INTERNATIONAL MEN'S CLUB OF ZUG, P.O. BOX 7212, 6301 ZUG

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IMCZ NEWS

FEBRUARY / MARCH 2021

IN THIS ISSUE

EDITORIAL

A Happy New Year to all our members. So far it's been a bit of a mixed bag. We have a stronger lockdown. We had a few days of what the Tages Anzeiger called "flockdown" with the snow disrupting public transport in Zürich (shock horror) for a few days. Up in Aegeri, we had up to 70 cm of snow – and for me it was good to get some colder weather again. Being out in the snow covered landscape is fantastic.

Life continues to be dominated by Covid-19. Vaccines are now coming through – with three now approved in Switzerland. Of course, production is being ramped up but can't meet demand at the moment – but it's on the way.

All the talk about SARS-CoV-2 is now about the more contagious mutations. Though there is good reason to be careful, the mutation of viruses is normal and, from the start of the pandemic, mutations have been tracked routinely by gene sequencing. Over 4,000 mutations have been see to date, of which only 2 are raising significant concerns. The mRNA technology should be able to be tailored to any major mutations rather rapidly so there is no cause for panic. Just follow the guidelines, get vaccinated as soon as you're able to do so and stay safe.

As far as the IMCZ is concerned, life goes on as normal – as far as possible. We've adapted to a Zoom environment for Stammtisches and we will continue those until we are able to organize in-person events once more. In the meantime we just need to be stoic about the situation.

And last, but not least – as you probably know John Arnold, our Treasurer, has decided to return down-under so he'll be leaving us. I'd like to thank John for all his efforts for the Club and wish him all the best for his return to Australia. Lindsay Johnston is taking over as Treasurer, for which we're very grateful. So, welcome to 2021. I hope we'll be back to near normal sometime this year. I can't wait.

Alan

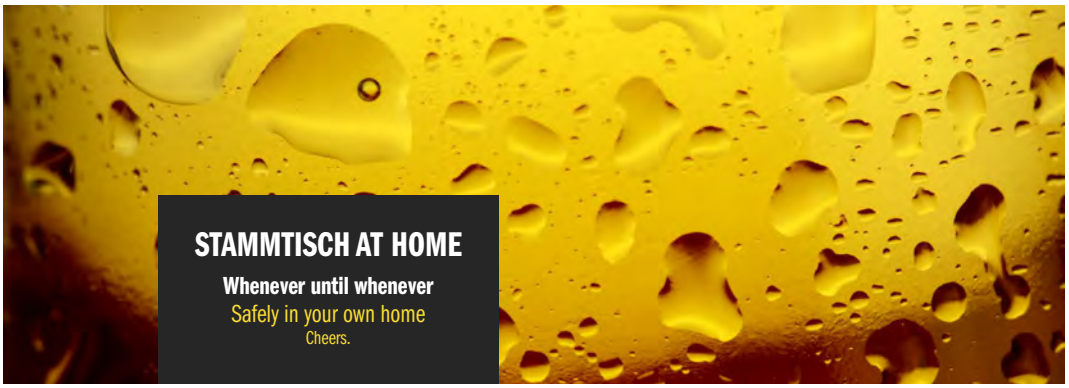
FUTURE EVENTS

As you all know, our event calendar is rather thin at the moment due to the SARS-CoV-2 pandemic and the consequent mitigation regulations.

For a complete view of our activities, please look at our club web site at **https://imcz.club/** and go to the "**Events**" link.

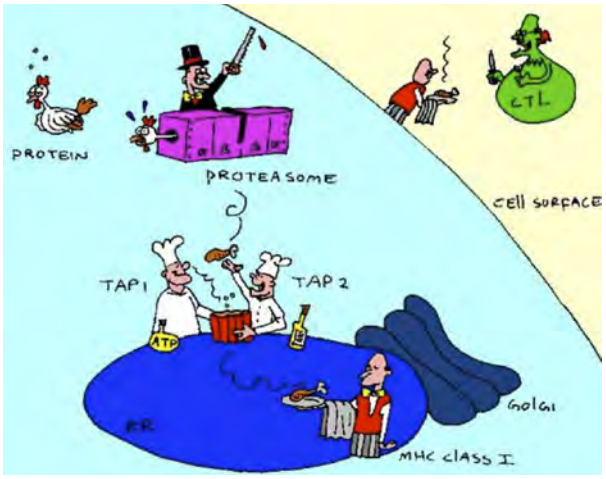
We have the regular weekly Stammtisch by Zoom (Meeting ID on the website and password in the weekly email bulletin).

We are also going to host Special Stammtisch events by Zoom – starting 11th February. We look forward to seeing as many of you as possible at these meetings.



The immune system influences female mate choice

Remo P. Jutzeler van Wijlen, Head R&D Sponser Sports Food
Ing.Appl Food Sciences, MAS Nutrition & Health ETHZ



All vertebrates have so-called MHC molecules (major histocompatibility complex), which are formed on the surface of many cells related to the immune system, and other cells too. In humans, MHC refers to the term HLA (human leukocyte antigen) because the molecules can be analytically measured / determined with the help of leucocytes' antibodies.

When confronted by an antigen, an intruded cell will ideally be able to cleave small protein pieces (peptides) from this antigen, bind them to specific MHC molecules, which send these complexes to the cell surface where they are presented to the patrolling T-cells of our immune system. However, since MHC molecules are highly specific, a T-cell needs the right receptors to recognise these complexes. The docking of an MHC complex with a particular T-cell receptor works like a lock-and-key.

unlikely to meet each other during the study. The men were asked to wear a T-shirt (100% untreated cotton, distributor: Virya, Zürich (CH)) during a Sunday and Monday night, to keep the T-shirt in an open plastic bag in between, and to live as much as possible 'odour-neutral' during these two days. They were provided with perfume-free detergent to wash clothes and bedclothes, and perfume-free soap to use from Sunday morning onwards. They were also provided with a list of odour-producing foods and asked to avoid them as well as any activities that could produce disturbing smells (for example, staying in smelly rooms, sexual activity, etc). They were advised not to use any deodorants, perfumes etc., to refrain from smoking tobacco or drinking alcohol, and to sleep alone in their bed.

The largest possible number of different MHC molecule "keys" is therefore of utmost importance for our immune system. This is ensured by an extraordinarily high diversity of coding genes (polymorphism), so that millions and millions of specific MHC molecules can be formed in random variation. MHC diversity is thus an immunological survival advantage, and external influences such as exposure to pathogens act as a "trigger" to expand further this evolutionary diversity. This diversity is heritable and, like other physical traits, is determined by the genes of both parents. A broad MHC spectrum seems to represent such a great survival advantage that there is a female preference in mate choice for being as "MHC-diverse" as possible in mammals, fish, birds, and reptiles - presumably via an "odour preference". Apart from the advantage of a more diversely equipped "antigen recognition system", such an innate preference also avoids the genetic disadvantages of inbreeding, of course. How odour is influenced by the individual MHC profile is unclear. It is possibly related to specific fatty or amino acids.

