets and high waves. Wee house (12 rooms), dock and yacht included. Call Bill at 041 123 45 67.

GRATIS - Freestanding satellite dish with SKY UK HD set-top box, including cables.
 Phone John Arnold at 079 664 0854

IMCZNEWS Advertising Rates

The IMCZ newsletter is delivered bi-monthly to about 200 members representing 20 nationalities. IMCZ members have personal or professional interests in both the international community and in the canton of Zug.

Format: A4 vertical, full color.

Ad content delivery: electronic by e-mail, .pdf, .jpg, .gif

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