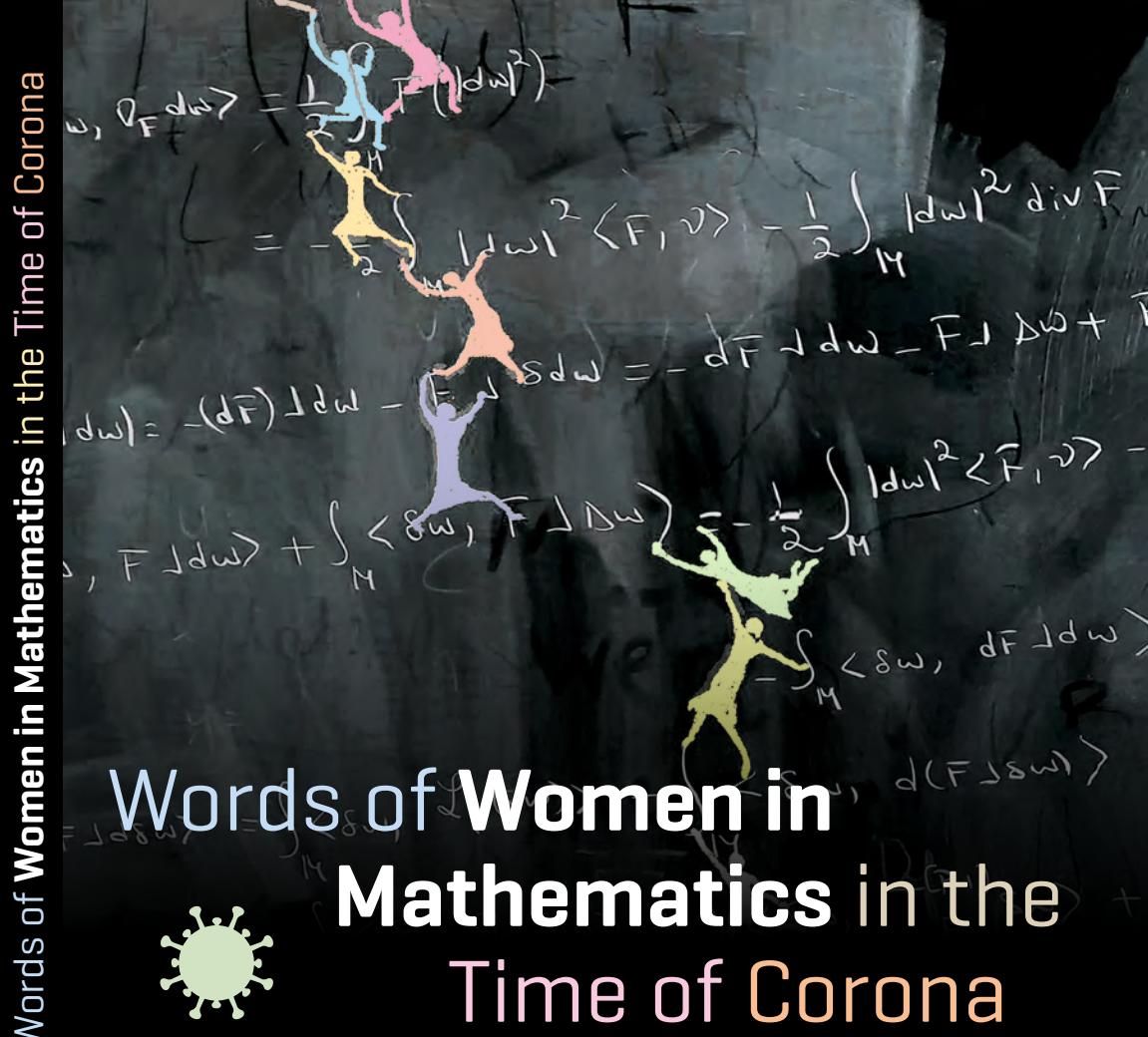


$$F + \int_M \langle dw, T_F^{(P+1)} dw \rangle + \sum \left\langle j^*(F \lrcorner dw), \nu \lrcorner dw \right\rangle$$

$$\langle j^*(F \lrcorner dw), \nu \lrcorner dw \rangle + \int_M \left\langle j^*(F \lrcorner \delta w), \nu \lrcorner dw \right\rangle + \int_M \left\langle T_F^{(P-1)} dw, dw \right\rangle + \int_M \left\langle T_F^{(P-1)} \delta w, \delta w \right\rangle.$$

**Words of Women in Mathematics in the Time of Corona**, based on a film with the same title, see [www.womeninmaths.com](http://www.womeninmaths.com), is a testimony and historical document of a major global health emergency, which reflects the strength with which the world of mathematical research conducted by us women is imbued.



# Words of Women in Mathematics in the Time of Corona

The film

"Words of Women in Mathematics  
in the Time of Corona"



[www.womeninmaths.com](http://www.womeninmaths.com)

# Words of **Women in Mathematics** in the Time of Corona

## Introduction

The pandemic particularly impacted working women around the world, with stories and statistics emerging about women burdened by demanding homeschooling and extra housework, women leaving employment in record numbers, and in academia, reduced paper and grant submission rates from women as other responsibilities loomed. We hoped that a film collecting the thoughts of these women, regarding how the pandemic has affected their personal or professional life as mathematicians, would allow them to be heard and seen, and would provide a particular view into the global impact of the pandemic.

Thanks to Irina's hard work and the financial support of various institutions named at the end of the book, the video "Words of Women in Mathematics in the Time of Corona" was launched on May 12<sup>th</sup> 2021, date of the anniversary of Maryam Mirzakhani's birthday, celebrated by women in mathematics around the world.

The many responses to the film prove that our hopes have been at least partly fulfilled, there have been many events organized around the film, in many countries: from film screening with online lectures or presentations of the project, to film loop-installations, in France, Germany, Italy, Nederlands, United Kingdom, United Arab Emirates.

We were particularly pleased to have the film selected as part of the UNESCO project "Creative Resilience: Art by Women in Science", shown in July 2021 in the virtual exhibition at this web site <https://en.unesco.org/creative-resilience> as well as in 7-14 February 2022 in the UN Co-create Space, Dubai, United Arab Emirates.

Hearing how women in mathematics have lived and coped with the pandemic around the world has opened the eyes of the public and made us more aware of problems and benefits related to the crisis, and the various strategies

adopted by these women to overcome the many challenges they faced. The sudden, long and unexpected reclusion at home, due to confinement to fight the coronavirus, brought us women mathematicians back to what the women of the generations before us probably experienced and suffered, for whom it was the norm: domestic isolation, in a limited and uninspiring horizon.

Setting up a vegetable garden on the university grounds was one of the survival strategies adopted by women during the pandemic in Africa [check which country], when at the same time, these same women could benefit from virtual access to international meetings they were never able to attend before – due to funding issues for instance. So communication through virtual channels allowed some of us to attend conferences that would otherwise have remained inaccessible, while the virtual participation in conferences was a source of

## The Project Team



Eugenie Hunsicker



Sonia Mahmoudi



Irina Linke

frustration for others accustomed to presenting their research in international conferences around the world, and used to working in cross-collaborations.

Four years later, and with two and a half years of pandemic behind us, Irina Linke and Markus Schaefer, produced this book based on the film, a work of art which we are all very proud of.

Using the videos of very diverse quality from which the film was built, they were able to put in print the protagonists' words and convey through the graphics, the atmosphere emanating from the videos.

The book is interspersed with mathematical boards written by some of the protagonists, which the artist ACHYAP then "decorated" with female dancing figures.

These rising and falling figures reflect the highs and lows that, particularly, women mathematicians can experience in their careers, and more so with the pandemic. They also bring to life black [and white] boards that had become virtual with the pandemic when they are so important to mathematicians. Given the context of the pandemic from which it emerged, this book provides an unusual insight into the world of mathematics.

It gives the reader a glimpse on the lives of women mathematicians, their fears and hopes, frustrations with solutions, concerns and passions in a time of confinement. Alongside the diversity of the personalities and situations of its protagonists, it reveals a certain unity in the ways of dealing with the pandemic described by the protagonists featured in this book, possibly reflecting the universality of the language of mathematics, valid at any latitude.

We feel that the documentary film "Words of Women in Mathematics in the Time of Corona" and this accompanying volume, will continue over time to be not only a testimony

and historical document of a momentous global health emergency, but also a powerful exemplification of the strength with which the world of mathematical research conducted by us women is permeated.

We are very grateful for the encouragements of all the organizations, associations, departments and agencies that have enthusiastically and confidently agreed to sponsor and contribute concretely to our initiative.

Sylvie Paycha



Claudia Malvenuto



Eriko Shinkawa



## How it all began ...

*T*hree years later and with a year of pandemic behind them, protagonists of the 2018 film "Faces of Women in Mathematics" were asked to share their experiences of the pandemic.

The resulting film, "Words of Women in Mathematics", collects the words of 87 women in mathematics from 36 countries and served as a basis for this book.

The project was initiated in February 2021 by a group of

mathematicians, Sonia Mahmoudi [Tohoku U., Japan], Claudia Malvenuto [U. di Roma La Sapienza, Italy] and Sylvie Paycha [U. Potsdam, Germany].

Soon after, Eugenie Hunsicker and Irina Linke [who produced the original Faces film] and Eriko Shinkawa [Tohoku U., Japan] joined the team.