Several studies have investigated the influence of the HLA genome on mate choice also in humans, following the almost historic, so-called Swiss "T-shirt study" (Wedekind 1995). In women, too, the smell of MHC-divergent men seems to be perceived more intensively and preferred. Astonishingly, this preference seems to be switched off again when contraceptive pills were taken (see diagram). Certainly, cognitive and socio-cultural factors have a far more important influence on mate choice, as the inconsistency of the human studies also suggests. But somehow it gives a grain of truth to the well-known tale "can smell him/her"; and it is a romantic idea that if one can literally "smell each other well", they are also biologically ideally suited for each other...

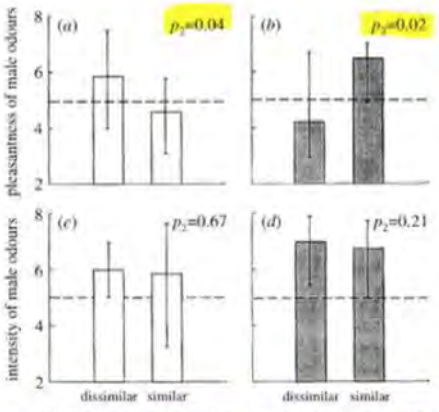


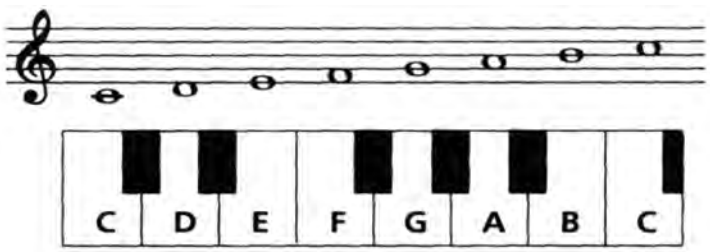
Figure 1. Average score per male (taking each male's odour as a statistical unit) by females who are similar or dissimilar on their MHC (medians and quartiles). (*a*) + (*c*) The odours were judged by females who did not take oral contraceptives (number of males = 38), and (*b*) + (*d*) judged by females who take the pill (number of males = 23). All *p*-values are two-tailed (Wilcoxon signed rank tests).

The Mathematics in Music

Contributed by IMCZ honorary member Muthana Kubba

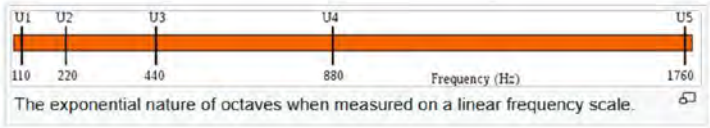
How often have you heard that Music and Mathematics are two phases of the same entity? Well, I have, several times and finally decided to find out for myself. I quickly realized that I had set myself a very difficult, but most interesting and challenging task.

According to the literature, the ancient Chinese and Mesopotamians studied the mathematical principles of sound, but the ancient Greek were the first to express musical scales in numerical ratios.

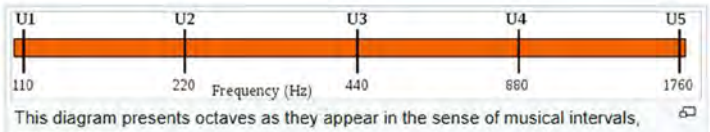


As most of you know, in music it is the ratio of tones that determine how we perceive them. For example if the ratio of two tones is 2:1 then they are one octave apart in pitch, and they sound the same to the human ear. Within each octave, there are several tones with certain fixed ratios to the basic one.

The musical scale is a discrete set of pitches used in generating or describing music. Within every Octave there seven notes, the frequency of each is a fixed ratio to the previous one. The multiplication factor is the 12th root of 2 or 1.0595. These notes are also referred to, as 'intervals'.



The exponential nature of octaves when measured on a linear frequency scale.



This diagram presents octaves as they appear in the sense of musical intervals, equally spaced.

Mathematical concepts such as symmetry, periodicity, discreteness and continuity can all be found in any piece of music. By definition, doubling the frequency corresponds to one octave, so the span from A2 to A3 is from 110 to 220 Hertz (Hz). The frequency of the next octave is 220 to 440 Hz, then 440 to 880 Hz and so on. Each octave spans double the frequency range of the previous one. On a logarithmic scale the intervals are the same, which reflects on the way in which we perceive sound. In fact, it is the ratios of the pitches (intervals) which determine how we perceive them.

There are altogether 12 semitones on one octave, whose frequency ratios vary from 16/15 to 15/8. The table below illustrates the division. Each note has a specific frequency and a fixed ratio to the unison or basic note. When a piece of music is composed or played, it's the succession of notes with these ratios played with varying duration and amplitude which maks a pleasant piece of music.

Semitone	Ratio	Interval	Natural	Half Step
0	1:1	unison	480	0
1	16:15	minor semitone	512	16:15
2	9:8	major second	540	135:128
3	6:5	minor third	576	16:15
4	5:4	major third	600	25:24
5	4:3	perfect fourth	640	16:15
6	45:32	diatonic tritone	675	135:128
7	3:2	perfect fifth	720	16:15
8	8:5	minor sixth	768	16:15
9	5:3	major sixth	800	25:24
10	9:5	minor seventh	864	27:25
11	15:8	major seventh	900	25:24
12	2:1	octave	960	16:15

The question whether we human were born with our brains wired up to consider a certain succession of these notes pleasant or otherwise, has long been proven to be not the case. Oriental music, which is based on different ratios, sounds highly unpleasant to the European ears. This indicates that taste in music is acquired rather than inborn.

Music

Since time immemorial, music had played a central role in human civilizations. Different cultures developed different musical scales, which were pleasant for the ears of the local populations. However, there seems to be no correlation between Western, Middle Eastern and Far Eastern music. Each had its own scale and audience. The only common factor was that all had a built-in mathematical structure. The following table illustrates the octaves and their frequencies.

So where is the maths in it? Actually, mathematics may be the wrong term to use. Arithmetic may be closer, or simply "frequency distributions". After all, it is the distribution of the frequencies of the various notes, which make up all music.

The range of emotions which music can induce in us is enormous. Listening to Beethoven's sixth, you go on a journey through the clouds, but march music will bring back to the horror of wars, which illustrates how much influence and power music has on us.

Common term	Example name	Hz	Multiple of fundamental	Ratio of within octave	Cents within octave
Fundamental	A_2	110	$1x$	$1/1 = 1x$	0
Octave	A_3	220	$2x$	$2/1 = 2x$	1200
				$2/2 = 1x$	0
Perfect Fifth	E_4	330	$3x$	$3/2 = 1.5x$	702
Octave	A_4	440	$4x$	$4/2 = 2x$	1200
				$4/4 = 1x$	0
Major Third	$C\sharp_5$	550	$5x$	$5/4 = 1.25x$	386
Perfect Fifth	E_5	660	$6x$	$6/4 = 1.5x$	702
Harmonic seventh	G_5	770	$7x$	$7/4 = 1.75x$	969
Octave	A_5	880	$8x$	$8/4 = 2x$	1200
				$8/8 = 1x$	0

Further reading

1. Music and Mathematics - Wikipedia
2. Set Theory https://en.wikipedia.org/wiki/Set_theory_(music)
3. Mathematics and Music https://www.simplifyingtheory.com/math-in-music/

Smaller, Faster and Cheaper Electronics: Chasing Moore's Law

Contributed by IMCZ member, Alan Cattell

Semiconductor Devices continue to improve

Moore's law is an observation that (since the mid '70s) the number of transistors in a microprocessor doubles approximately every two years. There are two corollaries, that the cost of processors falls and that the cost of the production facilities increase exponentially. What this means to us is ever cheaper, more compact and more powerful electrical devices. Recently there has been a lot more effort to keep this progress on track, but it's becoming increasingly difficult. Moore's Law is starting to push the limits of the laws of Physics. With the announcement of the implementation of the 5 nm fabrication process by Samsung, Intel (and others), I thought it might be interesting to summarise where the technology stands and where the challenges lie.

The "5 nm" (nano meter) refers to the length of the gate in a transistor[1], not the overall size of the transistor. But the smaller the gate length, the faster a transistor can be switched and the more you can pack together.

Overview of integrated circuit production

The manufacture of silicon chips is a multi-stage process which requires extreme cleanliness and precision. To put this in perspective, the best operating theatre in the world is at least 10,000 times dirtier than a good semiconductor clean room.

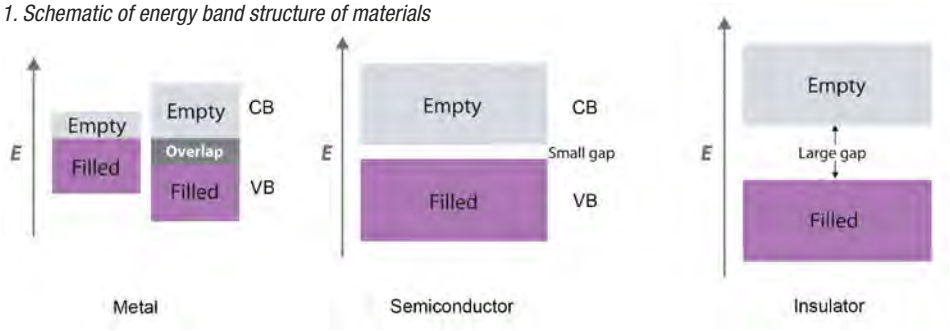
In the first step, single crystal silicon substrates are grown and prepared. The silicon wafers are then patterned using photo lithography and this pattern is used to alter defined areas of the wafer in specific ways. For example, by doping (see later), oxide layer growth (for transistor gates or passivation) or electrical interconnections. There are up to 80 sequential lithography steps to produce a modern high-end microprocessor which contain around 4 billion transistors. The final wafer is cut up into individual devices which are mounted into a frame and then "packaged" into a final form which allows the device to be bonded to a circuit board. Testing and packing finish the process.

What is a semiconductor, and why does it need to be a pure crystal?

When atoms are brought together to form a pure crystal, the chemical view is that covalent or ionic bonds are formed between the atoms to create the stable crystal lattice. The "outer shell" electrons form (in the case of silicon) a covalent bond. From a quantum mechanical perspective, it's a bit more complex. The "outer shell" electrons in a crystal no longer have discrete energy states which are identical for each atom. In a crystal, these electrons become "shared" and have closely spaced energy states which are distributed in "energy bands" (see diagram). The highest level band which is "filled" with electrons is called the valence band and the next level "empty" band is the conduction band. Each crystal has a different band structure and it's this which defines its electrical properties.

In metals, the valence and conduction bands overlap. This means that a small voltage applied across a piece of metal will increase the energy of an electron and it can "hop" from a valence band state to the conduction band where it can move from one state to another with ease. i.e. it conducts!

1. Schematic of energy band structure of materials



In insulators there is a large gap between the valence (VB) and conduction (CB) bands. This can be several eV (an eV is the energy required to raise the potential of an electron by 1 Volt 1eV = 1.6 x 10^{-19} Joules) Since the quantum thermal energy of electrons at room temperature is only about 0.025 eV, virtually no electrons will have sufficient energy to get into the conduction band so the material cannot conduct.

Semiconductors are in-between. There is a gap between the bands, but it's much smaller. This allows some thermal electrons to be in the conduction band at room temperature so the semiconductor conducts – but not well in its natural state.

To alter the electrical properties of a semiconductor (to make it useful), small quantities of an element with one electron more than silicon (for n-type doping) or one fewer electron (p-type doping) are added. These form energy levels which sit in the band gap as shown, with only a small energy difference to the edge of the band. n-type doping releases extra thermal electrons into the conduction band allowing conduction. P-type doping takes electrons out of the valence band leaving space for other electrons to move. Mathematically these missing electrons behave as if they were positively charged "holes". Silicon is typically doped at concentrations between 1 part in 10^4 and 1 part in 10^{10} depending on the electrical properties desired.

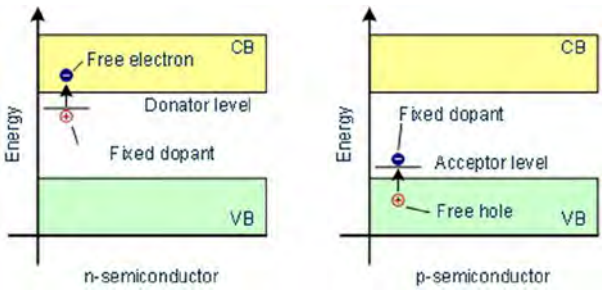
For consistent electrical performance, single crystal material is critical. Every crystal defect will introduce spurious energy states which can disturb the band structure – and that includes crystal lattice defects at the boundaries between crystallites in polycrystalline material even if there is no chemical impurity. For high-end electronics with very small feature size, the most perfect possible crystal structure is therefore a prerequisite for adequate yields.