*It started from an email exchange about our own experiences during the pandemic:*

### **Happy new year and more**

paycha <paycha@math.uni-potsdam.de> 14 gennaio 2021 13:37  
A: "Malvenuto, Claudia" <malvenuto@mat.uniroma1.it>

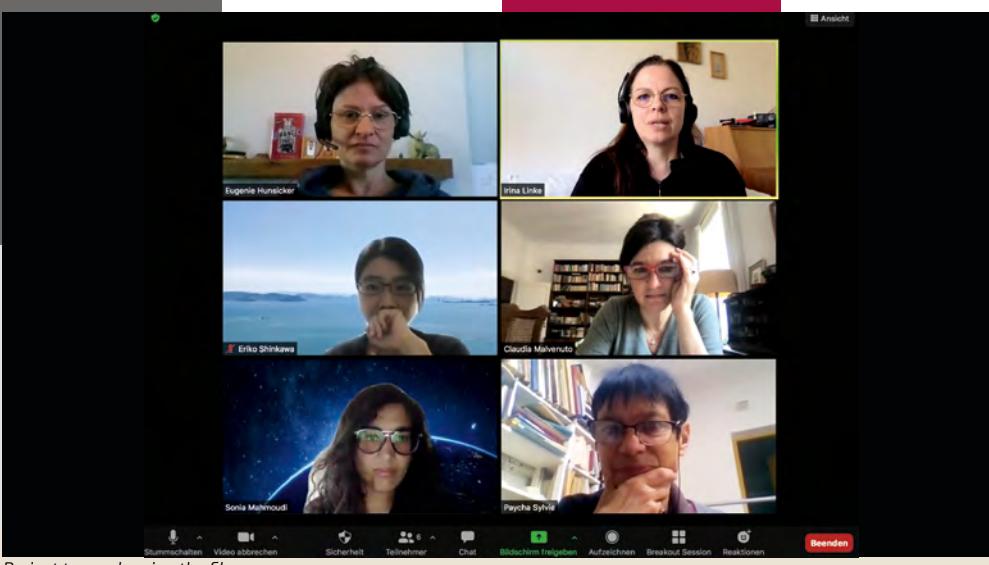
Dear Claudia, Let me wish you a very happy new year .... in spite of all [...] I recall that you suggested we met on skype/zoom to talk about women in maths and maybe about the specific situation in Corona times. It so happens that I initiated such a conversation with a PhD student in Japan, Sonia Mahmoudi, who was writing to ask me for a link to a colloquium session I was organising. I don't know her, yet she seems interested to pursue such a dialogue and it came to my mind that we could maybe converse the three of us as a start... and if we feel these discussions can be fruitful and the time difference permits ...invite other mathematicians to join. [...]

Let me know if you are interested in such an informal conversation, in which case I would suggest to have it one Saturday morning say around 11 am which would be 7 pm in Japan I think.

Take care.

Best wishes,  
Sylvie





Project team planning the film

Translation by the author:

**Ahead of our next meeting on Saturday 13 February:  
project and topic for discussion**

Dear Claudia, Dear Sonia,

I hope things are well with both of you. Prior to our next meeting [I noted Saturday 13 February at 11:00 h] [I am proposing] a vague idea of the project in order to get your feedback: You probably know the video "Faces of Women in Mathematics" <https://vimeo.com/259039018> at the initiative of Eugénie Hunsicker. [https://en.wikipedia.org/wiki/Eug%C3%A9nie\\_Hunsicker](https://en.wikipedia.org/wiki/Eug%C3%A9nie_Hunsicker)

Recently it occurred to me to use a similar approach in the context of the pandemic, asking each mathematician to say [on video] a sentence that reflects her feelings at during that time. One could for example ask them to say their name, their country, the

sentence "I am a mathematician" [as in Eugenie's video] and then to answer the question: "Can you say in one sentence whether and how the pandemic has affected your personal or professional life?" This would be done with Eugénie's consent, and we could also invite her to join the project, that is if she'd likes to. This series of videos would be a continuation of Eugénie's videos, while at the same time adding what could be a very strong message, if the mathematicians are ready to go along with the project. This way we could identify certain difficulties of women in science during this decisive period and make them visible. This is still a rather rough idea to take on or to leave drop altogether! What do you think?  
All the best, Sylvie

**En amont de notre prochaine réunion samedi 13 Février: projet et sujet de discussions**

paycha <paycha@math.uni-potsdam.de> 5 febbraio 2021 19:28

A: Sonia Mahmoudi <mahmoudi.sonia.q3@dc.tohoku.ac.jp>, "Malvenuto, Claudia" <malvenuto@mat.uniroma1.it>

Chère Claudia, Chère Sonia,

J'espère que tout va bien de votre côté. En amont de la prochaine réunion [j'ai noté samedi 13 février à 11 h], [je vous soumets] une vague idée de projet pour recueillir votre avis: Vous connaissez probablement la vidéo "Faces of women in mathematics"

<https://vimeo.com/259039018> à l'initiative d'Eugénie Hunsicker

[https://en.wikipedia.org/wiki/Eug%C3%A9nie\\_Hunsicker](https://en.wikipedia.org/wiki/Eug%C3%A9nie_Hunsicker)

Il m'est récemment venu à l'idée de suivre une démarche analogue dans le contexte de la pandémie, en demandant à chaque mathématicienne de dire [sous forme d'une courte vidéo] une phrase qui rende compte de son ressenti en cette période. On pourrait par exemple leur demander de donner leur nom, leur pays, de dire « je suis mathématicienne » [comme dans la vidéo d'Eugénie] puis de répondre à la question:

"Can you say in one sentence whether and how the pandemic has affected your personal or professional life?"

Tout cela avec l'autorisation d'Eugénie, qu'on pourrait peut-être inviter à rejoindre le projet si elle le souhaite. Cette série de vidéos s'inscrirait dans la continuité de celles d'Eugénie tout en y ajoutant un message qui pourrait être fort si toutefois les mathématiciennes jouent le jeu. On pourrait ainsi toute à la fois identifier et rendre visibles certaines difficultés rencontrées par les femmes scientifiques en cette période critique. C'est une idée un peu vague à prendre ou à laisser! Qu'en pensez-vous? [...]

Bien amicalement, Sylvie





Project team meeting

Translation by the author:

**Ahead of our next meeting on Saturday 13 February:  
project and topic for discussion**

Dear Sylvie, Dear Claudia,

Thank you very much for this information. I really like the idea of the video. I had also thought about a similar idea in written format [like quotes] but a video message will certainly be more impactful, and it's always nicer to put a face to a name. Plus, it's a continuation of an existing project so that's good too. Concerning the subject of the weight of words, it does indeed seem to have a place in our exchanges. It seems interesting to think about what is tolerated/tolerable when we express ourselves, while considering the context, and also to wonder about the way words can influence the way we think, our critical

spirit, etc. For example, could inclusive language be a solution to change mentalities and mitigate gender inequalities in the future? Could these inequalities have been [partly] avoided, if the weight of words had been "better" evaluated? etc.

These are questions that seem to have been studied for some time, but are still relevant.

Finally I would like to propose the participation of a new mathematical colleague, Eriko Shinkawa, who recently joined our laboratory as an assistant professor. She is Japanese and is very interested in these topics. She seems to be open-minded and would love to discuss them with people from different cultures. What do you think? I wish you a good Sunday.

See you soon. Best wishes, Sonia

**Re: En amont de notre prochaine réunion samedi 13 Février: projet et sujet de discussions**

De : **Sonia Mahmoudi** <mahmoudi.sonia.q3@dc.tohoku.ac.jp>

Date: dim. 7 févr. 2021 à 16:20

To: paycha <paycha@math.uni-potsdam.de>

Cc: Malvenuto, Claudia <malvenuto@mat.uniroma1.it>

Chère Sylvie, Chère Claudia,

Merci beaucoup pour ces informations. J'aime beaucoup l'idée de la vidéo. J'avais également réfléchi à une idée similaire sous format écrit [type citations] mais un message vidéo sera certainement plus impactant, et c'est toujours plus sympa de mettre un visage sur un nom. De plus, c'est dans la continuité d'un projet existant donc c'est aussi une bonne chose. Concernant le sujet du poids des mots, il semble en effet avoir toute sa place dans le cadre de nos échanges.

Il semble intéressant de réfléchir à ce qui est toléré/tolérable lorsque l'on s'exprime, tout en considérant le contexte, et aussi de s'interroger sur la manière dont les mots peuvent influencer la façon de penser, notre esprit critique. etc.. A titre d'exemple, est-ce que le langage inclusif pourrait être une solution pour changer les mentalités et atténuer les inégalités h/f dans le futur? Est-ce que ces inégalités auraient [en partie] pu être évitées, si le poids des mots avait été "mieux" évalué ? etc... Ce sont des questions qui semblent déjà être étudiées depuis quelque temps, mais qui sont toujours d'actualité. Enfin j'aimerais proposer la participation d'une nouvelle collègue mathématicienne, Eriko Shinkawa, qui a récemment rejoint notre laboratoire en tant qu'assistante professeure. Elle est japonaise et s'interroge beaucoup sur ces sujets. Elle semble ouverte d'esprit et aimerait beaucoup en discuter avec des personnes de différentes cultures. Qu'en pensez-vous?

Je vous souhaite un bon dimanche et vous dis à très bientôt. Bien à vous, Sonia





Film release on 12 May 2021

## Faces

Am 19.02.2021 um 11:59 schrieb Eugenie Hunsicker <E.Hunsicker@lboro.ac.uk>:

Hi Irina,

there is a group from IMU women in mathematics group who want to create a follow-up project to the faces of women in mathematics film, using again contributed film clips to explore the impact of covid on some of the women who featured in the film [and perhaps other], perhaps asking them to respond to a question along the lines of "Could you say in one sentence whether and how the pandemic has affected your personal or professional life as a woman".

Some questions have emerged

1] Do you have the contact information for the women who submitted clips last time, so they could be contacted about this follow-up project? [we might ask other women as well]

2] Would you have time and interest to work on this project?  
[....]

Let me know what you think!