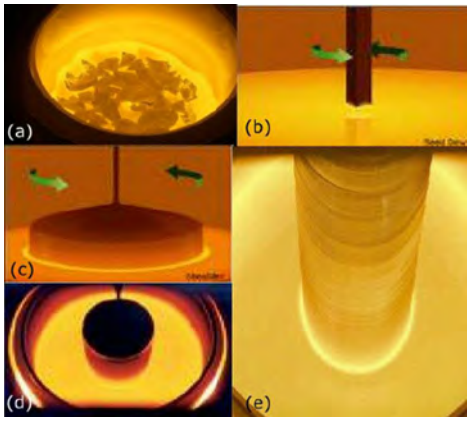
There are many types of semiconductor: simple semiconductors such as silicon or germanium or binary semiconductors such as gallium arsenide (GaAs), indium antimonide (InSb) or zinc sulphide (ZnS) to mention a few. Each have their own properties – so why is silicon most commonly used?

Why Silicon?

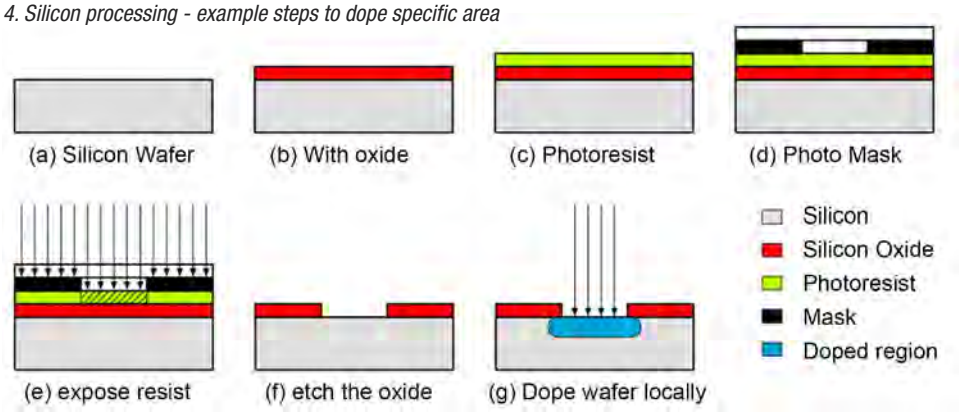
The reasons for choosing silicon for mass electronic production rather than some other semiconductor are basically practical. Silicon is everywhere – it's nearly 28% of the earth's crust. It forms a very stable, highly insulating native oxide (silica, SiO_2) which is chemically inert and that simplifies manufacture (see later). It's also easy to purify to very high levels. Finally, dopants for both n- and p-doping are readily available: phosphorus or arsenic for n-type or boron for p-type.

2. Doping a semiconductor





3. Stages of Si growth



4. Silicon processing - example steps to dope specific area

Growing and preparing Silicon wafers

Silicon crystals are mainly grown by the Czochralski method. Very pure polycrystalline silicon is heated in a quartz crucible to melting point (above 1,414 °C) (a). A carefully orientated "seed" crystal mounted on a moveable rod is dipped into the liquid. (b) The crucible and rod counter-rotate to minimise any inhomogeneity in the growth. The rod is slowly extracted from the melt. (c) By varying the speed of withdrawal, the diameter of the silicon ingot can be controlled. (d) The silicon crystal is even more pure than the starting polycrystalline silicon because impurities would distort the crystal structure and the growth process resists this and pushes them out. The final crystal is removed from the melt and allowed to cool slowly. (e) In the '70s crystals with a diameter of 30 mm or so were the norm. However, today crystals up to 450 mm diameter over 2 meters long can be produced reliably. Many tons per ingot.

To prepare silicon wafers for the chip fabrication process the silicon ingot is sawn into thin slices using precision diamond coated wires, polished to atomic level flatness and chemically etched and cleaned to eliminate all contamination. Silicon for electronic purposes must have a purity of *at least* 1 part per billion. For high-end chips, it should be significantly better.

Schematic outline of fabrication process steps

Semiconductor processing is a sequential series of steps involving lithographic patterning followed by the desired process steps. In the diagram a process to produce a defined doped area is shown. A silicon wafer has an oxide coat grown or deposited on its surface. A thin photoresist is applied. A photo-mask is placed on the wafer, aligned very precisely. With UV light, the photoresist is exposed. The exposed photoresist is washed off and the resist pattern used to etch the silicon oxide (where the resist is missing). Hydrofluoric acid (HF) is often used for this as it dissolves SiO_2 quickly but Si itself only slowly. (HF is a VERY dangerous chemical. In addition to being an acid, It penetrates human tissues very quickly and dissociates into H and F atoms. These attack organs which contain calcium and magnesium. Exposures of as little as 5% of body area to HF are almost always fatal within a few hours.)

The exposed silicon region is then doped. This is often done by ion implantation. Ions of the dopant (e.g. boron) are used to bombard the surface of the silicon with a controlled dose. The wafer is then usually annealed to remove the damage to the crystal lattice caused by implantation.

The process above is just one example of the various processes performed on the wafer. Typically, for a high-end chip, at least 10 functional layers will be needed. Each layer requires its own photolithography step and the associated process step to produce the feature required. Layers may be electrical interconnects, insulator layers, doping of different types and concentrations, transistor geometry definition (e.g. transistor gate size and shape) and many more.

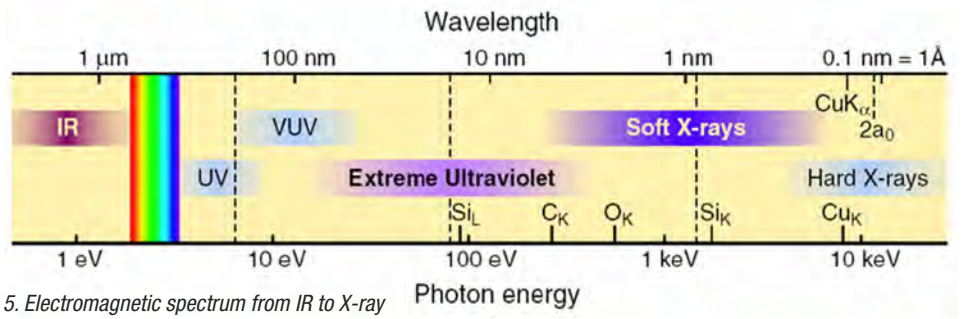
One of the "hidden" enablers for this technology is the suite of design tools which allows the design of chip layout to produce a given functional chip. All of the design rules for layout geometry such as size limits, maximum electrical current / field limits and so forth. Design tools are specific to the process being used.

EUV Photolithography

The methodology outlined in the previous section is no longer suitable for modern semiconductor production, and in truth has not been used for many years. The problem arises from the basic laws of physics. When defining an image, it's not possible to achieve a special resolution of much better than the wavelength of the light being used. (There are techniques to do better, but they have limits and introduce complexity.) In the diagram below the wavelength of different regions of the electromagnetic spectrum are shown. From this you can see that UV light has a wavelength around 200 nm. Until recently 193 nm UV light has been the shortest wavelength light used for mass silicon production. However, the complexity of the various tricks needed to make this work with smaller feature sizes has now reached its limit.