Eugenie



### **Assignment**

*paycha <paycha@math.uni-potsdam.de> 26 febbraio 2021 20:10  
A: Eugenie Hunsicker <E.Hunsicker@lboro.ac.uk>, eriko.inada10@gmail.com, Sonia Mahmoudi <mahmoudi.sonia.q3@dc.tohoku.ac.jp>, "Malvenuto, Claudia" <malvenuto@mat.uniroma1.it>  
Cc: irina.linke@icloud.com*

Hi to all,  
it was nice talking to you today! I am looking forward to this exciting project coming to life!

Here is our assignment: answer the question in various forms video/written/audio

How has the pandemic affected your personal or professional life?  
and send the result to Irina [in cc] via <https://wetransfer.com/>  
by March 8th.

We plan to meet on Friday March 12th at 1:30pm. Here is the link to my zoom room:

[...]

See you then!

Take care,  
Sylvie



***On April 2021 a call for clips was sent out:***

Dear...

We are writing to you, because you contributed to the 2018 film project "Faces of Women in Mathematics". If you did your clip as a group, please share this mail with your colleagues who were in the clip! The "Faces of Women in Mathematics" film [<https://vimeo.com/259039018>] collected 146 clips of 243 women mathematicians from 36 different countries speaking 31 different languages. This very successful project has contributed to making women working in mathematics more visible and has received very positive resonance from the general public.

Three years later and with a year of pandemic behind us, we are launching a follow-up of the project, with the working title "Words of Women in Mathematics in the Time of Corona". The pandemic has made women and in particular women in mathematics more invisible than ever, and this project aims to let them be heard and seen. The new film will bring together your statements about how the pandemic has affected your personal or professional life as a mathematician.

The film will be launched on May 12<sup>th</sup>, Maryam Mirzakhani's birthday, that has become a day to celebrate Women in Maths!

We would like you to contribute:

- I] a video clip [8-30 seconds in your original language]  
or  
a photograph + audio file [use memo function of your cell phone]. The photograph should be a "natural" one, not an official "professional" one. Here you can look at samples: [...]
- II] a written translation in English translation of your spoken words, as well as your first name, last name, the name of the language in which you made your statement and the country where you live and work
- III] a photograph of your work space [Home-office?] in high resolution that we will also use in editing.

We need to receive your contributions by April 21<sup>st</sup> 2021. Transmit your clip to [...]

If you have any further questions, please don't hesitate to contact ...

We are very much looking forward to seeing and hearing your contributions!

**Longitude**  
**151° E to 130° E**



# Anita Liebenau

University of New South Wales  
Sydney | Australia

Longitude: 151° E



*Traveling is completely restricted due to corona, which is why many things are online now.*

*Seminars are online, lectures are online, but also discussions with research colleagues, and I believe, this connected us here in Australia a little bit better to the rest of the world.*



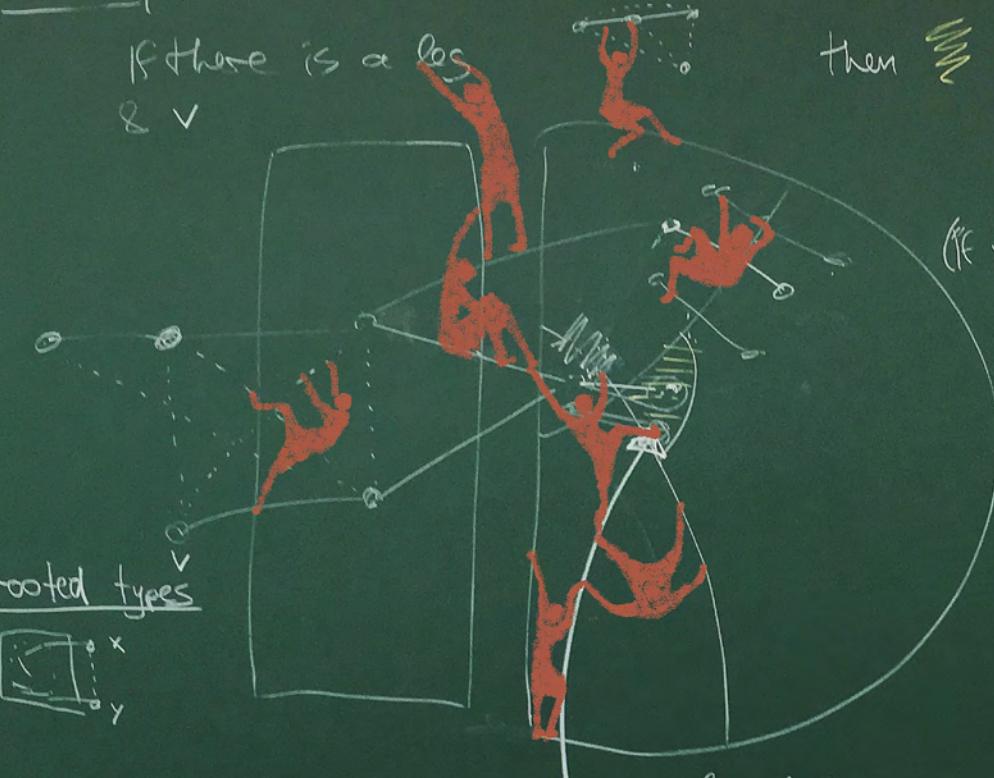
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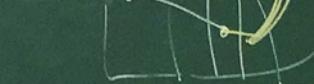


then is small & dead end.



6.3\*

(F × han al)



still true.

L5.7\*



then  $N_B(x) + N_B(y)$

## Catherine Greenhill

University of New South Wales  
Sydney | Australia

Longitude: 151° E



*Australia is a long way from anywhere at the best of times, so during the pandemic the lack of travel has been really hard.*

*So I'm very grateful to colleagues who have run online seminars so that our community can stay in touch.*



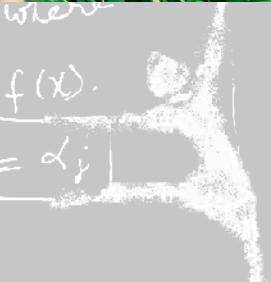
## Elsie H Dunnam

Freelance  
Melbourne | Australia

Longitude: 145° E



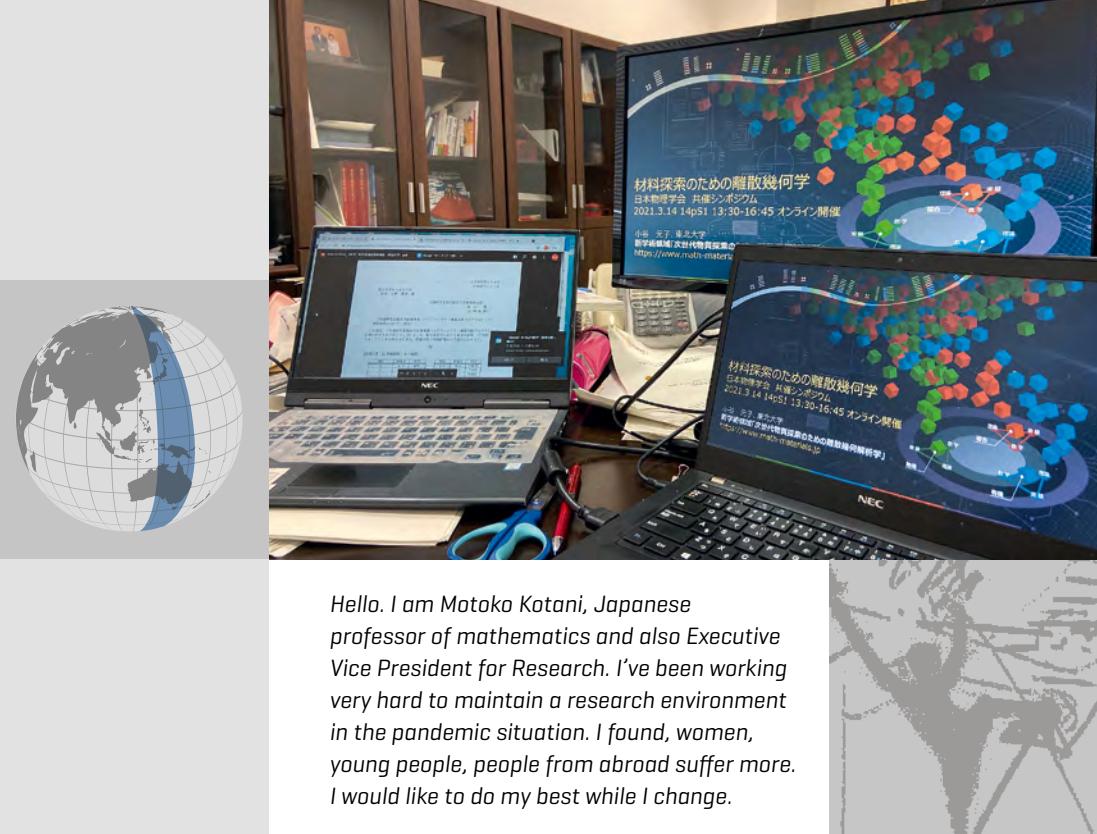
*Corona made me wear a mask and gloves and become even more reclusive. I have allergies to the material of the gloves.*



## Motoko Kotani

Tohoku University  
Sendai | Japan

Longitude: 141° E

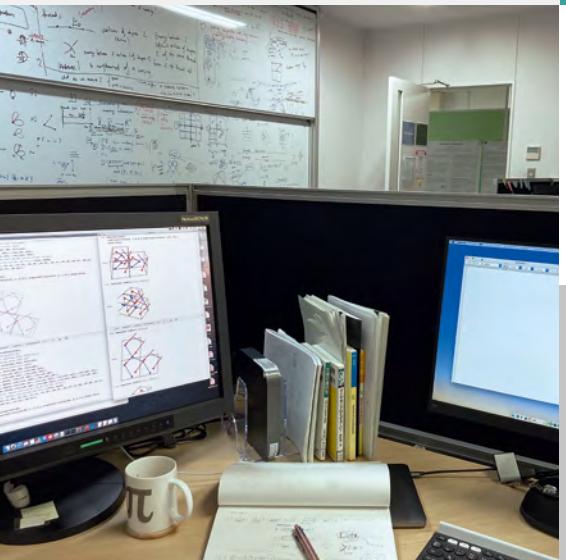


Hello. I am Motoko Kotani, Japanese professor of mathematics and also Executive Vice President for Research. I've been working very hard to maintain a research environment in the pandemic situation. I found, women, young people, people from abroad suffer more. I would like to do my best while I change.

## Eriko Shinkawa

Tohoku University  
Sendai | Japan

Longitude: 141° E



*I felt isolated, but  
that was a good  
opportunity to make  
me rethink my life.*



# Sonia Mahmoudi

Tohoku University  
Sendai | Japan

Longitude: 141° E



*The pandemic has revealed the difficulties linked to isolation, but has also helped me to reconsider my priorities.*



# Hiroko Manaka

Nihon University  
Chiba | Japan

Longitude: 140° E

*I found some important things.*

*Mathematicians sometimes study alone,  
but the existence of fellowship, sharing  
mathematical fruits is so important.*

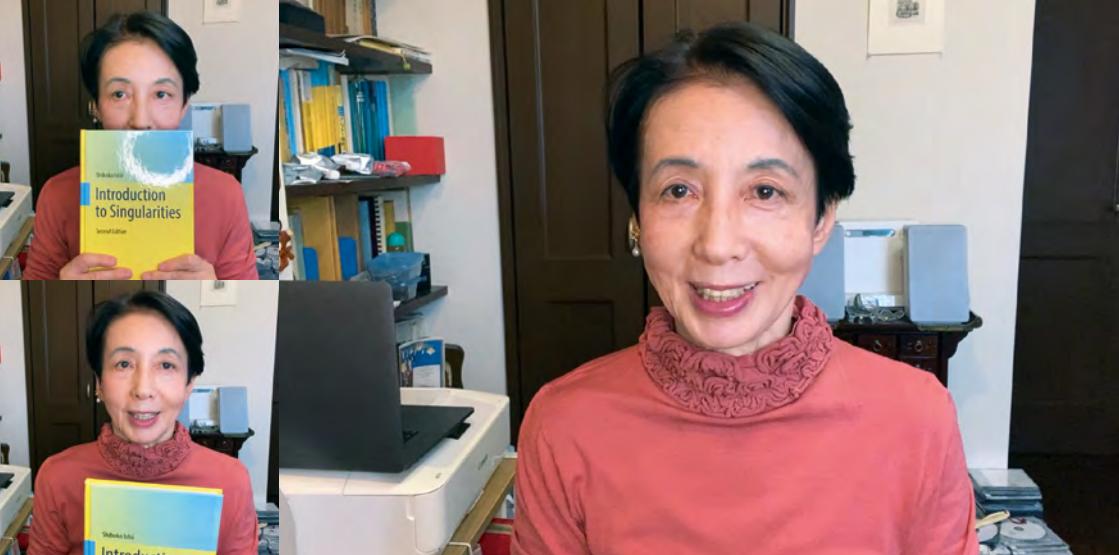
*I miss two beloved mathematicians  
who are gone in this time.*



# Shihoko Ishii

University of Tokyo  
Tokyo | Japan

Longitude: 139° E



*Two good things I found in the pandemic:  
Firstly, we became so familiar with online  
systems.*

*We invite people from foreign countries  
to give talks in our regular seminars.*

*Secondly, I have received many questions  
from abroad about my textbook.*

*I can answer them precisely, as I have more  
time now than I used to, due to the  
cancellations of many events.*



# Yukari Ito

Kavli IPMU | University of Tokyo  
Tokyo | Japan

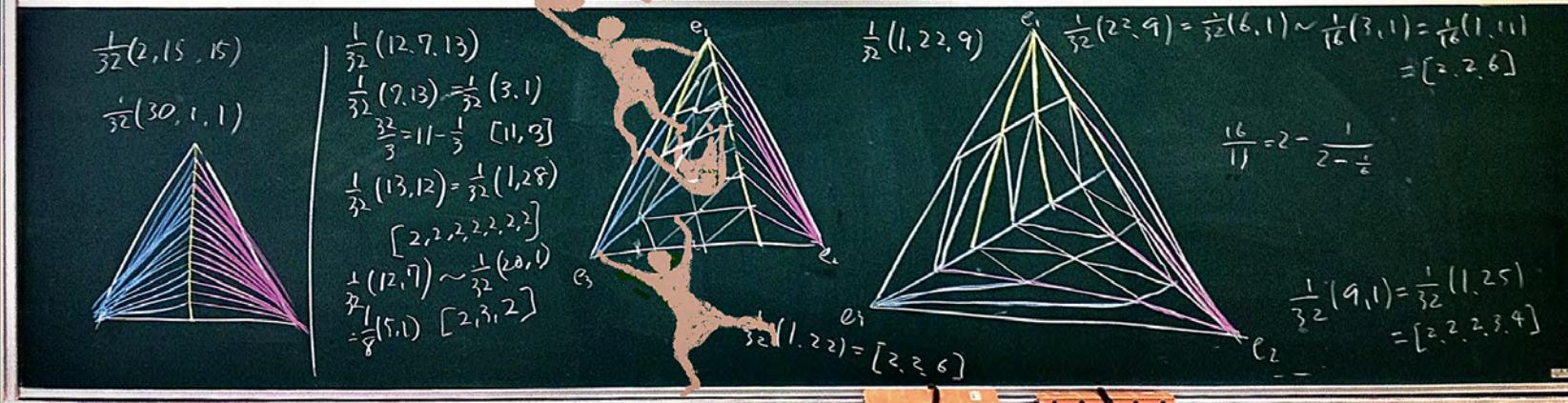
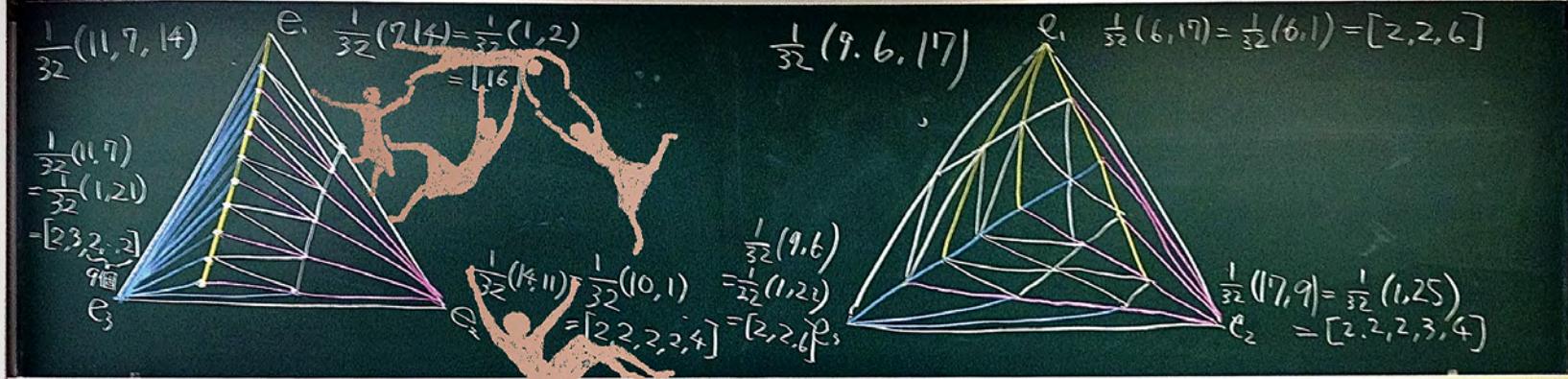
Longitude: 139° E



*When the state of emergency was declared, living with the whole family all day was cramped and the amount of housework increased, which was difficult.*

*However, I am glad that the seminars and research meetings are online and that I can meet my research colleagues all over the world while staying at home.*





## Makiko Sasada

University of Tokyo  
Tokyo | Japan

Longitude: 139° E



*I gave birth to my second child in the middle of the pandemic.*

*As workshops and seminars went online, I was able to listen to the lectures I wanted to hear with my child on my lap right after the birth, and to talk at seminars around the world.*

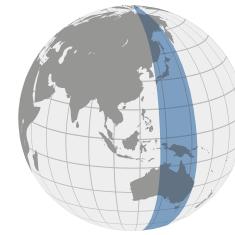
*This would not have been possible without the pandemic, so I feel that there is a positive side to the fact that many research activities are conducted online.*



## Sachiko Nakajima

University of Tokyo  
Tokyo | Japan

Longitude: 139° E



*During the pandemic of Covid-19 my time on the train got reduced.*

*But as my screen time increased a lot, I often feel tired easily, without being able to free my physical senses or evoke my creativity.*

*It also brought various possibilities while many of my friends are feeling anxious or lonely now.*