For 5 nm resolution, 193 nm light is completely unworkable. For that reason the newest processes used by Samsung, Intel and others are being based on Extreme UV technology – but it's a huge jump in technical terms. Almost everything needs to change!

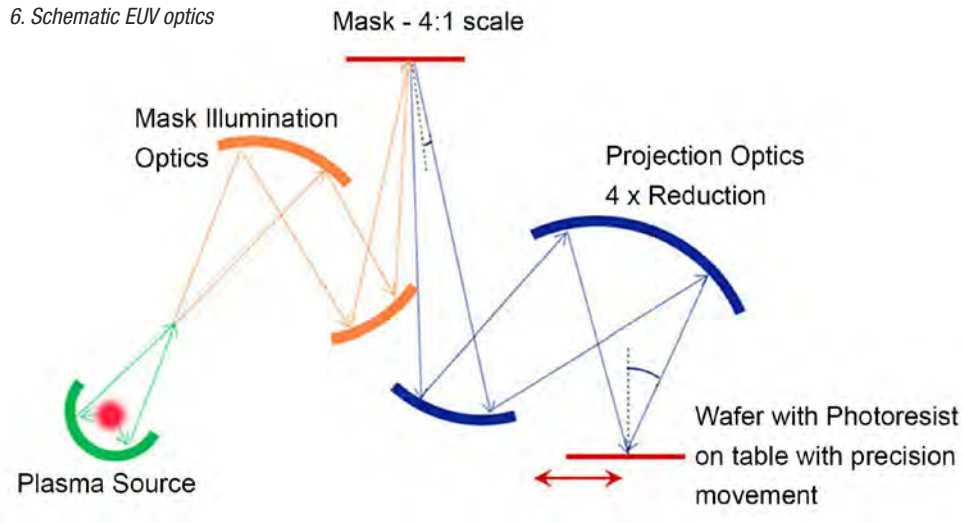
EUV is absorbed by almost all materials so EUV-lithography must be done in a vacuum. (This also eliminates the use of contact masks for lithography though contact masking has not been used for some time.) Masks are made oversize (typically 4x or more) and an imaging system projects a reduced size image of the mask onto the wafer. This also avoids contact damage. But, for EUV this presents another level of complexity. There are no refractive lenses for EUV so the whole imaging system must be built using reflective optics. But materials only reflect EUV poorly, so more exotic reflectors are needed. Only Bragg reflectors[2] made from precisely deposited multi-layer molybdenum and silicon layers utilising constructive interference effects have sufficient reflectivity – and they only have 70% reflectivity. So projecting sufficient light intensity means the source must be bright. However, there are no off-the-shelf EUV light sources. No material can survive the energy required to create EUV. The only viable source is a plasma. Some material needs to be



5. Electromagnetic spectrum from IR to X-ray

excited by a huge pulse of energy, precisely delivered, to turn it into a plasma – where the ions and electrons are dissociated. They can then violently recombine to produce radiation in the 10 nm range. Different technologies are being used to create this plasma reliably. One example used by Intel is that they pulse a 30kW laser at 50 kHz to convert precisely delivered melted tin droplets to a plasma. Each pulse hits a droplet of molten tin (approx. 30 m across) to produce a burst of EUV light. The technology involved is impressive. The light source and associated optics come in a unit the approximate size of a locomotive and weighing more than 100 tonnes!

6. Schematic EUV optics



Mask production is now, increasingly, a core knowhow for semiconductor producers. For many years, mask production was outsourced, but no longer for high-end silicon fabrication. The complexity of a mask containing the image of a layer from a chip which has 4 billion transistors is immense and the risk of damage and contamination is just too high to leave to chance.

In addition to the issue of the optics and masking, the whole topic of the processing chemistry needed to be reworked. Photoresist materials which work at 193 nm will not work at EUV wavelengths. So new resists had to be developed along with the whole chemistry for etching, dissolving and cleaning the wafers after applying the resist.

Also, for small geometry devices, issues such as diffusion of materials between the various layers needs to be revisited. Metals which are sufficiently stable at 50 nm geometry are suddenly no longer adequate at 5 mm because diffusion over distances of only 1nm or so (driven by the electric fields an temperatures present in a silicon device) start to become significant and can cause chips to fail. Some high-end production now uses cobalt for some of the critical interconnects rather than copper (which is still used for the majority). But there is worse to come as sizes shrink further.

Quantum tunnelling and energy band distortion

As the size of semiconductor devices becomes ever smaller, there are two fundamental physical effects which come into play. The first is the easiest to deal with.

In crystalline silicon, atoms are typically spaced around 0.235 nm from each other. It's therefore clear that 5 nm dimensions are only around 20 atom spacings wide. When calculating the band structure of a semiconductor, the normal approximation made is that the crystal is infinite – boundary effects are not important. To date, this has been essentially true. However, at some point this assumption will no longer hold and the band structure of the silicon will be affected by its geometry. This will also create directional differences in the electrical properties. This is a challenge, but we can calculate this effect and design for it – to a limit. It just makes things more complex.

However, the biggest challenge is quantum tunnelling. If an electron occupies a state which is a small distance from an unoccupied state, if the physical distance is small enough tunnelling of the electron between the states is possible. This is true even in the case that the two states are separated by a material with no allowed energy states for the electron. The reason is that the wave function[3] describing an electron in quantum mechanical terms is distributed. That means that there is a finite probability of tunnelling happening which increases quickly with decreasing distance. This effect is well known, and indeed there are commercially available devices which work on this principle (Josephson Junctions).

At 5 nm there is already the potential to see some small tunnelling currents. Changes have been made to transistor geometry to mitigate this effect, but the smaller the size the more challenging this topic will become.

The future for Moore's Law

While it's clear that the current level of silicon technology is starting to hit some boundaries, it has to be said that the death of Moore's Law has been predicted several times. However, it seems to have Lazarus like qualities. I expect that there is still some life in it yet, but at the cost of massively increasing equipment costs in the silicon fabrication plants. EUV plant costs well in excess of $100 million today, and a complete high-end production facility costs several billion dollars. As long as volume of production can continue to compensate for these costs, progress will continue.

Semiconductor processing today is still two dimensional (mostly). Increasing use of the third dimension should extend the scope for improvements. Of course, this has its own challenges related to production yield and heat management. When a semiconductor becomes too warm it stops being a semiconductor and becomes more like a metal (so called degenerate state) so it doesn't work anymore.