## Ade Irma Suriajaya

Kyushu University  
Fukuoka | Japan

Longitude: 130° E

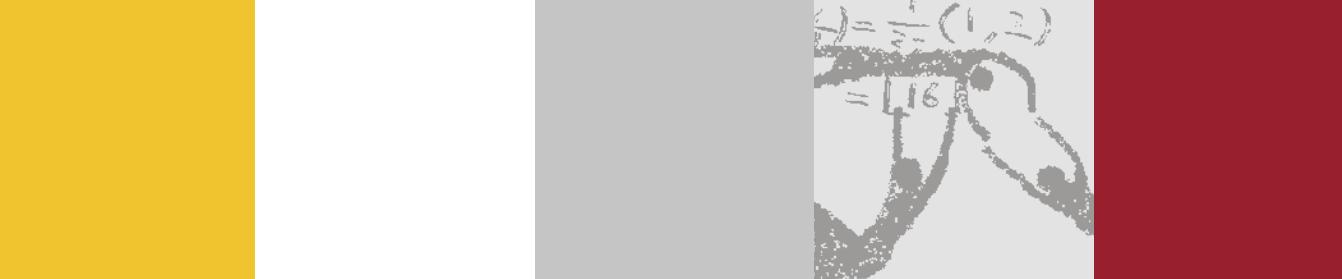


*Hello! I apologise that I could not find the right words in Indonesian.*

*Please let me share my words in the language of the country where I currently live and work.*

*Without business trips, I did not get to meet friends nor make new friends, but I am getting used to using online platforms to communicate with my colleagues.*

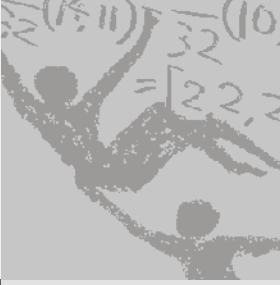
*Besides, without active traveling, instead of moving from one topic to another without getting deeper into each of them, the pandemic gave me an opportunity to focus on only a few topics and explore them.*



# Aoi Honda

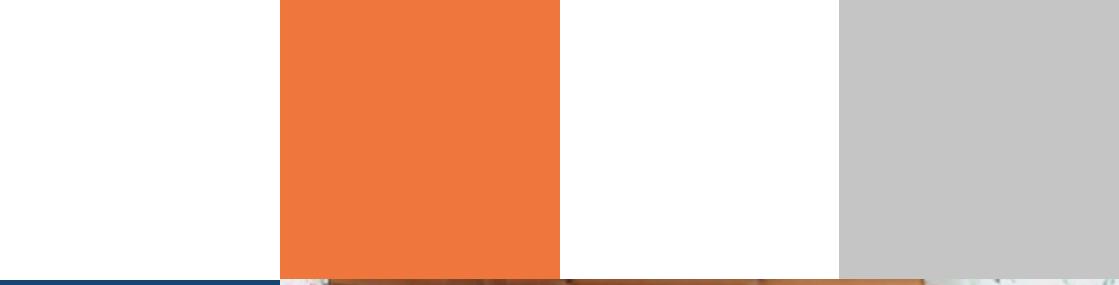
Kyushu Institute of Technology  
Fukuoka | Japan

Longitude: 130° E



*A lot of things have really changed in a year.  
I have started to give lectures and meetings  
remotely.  
Also, presenting at conferences from home is  
something I never thought I would do even just  
a short time ago.*

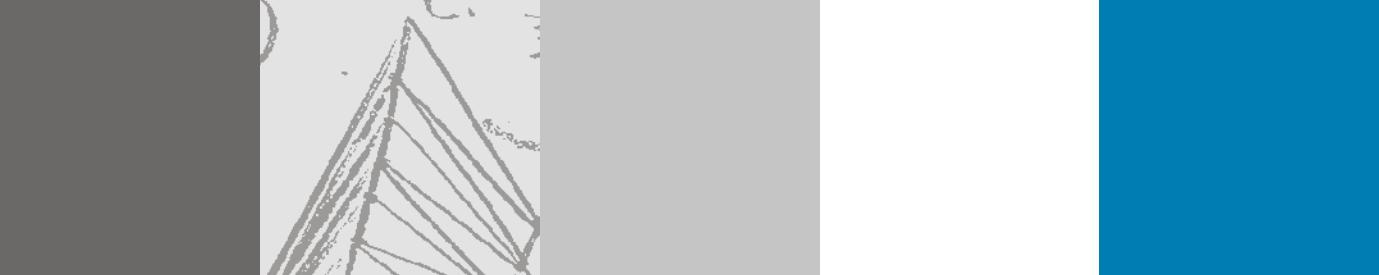
*It was possible because of the situation in  
Corona, but I realised that if everyone is willing  
to do things like this, we can change a lot in a  
short period of time.*



## Miyuki Koiso

Kyushu University  
Fukuoka | Japan

Longitude: 130° E



*I am a professor at Kyushu University, Japan.*

*But these days I am mostly working from home. It is unfortunate that I cannot see other mathematicians face to face to discuss mathematics.*

*On the other hand I enjoy participating in online conferences and seminars held at various places in the world.*

*Also, it is now easier to balance work and care for my husband with a disability.*



**Longitude**  
**114° E to 77° E**



## Jana Rodriguez Hertz

Southern University of Science & Technology  
Shenzhen | China

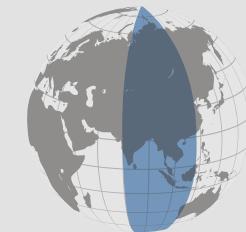
Longitude: 114° E



*Professionally, the pandemic was a very productive period for me, because it allowed me to attend many conferences and I had new doctoral, master's and bachelor's degree students.*

*But personally, it affected me seriously because I have not been able to see my children for a year and a half.*

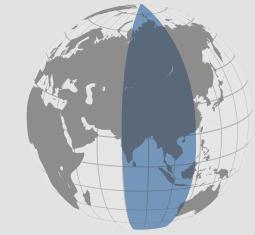
*I hope this will pass soon and that all my colleagues will have a better year than the one we had.*



## Salma Parvin

University of Engineering and Technology  
Dhaka | Bangladesh

Longitude: 90° E



*In the beginning of the corona pandemic, I was fearful, anxious and under a huge amount of mental pressure. However, I slowly became used to carrying out my social and occupational duties online. Although there are certain benefits of doing work online, it is still no alternative to the actual physical activities.*



## Dhana Thapa

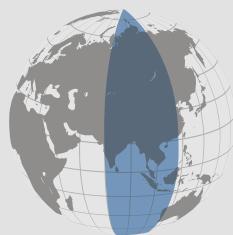
Tribhuvan University  
Kathmandu | Nepal

Longitude: 85° E

*Last year, there was a fearful situation at the onset of the corona pandemic.*

*After a year, I feel that the pandemic situation has taught me many things like conducting online classes, organising Zoom meetings, programs, participating in virtual conferences and discussions.*

*Especially, it was a good opportunity for me to observe, understand and study interrelationships among science, technology, nature and human beings as well as mathematics and life in different ways. Thank you!*



## Jyoti Upadhyaya

Kathmandu University  
Kathmandu | Nepal

Longitude: 85° E



Namaste from Nepal!

Although we were in Covid-19 lockdown, the mathematics class was conducted from home in online mode, but I prefer teaching in the classroom, directly in front of the students.

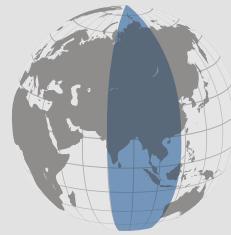
I think that mathematics can be made more popular, if it is taught physically in the classroom in front of the students.



## Elina Biberdorf

Sobolev Institute of Mathematics  
Novosibirsk | Russia

Longitude: 83° E



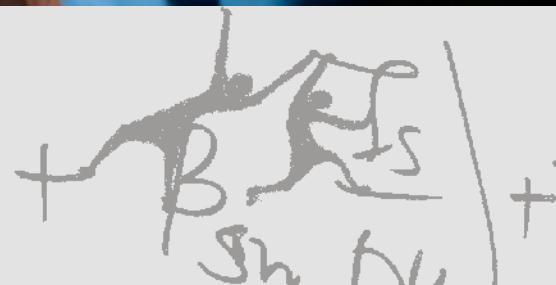
*In my opinion, working at home during the pandemic was even funny.*

*Imagine the morning: My daughter has a school lesson in her room, my husband a work meeting in his, I have a lecture or conference in the kitchen.*

*It was a plus that there was no need to spend time on the road.*

*A bad point was that I had to cook more. The family was at home and everyone wanted to eat.*

*And yet, I began to use more computer communication and to communicate more with my students.*



## Anita Tomar

Government Degree College Thatyur  
Tehri Garhwal | India

Longitude: 79° E



The whole time during the pandemic I had a tough time. Initially I used to work ten to twelve hours per day preparing lectures, because teaching mathematics online was not an easy task with limited resources. In vacations I devoted my time to research, which led to five research papers.

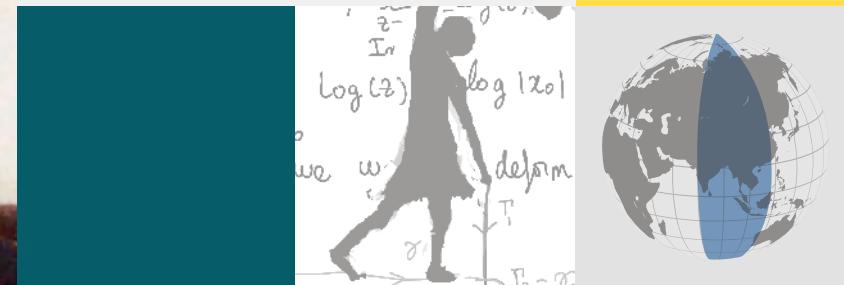
Beside this, I organised two international conferences which otherwise would have not been possible. In offline conferences we need too many resources which I don't have working in a small college in Uttarakhand, India.

But this was a good opportunity to utilise my time. In this period, I was lead guest editor for a special issue in the Journal of Function Spaces and published a book on Fixed Point Theory & its Applications to Real World Problem. I received the leading woman scientist award from Uttarakhand Council of Science and Technology and Teacher of the Year Award for 2020.

## Sarla Bhardwaj

University of Delhi  
Delhi | India

Longitude: 77° E



This is how I teach my online classes as a mathematics teacher: I start my class trying to show my face to the students and talk to them.

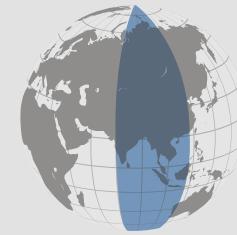
Then I change the position of laptop so that they can see the board, and I start teaching them.

When they ask a question, I bend down to see them and answer the question.

## Geetha Venkataraman

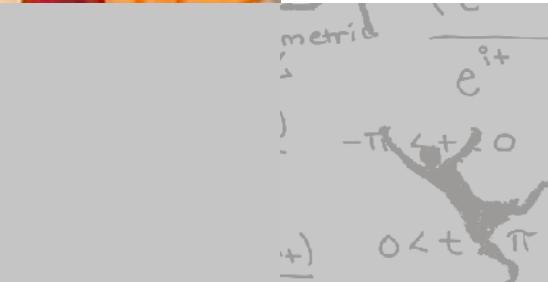
Ambedkar University Delhi  
Delhi | India

Longitude: 77° E



At first, work from home seemed something which was to be appreciated. But after a year of going through the pandemic I feel very isolated. I realise that doing maths requires being in contact with people – in actual physical contact.

When I – during a brief opening – met my research scholars face to face, there was such euphoria at that time, but when I'm at home, there is a dullness with which I wake up and then I wonder, what should I be doing in the day which would bring me some joy. I hope this ends soon.



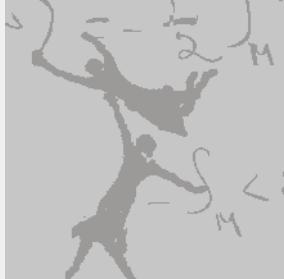
**Longitude**  
**54° E to 15° E**



## Lama Tarsissi

Sorbonne University Abu Dhabi  
Abu Dhabi | United Arab Emirates

Longitude: 54° E



*For me, the pandemic Covid-19 wasn't easy to deal with alone at home.*

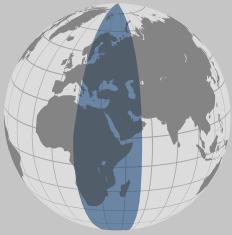
*Now, after more than one year and as a mathematician, I can say that we need to be amongst our students and team of work in order to give more and to prove our existence in society.*



## Zohreh Mostaghim

Iran University of Science and Technology  
Tehran | Iran

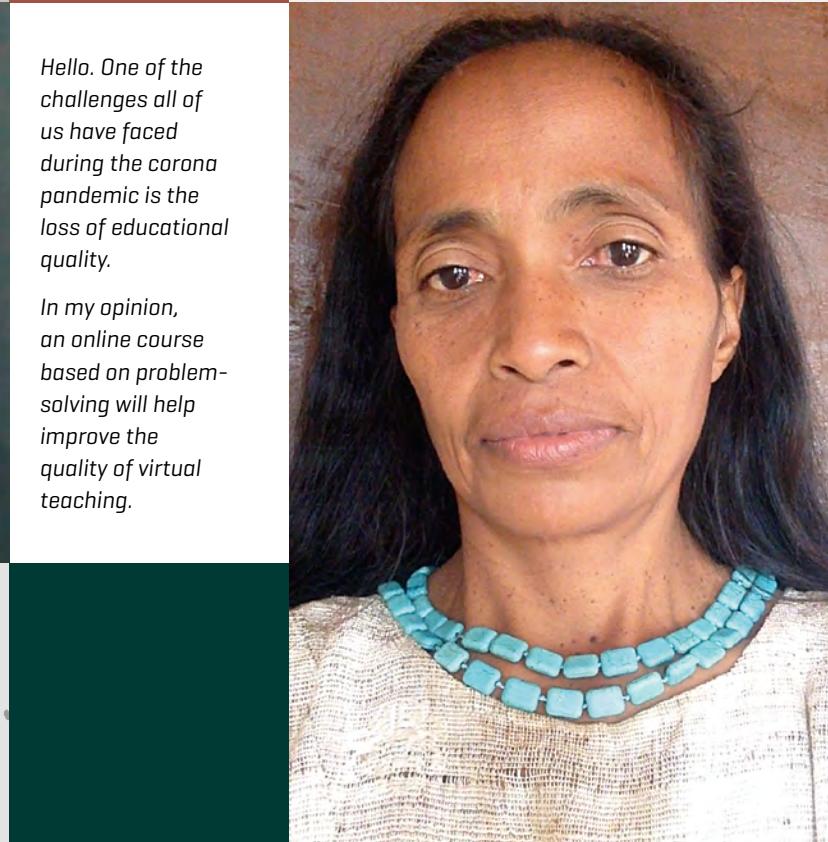
Longitude: 51° E



## Fanja Rakotondrajao

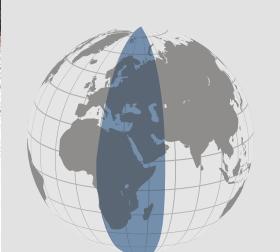
University of Antananarivo  
Antananarivo | Madagascar

Longitude: 46° E



*Face to Covid-19. Our border was closed. Schools were closed. I spent five hours a day in front of my laptop.*

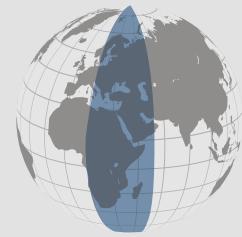
*I have been infected twice. Medicinal plants from Madagascar were used for my drugs.*



## Josephine Wairimu

University of Nairobi  
Nairobi | Kenya

Longitude: 37° E



*We have done maths in this Covid-19 period and learnt so much, you cannot imagine. I used Google Meet and Zoom for the first time to teach.*

*One minute I am in class learning how to use the online tools and the next minute I am using the tools to teach.*

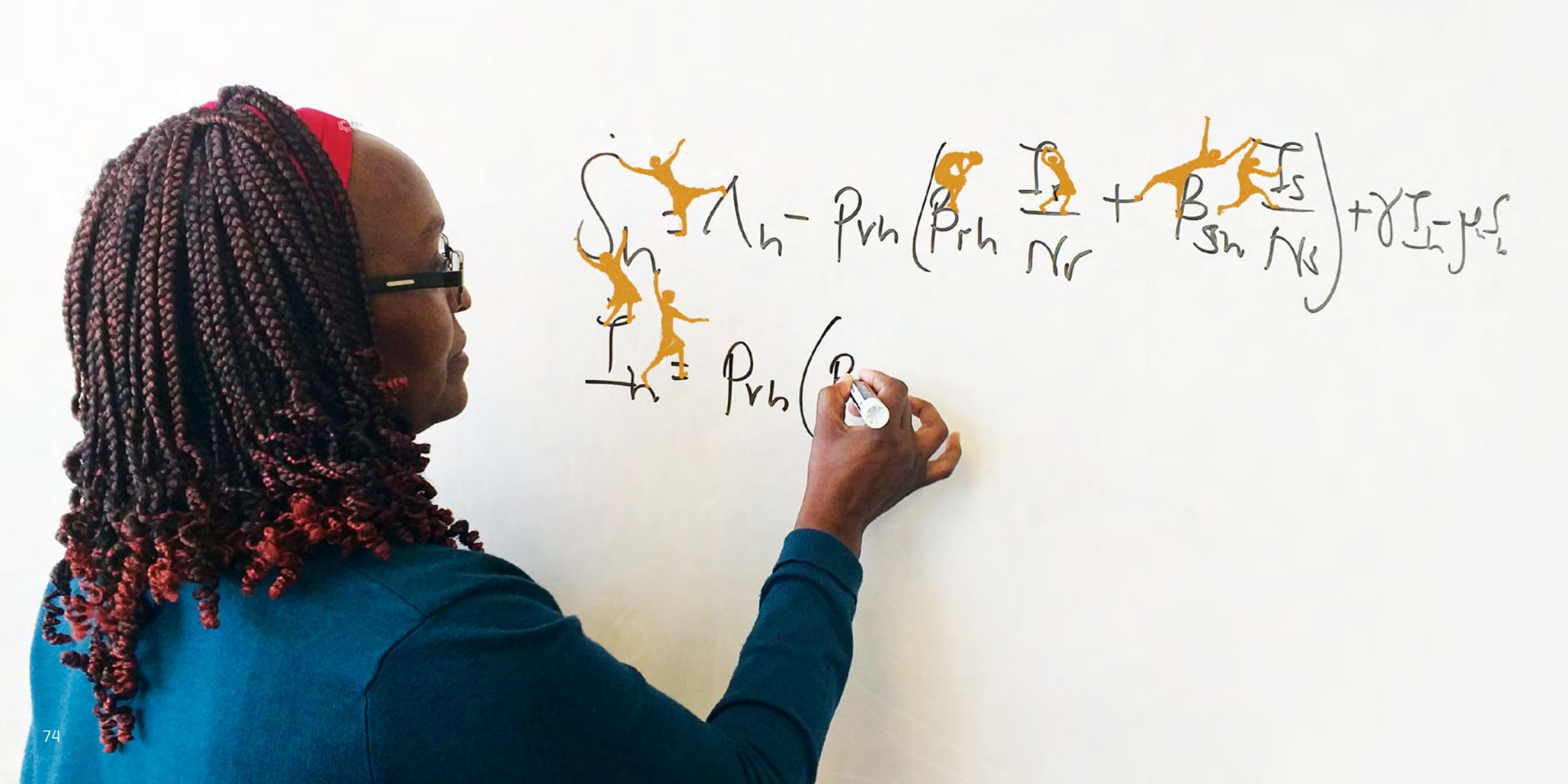
*Then I cook and clean the house while taking care of my kids who were also learning at home.*