Further Reading

1. How a Field Effect Transistor works
2. Bragg Mirror (or Dielectric Mirror)
3. Wave Function
4. Youtube presentation on EUV and related technology (Intel based)

Investment Commentary

WAGNER & ASSOCIATES Investment Consulting

Contributed by IMCZ member Christian Wagner

JANUARY 2021

ECONOMICS AND POLITICS

In flying, one would be saying economists are "flying blind". The economy is in the air but the economic recovery is not really in sight. At least, pilots can depend on their ILS (Instrument Landing System) which gives them direction, distance and descent rate to the airport. Economists can hardly use their economic models since the "Covid-19 factor" and its consequences have not been programmed. At least the deal between the EU and United Kingdom provides a ray of hope even if the details still have to be evaluated.

BOND MARKETS

The EU has at last reached an agreement on a new budget and billions worth of pandemic help, the USA is passing expenditures of USD 900 billion. These economic helplines are being financed by their respective central banks. The ECB has recently increased its buy program for European debt to EUR 1.85 trillion, and the Fed is buying USD 80 billion worth of US Treasuries per month (Modern Monetary Theory at work?).

EQUITY MARKETS

Almost all experts are of the opinion that the term "restrained optimism" is warranted for next year, and fund managers have reduced their allocation to cash below 4%. The main reason for this attitude is the expectation of a significant economic recovery with global growth of 5.8%. To a large extent, this should occur due to much better consumer expenditures. However, the use of the adjective "restrained" could imply that these forecasts are based on the principle of hope.

CURRENCIES

To give currency markets something to think about, the USA announced that Switzerland fulfils the 3 criteria for currency manipulation. The criteria are at least USD 20 billion trade surplus with the USA, at least 2% of GDP surplus in its current account and currency interventions of at least 2% of GDP in 6 of the last 12 months. They have been fulfilled for a longer period of time and a change in government is imminent, but, more importantly, other currencies like EUR and Yuan could also come under scrutiny.

FOOD FOR THOUGHT

The turn of the year is always characterized by reflections on the past and the future. It also presents the opportunity to analyse a longer period of time, to escape the "time compression" of the digital world and to place events in a reasonable time frame. Trading any financial markets may well be digital but the factors responsible for it are analogue and need a thorough analysis to find out if and where to invest.

FEBRUARY 2021

ECONOMICS AND POLITICS

The well-known economist John Kenneth Galbraith once quipped that "the only function of economic forecasting is to make astrology look respectable". The horoscope for the past Chinese year 2020 (lunar year rat, element metal) did not have economic growth numbers, but the general predictions were a lot better than those of economists. This year, the "experts" expect the Covid-19 virus to be overcome and an economic rebound based on pent-up consumer demand. Let us hope they are right this time!

BOND MARKETS

Governments and central banks are competing to see who can spend or print more money. The US wants to spend USD 3 trillion for a "Green New Deal" on top of the already approved USD trillions for Covid-related aid. The EU has also granted more than EUR 1 trillion because of the pandemic and passed generally worded spending to cope with climate change. Their central banks have signalled that their monetary policy will be characterized by "more flexibility".

EQUITY MARKETS

The IT sector of the US S&P 500 is now about a third of the index and, without its contribution, performance would be roughly 10% less. In similar circumstances in the past (oil in the energy crisis, technology in the dotcom-bubble) such exaggerations were corrected fairly quickly. Regulation efforts by the EU, anti-trust investigations in the USA, tax issues, decision-making authority with regard to internet accounts etc are becoming more and more of a burden.

CURRENCIES

Markets are expecting a confirmation of the longer-term trend, i.e. more USD weakness. Overlooked is the fact that USD bonds have a higher yield and that the economy has greater recovery potential. Government finances are worrying but they are only marginally worse than those in the EU. The decisive factor will probably be the realization that the USA can overcome domestic difficulties fairly quickly.

FOOD FOR THOUGHT

According to the Chinese calendar, February 12, 2021 marks the beginning of the year of the ox with the element metal. As this combination already implies, a combination of the stoic ox and hard metal suggests caution. The ox represents traditional and responsible action. Metal stands for the ability to assert oneself indiscriminate of the difficulties and consequences to achieve the objective. The investor should be prepared for a difficult year which is best mastered through strict discipline.

(Ed. Thanks to Christian for a double-helping of his advice to start the New Year.)

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Trudging in Style:
The New On Cloud Hi Waterproof Bootie

Contributed by IMCZ Sports' editor Joseph Dow

On is a revolutionary Swiss sport shoe brand quickly becoming the "*Nike of Switzerland*" with futuristic designs, a wide range of color choices, and especially innovative soles. Recently, the great Roger Federer signed on as a partner of the brand and has a new signature tennis shoe, **The Roger Centre Court**. If you watched the 2019 Zytturm Triathlon in Zug, you will have seen many serious athletes also sporting On's shoes. I first came upon the brand a few years ago when they put out their limited Cloudrunner Winter Edition shoe. Always looking for light and compact waterproof footwear for ski day trips via train, this winter version of the Cloudrunner was the perfect solution for me. It replaced my Lowa Gore-Tex light hikers and reduced the load of my backpack significantly when skiing. Since that time, On has greatly expanded its waterproof offerings with the **On Cloud Hi Waterproof** shoe/boot being the latest. As an enthusiast of lightweight, waterproof sports shoes, I was intrigued to check them out.

The Cloud Hi WP is another boot-style shoe in the On lineup, which includes a non-waterproof version and the more traditional-looking **Cloudrock Waterproof** hiker (*weight: 445g*). In contrast to the bulkier Cloudrock, the Cloud Hi WP (*weight: 354g*) is a somewhat low boot with a bit of funky style, especially in the non-black color with the white sole, and has an unusual, vegan leather forward upper. The sleek form morphs into an almost tactical military / special forces style in the all-black version. This more discrete appearance could easily pair with some chinos and a collared shirt for a night out on a rainy evening.

Surprisingly, the Cloud Hi is not merely a taller version of On's iconic **Cloud** shoe, which is also available in a waterproof version (*this compact and light variant, weighing 250g, would be my choice for an approach shoe to stow in my ski backpack*). The two models are not very similar and have a different feel and no resemblance of being just a low versus high version. On describes the Cloud Hi as an evolution of the Cloud, which still retains its classic look.

The fit of the Cloud Hi is quite snug and On even advises to go up one size, but I stayed with my normal size for On and think that was a good decision. Probably due to the initial stiffness of the vegan leather toe, the boots took a bit of breaking-in but became extremely comfortable after a short period. The boot provides an exceptionally supportive, protective, and stable wearing experience, closer to a hiking boot than a running shoe. I much preferred the fit of the Cloud Hi to the Cloudrock boot.

One unique feature of the Cloud Hi is the robust LoopLock elastic speed-lacing system with a hook anchor on one side at the top of the boot. I'm not sure what would happen if it were to break or wear out. Replacing it appears a daunting task. That said, the system is not at all flimsy and makes putting on the boot very convenient and works well keeping the foot locked in.