*All this time, there are students waiting for my response and help. I had to prepare notes and slides for the next lesson, then teach again and again.*

*I learnt skills that would have taken me the next five years to be where I am digitally, in one year and few months.*

*It's good we got the corona challenge, now I can do so much.*





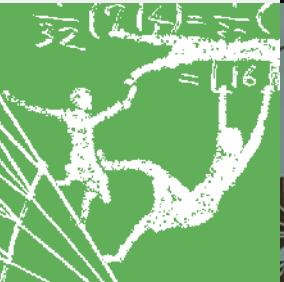
A person with dark skin, wearing a red headband and glasses, is seen from the side, writing on a whiteboard. They have long, dark, braided hair. A hand holding a white marker is shown writing a complex mathematical equation. The equation includes terms involving  $\lambda_h$ ,  $\Pr_h$ ,  $\beta_{rh}$ ,  $N_r$ ,  $\beta_{sh}$ ,  $N_k$ ,  $\gamma$ ,  $I_i$ , and  $\mu_s$ . The term  $\Pr_h(\beta_{rh} \frac{I_r}{N_r} + \beta_{sh} \frac{I_s}{N_k})$  is multiplied by a factor of  $\lambda_h - \Pr_h(\beta_{rh} \frac{I_r}{N_r} + \beta_{sh} \frac{I_s}{N_k})$ .

$$\lambda_h - \Pr_h \left( \beta_{rh} \frac{I_r}{N_r} + \beta_{sh} \frac{I_s}{N_k} \right) + \gamma I_i - \mu_s$$
$$= \Pr_h \left( \beta_{rh} \frac{I_r}{N_r} + \beta_{sh} \frac{I_s}{N_k} \right)$$

## Joelle Beyrouthy

Lebanese University  
Beirut | Lebanon

Longitude: 35° E



*Covid-19 has made the task of being a female mathematician more difficult, especially because my kids couldn't go to school this year and they are only taking online courses.*

*The corona virus pandemic ruined my plans!*



## Fida El Chami

Lebanese University  
Beirut | Lebanon

Longitude: 35° E

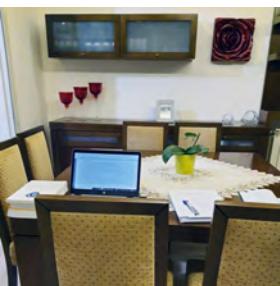
*Like all people, I have been affected a lot by the corona pandemic.*

*Home has become a place for all activities.*

*As for online education, the methods had to be reconsidered and the necessary equipment was not available.*

*Research work has been also affected due to the difficulty of concentrating at home.*

*Aligning professional responsibilities with preserving the psychological and physical health of all family members has been one of the main challenges for me.*



$$\int_M \langle d\omega, \Omega_F d\omega \rangle = \frac{1}{2} \int_M F(|d\omega|^2) =$$

$$= -\frac{1}{2} \int_M |d\omega|^2 \langle F, \nu \rangle - \frac{1}{2} \int_M |d\omega|^2 \operatorname{div} F.$$

$$\delta(F \lrcorner d\omega) = -(dF) \lrcorner d\omega - F \lrcorner \delta d\omega = -dF \lrcorner d\omega - F \lrcorner d\omega + F \lrcorner d\delta\omega$$

$$\int_M \langle d\omega, F \lrcorner d\omega \rangle + \int_M \langle \delta\omega, F \lrcorner d\omega \rangle = -\frac{1}{2} \int_M |d\omega|^2 \langle F, \nu \rangle - \frac{1}{2} \int_M |d\omega|^2 \operatorname{div} F + \int_M \langle d\omega, T_F^{(p+1)} d\omega \rangle + \sum \langle j^*(F \lrcorner d\omega), \nu \lrcorner d\omega \rangle$$

$$\int_M \langle \delta\omega, F \lrcorner d\omega \rangle = \int_M \langle \delta\omega, dF \lrcorner d\omega \rangle + \int_M \langle \delta\omega, T_F^{(p-1)} \delta\omega \rangle + \sum \langle j^* \delta\omega, \nu \lrcorner F \lrcorner d\omega \rangle$$

$$\int_M \langle \delta\omega, F \lrcorner d\delta\omega \rangle = \int_M \langle \delta\omega, \mathcal{L}_F(\delta\omega) \rangle - \int_M \langle \delta\omega, d(F \lrcorner \delta\omega) \rangle$$

$$= \int_M \langle \delta\omega, \nabla_F \delta\omega \rangle + \sum \langle \delta\omega, T_F^{(p-1)} \delta\omega \rangle + \sum \langle j^*(F \lrcorner \delta\omega), \nu \lrcorner \delta\omega \rangle$$

$$\dots = \int_M \langle d\omega, F \lrcorner d\omega \rangle + \int_M \langle \delta\omega, F \lrcorner d\omega \rangle + \sum \langle (|d\omega|^2 + |\delta\omega|^2) \langle F, \nu \rangle + \langle F \lrcorner j^*\delta\omega, \nu \lrcorner d\omega \rangle + \sum \langle j^*(F \lrcorner d\omega), \nu \lrcorner d\omega \rangle + \sum \langle j^*(F \lrcorner \delta\omega), \nu \lrcorner \delta\omega \rangle$$

$$- \frac{1}{2} \int_M (|d\omega|^2 + |\delta\omega|^2) \operatorname{div} F - \int_M \langle \delta\omega, dF \lrcorner d\omega \rangle + \int_M \langle T_F^{(p+1)} \lrcorner d\omega, d\omega \rangle + \int_M \langle T_F^{(p-1)} \lrcorner \delta\omega, \delta\omega \rangle.$$

## Gihane Mansour

Saint Joseph University of Beirut  
Beirut | Lebanon

Longitude: 35° E

*During this year and as a university professor in mathematics, I had to juggle different tasks: In addition to teaching and research, that changed a lot due to the pandemic, we had to help our children with their online courses and share this duty with their school teachers.*



## Galina Rusu

Moldova State University  
Chișinău | Moldova

Longitude: 29° E



*Hello! Unfortunately, the pandemic Covid-19 hides the mathematics behind the difficulties that we meet in teaching it and in communicating with our students.*

*It became impossible to organise in person events that made us feel part of a community with common interests.*

*However, we are glad that in these not easy time, some publishing houses offered open access to their valuable resources, which happened less often in non-pandemic conditions.*



# Alexandra Tkacenko

Moldova State University  
Chișinău | Moldova

Longitude: 29° E

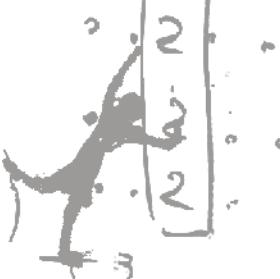
*For me personally, the pandemic meant a reset of the order of all of my activities.*

*First of all, I could allocate more focus into matters of scientific research.*

*I reorganised my didactical process with students, where physical presence and live interaction were a problem.*

*I am adapting the "Psalms of God's Mother" into lyrics, because in fact, poetry is one of my passions.*

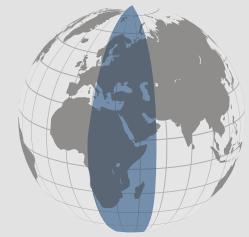
*Last but not least, I am a mother of four and a wife, and in these times, I don't know how it happens, household chores have been multiplying.*



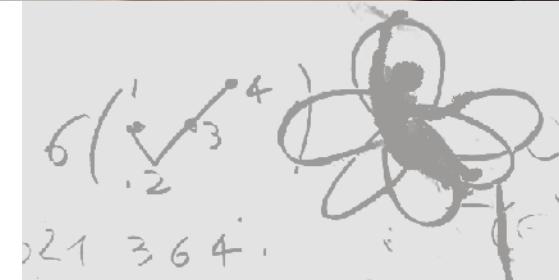
# Eralda Gjika Dhamo

University of Tirana  
Tirana | Albania

Longitude: 19° E



*The year of the pandemic, year 2020, was a difficult and challenging year. We managed successfully to overcome obstacles and to rebuild bridges and communication between students and professors as well as researchers and collaborators in the academic world.*



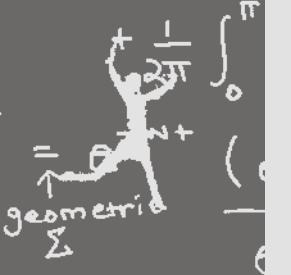
## Biljana Stamatovic

University of Donja Gorica  
Podgorica | Montenegro

Longitude: 19° E



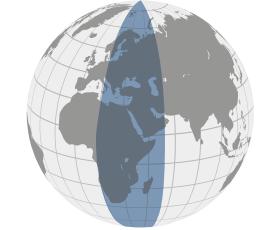
*I realise that science doesn't have the answers to many questions and is often maliciously neglected. It is important that science speaks loudly, directs people in the right direction, removes confusion and drives away fear. I talk openly with students about all the spiritual aspects of our lives, which I have not done before.*



## Kruna Ratkovic

University of Donja Gorica  
Podgorica | Montenegro

Longitude: 19° E



*As scientists, we have no right to stop in front of any obstacle, not even in front of a pandemic. I used my free time to do scientific work and to improve my work with students, for their personal advancement and autonomy.*

*Finally, the line of progress must not be broken. Sometimes, very bad things like a pandemic seem to get the best out of people.*