Traction, specifically on ice, was the big question I had. The Cloudrunner Winter Edition's sole was quite good on ice. The next waterproof shoe that On produced was the original On Cloudventure Waterproof trail running shoe. This was an excellent shoe, but I discovered its Achilles' heel to be the sole's traction on ice, which is an important aspect when walking around ski resorts. That shoe has since been updated with a new sole, but I have not had an opportunity to try it or evaluate its ice traction capabilities. However, I'm happy to say that the Cloud Hi WP's ***CloudTec® outsole in Helion™ superfoam*** sole has excellent grip on ice and rivals that of the old Cloudrunner Winter Edition.

So, if you need a comfortable shoe for wet or snowy conditions but a full hiking boot is too much or not the right style, I highly recommend the Cloud Hi Waterproof from On-running.

On's Waterproof Line-up:

Cloud Waterproof
– shoe for urban adventures in wet weather

Cloudflyer Waterproof
– shoe for running in wet conditions

Cloudventure Waterproof
– shoe for trail running in wet conditions

Cloud Hi Waterproof
– boot for all-day performance in wet weather

Cloudrock Waterproof
– boot for speed hiking and all-weather exploration

CloudTec® outsole in Helion™ superfoam

On Cloud Hi WP in all-black

.... in Snow

.... in Water

On Cloudrock Waterproof

On Cloud Waterproof

Mask Update – Experience wearing while skiing

As I mentioned previously, this ski year is definitely "*the season of the mask,*" and lift personnel strictly enforce the requirement. While wearing a ski helmet, removing the mask for every run is quite cumbersome, so I have continued wearing the mask during actual skiing. Testing a large number of brands and types, I quickly determined the Livinguard masks were the most breathable, specifically the model designed for physical activity. Back in November in Zermatt, I was using a sports prototype but now this mask is officially for sale. It's called the "**Livinguard Fitness Mask**" and is available in additional colors besides the original steel blue. Per customer preference and request, the production model does not have the dual valves like the one I've been evaluating.

After having skied in all weather conditions and temperatures, this season, I give very high grades to the Livinguard Fitness Mask in terms of breathability and comfort. The biggest issue around wearing a mask skiing is fogging of eyewear, especially if one is an eyeglass wearer. No mask avoids this situation entirely, but the Livinguard Fitness Mask causes the least amount of problems.

On a recent trip to Obersaxen during a snowstorm, I skied all day in the Fitness Mask with goggles, eyeglasses and a helmet. Despite the precipitation and cold temperatures combined with my heating up from skiing in substantial powder snow, I had only minor issues with fogging. I'm even starting to think I like wearing the mask skiing as it keeps my face warm and protected from the wind and sun but is much lighter than traditional ski masks and pulled-up neck gaiters. I can't imagine any other mask I've tried or seen performing as well as this one for skiers and boarders.

Think Snow Think Snow Think Snow Think Snow Think Snow

Links

On Cloud Hi WP https://www.on-running.com/en-ch/products/cloud-hi-waterproof/mens/all-black

On Waterproof Collection https://www.on-running.com/en-ch/explore/mens/shoes/waterproof?page=last

https://www.on-running.com/en-ch/collection/no-excuses/?page=last

On and Roger Federer https://www.on-running.com/en-ch/articles/welcome-to-on-roger-federer-refresh

https://www.on-running.com/en-ch/products/theroger-centre-court/mens/white-gum

Livinguard Fitness Mask https://livinguard.com/fitness-mask/

The Burglar

Late one night a burglar broke into a house and while he was sneaking around he heard a voice say, "Jesús is watching you." He looked around and saw nothing. He kept on creeping and again heard, "Jesús is watching you." In a dark corner, he saw a cage with a parrot inside. The burglar asked the parrot, "Was it you who said Jesús is watching me" The parrot replied, "Yes." Relieved, the burglar asked, "What is your name?" The parrot said, "Clarence." The burglar said, "That's a stupid name for a parrot. What idiot named you Clarence?" The parrot answered, "The same idiot that named the rottweiler Jesús."

Religious Competition

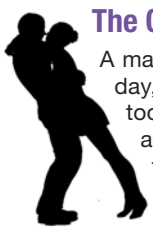
A priest, a minister, and a rabbi want to see who's best at his job. So they each go into the woods, find a bear, and attempt to convert it. Later they get together. The priest begins: "When I found the bear, I read to him from the Catechism and sprinkled him with holy water. Next week is his first communion." "I found a bear by the stream," says the minister, "and preached God's holy word. The bear was so mesmerized that he let me baptize him." They both look down at the rabbi, who is lying on a gurney in a body cast. "Looking back," he says, "maybe I shouldn't have started with the circumcision."

Fake it till you make it

A wealthy old lady decides to go on a photo safari in Africa, taking her poodle along for company. One day the poodle starts chasing butterflies and before long, discovers that he's lost. Wandering about, he notices a hungry-looking leopard heading rapidly in his direction. The poodle thinks, "Uh, oh!" Noticing some bones on the ground close by, he immediately settles down to chew on the bones with his back to the approaching cat. Just as the leopard is about to leap, the poodle exclaims loudly, "Boy, that was one delicious leopard! I wonder if there are any more around here?" Hearing this, the leopard halts his attack in mid-strike, a look of terror comes over him and he slinks away into the trees. "Whew!" says the leopard. "That was close! That poodle nearly had me!" Meanwhile, a monkey who had been watching the whole scene from a nearby tree, figures he can put this knowledge to good use and trade it for protection from the leopard. So off he goes, but the poodle sees him heading after the leopard with great speed, and figures that something must be up. The monkey soon catches up with the leopard, spills the beans and strikes a deal for himself with the leopard. The leopard is furious at being made a fool of and says, "Here, monkey, hop on my back so you can watch me chew that poodle to bits!" Now, the poodle sees the leopard coming with the monkey on his back and thinks, "What am I going to do now?" but instead of running, the dog sits down with his back to his attackers, pretending he hasn't seen them yet, and waits until they get just close enough to hear. "Where's that damn monkey?" the poodle says. "I sent him off an hour ago to bring me another leopard!"

Experimental Medication

A lady goes to the doctor and complains that her husband is losing interest in sex. The doctor gives her a pill, but warns her that it's still experimental. He tells her to slip it into his mashed potatoes at dinner, so that night, she does just that. About a week later, she's back at the doctor, where she says, "Doc, the pill worked great! I put it in the potatoes like you said! It wasn't five minutes later that he jumped up, raked all the food and dishes onto the floor, grabbed me, ripped all my clothes off, and ravaged me right there on the table!" The doctor says, "I'm sorry, we didn't realize the pill was that strong! The foundation will be glad to pay for any damages." "Nah," she says, "that's okay. We're never going back to that restaurant anyway."



The Confession

A married man was having an affair with his secretary. One day, their passions overcame them in the office and they took off for her house. Exhausted from the afternoon's activities, they fell asleep and awoke at around 8 p.m. As the man threw on his clothes, he told the woman to take his shoes outside and rub them through the grass and dirt. Confused, she nonetheless complied and he slipped into his shoes and drove home. "Where have you been?" demanded his wife when he entered the house. "Darling," replied the man, "I can't lie to you. I've been having an affair with my secretary. I fell asleep in her bed and didn't wake up until eight o'clock." The wife glanced down at his shoes and said, "You liar! You've been playing golf!"

At the Party

A doctor and a lawyer are talking at a party. Their conversation is constantly interrupted by people describing their ailments and asking the doctor for free medical advice. After an hour of this, the exasperated doctor asks the lawyer, "What do you do to stop people from asking you for legal advice when you're out of the office?" "I give it to them," replies the lawyer, "and then I send them a bill." The doctor is shocked, but agrees to give it a try. The next day, still feeling slightly guilty, the doctor prepares the bills. When he goes to place them in his mailbox, he finds a bill from the lawyer.

Smart Irishman

An Irishman named Murphy went to his doctor after a long illness. The doctor, after a lengthy examination, sighed and looked Murphy in the eye and said, "I've some bad news for you... you have cancer and it can't be cured. I'd give you two weeks to a month." Murphy, shocked and saddened by the news, but of solid character, managed to compose himself and walk from the doctor's office into the waiting room. There he saw his son who had been waiting. Murphy said, "Son, we Irish celebrate when things are good and celebrate when things don't go so well. In this case, things aren't so well. I have cancer and I've been given a short time to live. Let's head for the pub and have a few pints." After three or four pints the two were feeling a little less somber. There were some laughs and more beers. They were eventually approached by some of Murphy's old friends who asked what the two were celebrating. Murphy told them that the Irish celebrate the good and the bad... he went on to tell them that they were drinking to his impending end. He told his friends, "I've only got a few weeks to live as I have been diagnosed with AIDS." The friends gave Murphy their condolences and they had a couple more beers. After his friends left, Murphy's son leaned over and whispered, "Dad, I thought you said that you were dying from cancer. You just told your friends that you were dying from AIDS!" Murphy said, "I am dying from cancer, son, I just don't want any of them sleeping with your mother after I'm gone."

A little encouragement

An elderly man had owned his large farm in Louisiana for many years.

Right at the back of the farm there was a large pond that was ideal for swimming. The old farmer had fixed it up real nice with picnic tables, horseshoe courts and some apple and peach trees.

One evening the farmer decides to go down to the pond, to look it over, as he hadn't been down there for a while.

Before setting off, he grabs a five-gallon bucket as he decides he'll bring back some fruit.

As he nears the pond, he can hear voices shouting and laughing with glee. Clearly someone is having a good time. As the farmer gets closer, he can see a bunch of young women who are clearly skinny-dipping in his pond.

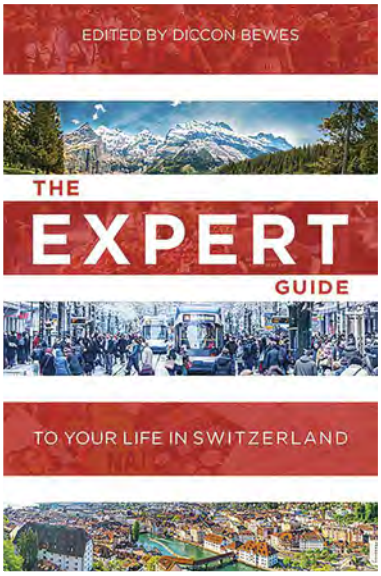
He makes the women aware of his presence and immediately they all swim over to the far end.

One of the women then shouts, "We're not coming out until you leave mister!"

The farmer replies, "Ladies, I didn't come down here to watch you swim naked or make you get out of the pond. You carry on."

The wily old timer then holds up his bucket and says, "I just came down here to feed the alligators!"

Book Review: The Expert Guide to your life in Switzerland



ed. Diccon Bewes, Bergli Books ISBN 978-3-03869-076-4, 2020.

Thinking of relocating to Switzerland? Want to find out more about your adopted country, save money, get insider tips on all aspects of Swiss life, become a Swiss citizen? This is the book for you!

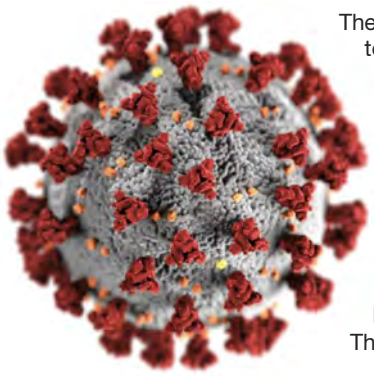
The Expert Guide to your life in Switzerland, edited by well-known Swiss-watcher Diccon Bewes, contains 18 chapters covering all aspects of life in Switzerland, both for the new arrival and the seasoned resident, written by experts in their field. Articles cover arrival, housing, work, history, health, money, laws, leisure time, even LBGTQ life and lots more. I found particularly useful the sections on how to make friends and citizenship for wannabes.

The guide is amazingly comprehensive yet attractively laid-out, user-friendly (index, cross-referencing, glossary in three languages) but also humorous. Pitfalls, hazards (laundry room) and how to save money (don't declare your religion if you want to avoid paying church tax) and similar advice are good to know in advance of arrival. Even if you've been here for years, you'll learn a lot of useful advice.

Bergli Books was founded by a former member of the ZIWC, Dianne Dicks, and Bergli have kindly offered our readers a 10% discount (code ZIWC10) **https://www.bergli.ch/**

Helena Lustenberger

Covid 19 Regulations and Information



The rules around SARS-CoV-2 and what we are allowed to do are continually changing in response to the threat level and our increasing understanding of the disease. It's not always easy to stay on top of this so here are some links to help.

Information

The BAG Coronavirus page. This is available in German, French, Italian and English.
The main "rules" section is "Measures and ordinances".
The Kantonal Volkswirtschaftsdirektion has also published Covid-19 related information here. (In German.)

Vaccination

For those who are eligible for vaccination and live in Kanton Zug, the link to register is here. This site is in English or German and also gives information on eligibility.

Members' Marketplace

*Are you **selling** your yacht (harboured in Piraeus)?*
Your Aston-Martin old-timer with the roll top roof?
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with a little bit of house attached?
Or are you cashing in the half of your stamp
collection that is finally worth something?
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Then ADVERTISE here, in the IMCZ News;

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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

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Ad content delivery:
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