# Daniela Velichová

Slovak University of Technology  
Bratislava | Slovakia

Longitude: 18° E



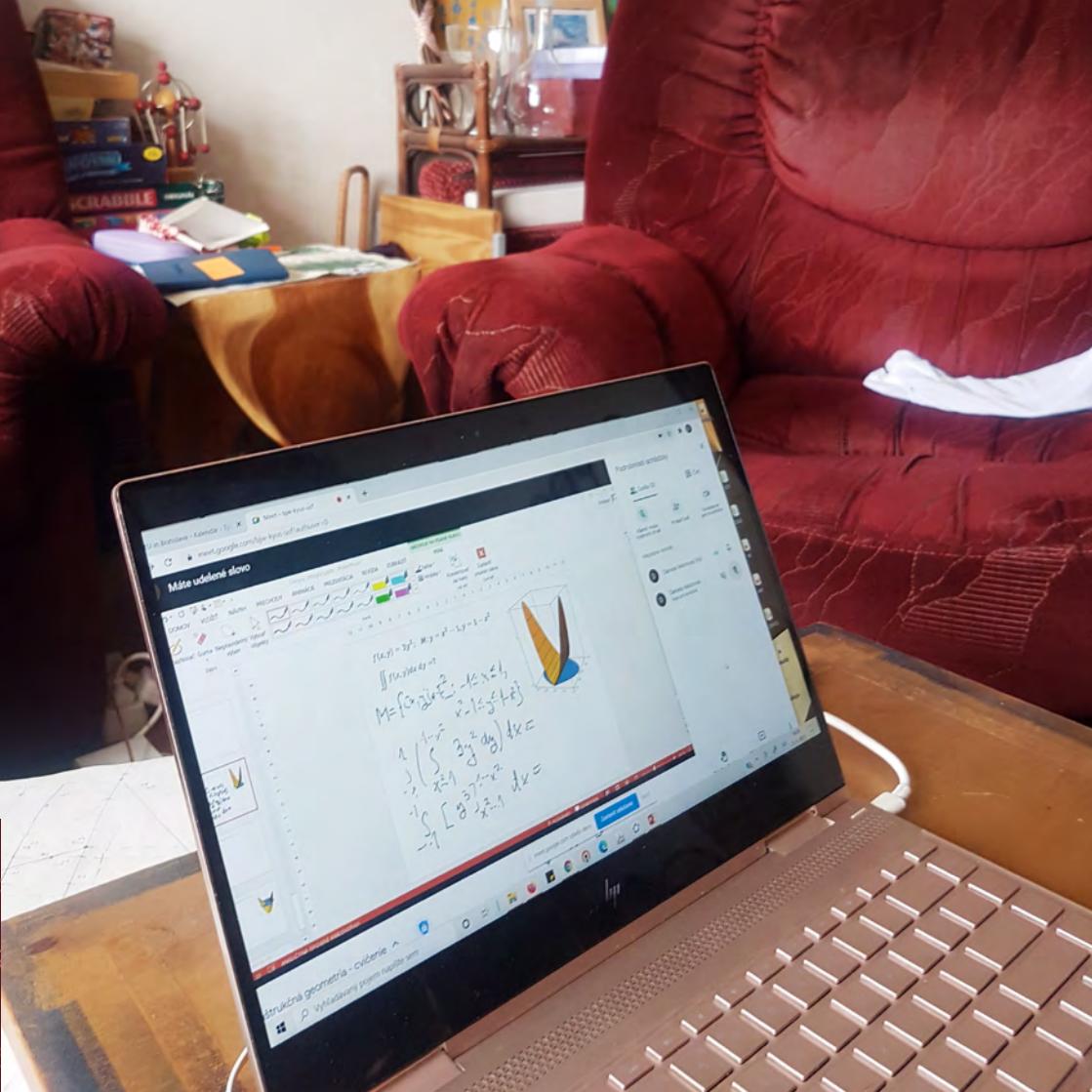
This pandemic brought me especially the anxiety from loneliness and isolation, the loss of direct contacts with colleagues and a lot of frustration from the burden of invisible pedagogical work in the anonymous virtual world.

For women in science it will have been another barrier to professional growth and a drop in their self-confidence.

A chalkboard featuring various mathematical drawings and formulas. At the top left, there's a diagram of a function  $y = f(x)$  with points labeled  $x_0, x_1, \dots, x_n$ . Next to it is a geometric diagram of a triangle with vertices labeled  $(x_0, 0), (x_n, 0), (x_0, f(x_0))$ . Below these are several equations:

$$e^{-int} \sum_{n=0}^{2N} e^{int} = \frac{(e^i)^{N+1} - 1}{e^i - 1}$$
$$= \left\{ \begin{array}{l} f(t+x) - f(x) \\ \hline x \end{array} \right. \quad -t < x < +$$

Other visible text includes "geometrico" and "f(x) = 2x".



# Tram Nguyen

University of Graz  
Graz | Austria

Longitude: 15° E



*What I missed last year were the conferences.  
I miss the atmosphere there, attending talks in  
presence and discussing with others.*

*The second thing I regret is that I could not travel  
to my homeland Vietnam last year.*

*I miss my family very much and I am looking  
forward to the normal days.*



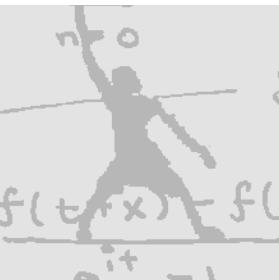
**Longitude**  
**13° E to 4° E**



## Sylvie Paycha

University of Potsdam  
Berlin | Germany

Longitude: 13° E



Covid-19, an invisible virus, which has made us women – and in particular us women in mathematics – even more invisible.



## Elke Rosenberger

University of Potsdam  
Berlin | Germany

Longitude: 13° E



Since Covid-19 I feel like being on an island, sitting at this desk in front of the screen talking to the screen on which I see faces.

I very much miss talking to each other casually, in the hallway, coffee room or wherever.



# Linda Frey

University of Copenhagen  
Copenhagen | Denmark

Longitude: 12° E



*The corona pandemic is hard for me since for more than a year, I usually have at least one of my fours kids at home since child care facilities are closed or restricted. It is hard to do concentrated work and I fear that this will affect my career heavily.*



$$\pi - 2\pi \int_0^{\infty} = \theta + N^+ \\ \uparrow \\ \text{sometria}$$
A mathematical diagram featuring a figure-eight shape and a stick figure holding a pi symbol. The diagram includes mathematical symbols such as  $\pi$ ,  $2\pi$ ,  $\int_0^{\infty}$ ,  $\theta$ ,  $N^+$ , and the word "sometria".



## Claudia Malvenuto

Sapienza University of Rome  
Rome | Italy

Longitude: 12° E



*At the beginning of the pandemic, I experienced a lot of distress and also panic attacks, a new kind of loneliness.*

*Now, one year later, I feel I can say with great conviction, that physical presence, meeting to work together, even in mathematics, is essential in order not to lose inspiration. I don't believe in remote work.*



$L(P) =$

$$51 \cdot 3 \cdot 2 \cdot 1 \cdot 6 = 52 \cdot 1 \cdot 6 +$$

$$2 \cdot 1 \cdot 3 \cdot 6 \cdot 4$$

$$2 \cdot 1 \cdot 5 \cdot 6 \cdot 3 \cdot 4$$

$$2 \cdot 1 \cdot 7 \cdot 3 \cdot 6 \cdot 4$$

$$2 \cdot 5 \cdot 1 \cdot 6 \cdot 3 \cdot 4$$

$$2 \cdot 5 \cdot 3 \cdot 1 \cdot 6 \cdot 4$$

$$2 \cdot 5 \cdot 6 \cdot 3 \cdot 4$$

$$2 \cdot 5 \cdot 6 \cdot 7 \cdot 4$$

$$2 \cdot 5 \cdot 6 \cdot 8 \cdot 4$$

$$2 \cdot 5 \cdot 6 \cdot 9 \cdot 4$$

$$2 \cdot 5 \cdot 6 \cdot 10 \cdot 4$$

$$= 3,628,800$$

521	364		
521	634		
523	164		
526	134		
523	614		
526	314		
523	641		
520	341		
52			
562	(1 84)	12	
	1 34	12	
5.	14	12	
562	341	12	

$\rightarrow 16375(=?)$

$$= \left\{ \dots \mid S_i > S_j \wedge e^{S_i} < e^{S_j} \right\}$$



$$\begin{array}{c} \leq ? \\ \rightarrow \underbrace{1, 2,}_{(1, 2, 3), (2, 3, 5), (3, 5, 5)} m \end{array}$$

## Isabeau Birindelli

Sapienza University of Rome  
Rome | Italy

Longitude: 12° E



*With the pandemic, the flux of visitors has dried out and with it one of my favourite sides of mathematics, its human side.*



## Laura Tedeschini Lalli

Roma Tre University  
Rome | Italy

Longitude: 12° E



Covid-19, Rome.

Phase 1, 2, 3, 4, 5.

Yellow zone, red zone, orange zone.

*There have been many phases, the first phase has been the easiest one: It has been the hardest and we knew what we had to do.*

*I have discovered my neighbours, we became friends. I also made friend with a two-year-old boy who lives behind that window there, in front of mine just across the street. It has been very sweet. And then – everything became very difficult, and we keep waiting.*



## Elisabetta Strickland

University of Rome Tor Vergata  
Rome | Italy

Longitude: 12° E

*When the terrible scourge of Covid-19 pandemic compelled all Italians to remain at home and do remote working whenever possible, it was March 8<sup>th</sup> 2020, the International Women's Day. Universities and schools were closed, lessons and seminars had to go on using various digital platforms. But it was difficult to work thinking of thousands of people dying in hospital. Moreover, women in the academy, after being more or less liberated from domestic chores, all of a sudden found themselves back in the traditional role of women, taking care of their houses and families, suffering a great damage to their research. Which meant that their lives went back of at least fifty years. Too bad.*



## Julie Rowlett

Chalmers University of Technology  
Gothenburg | Sweden

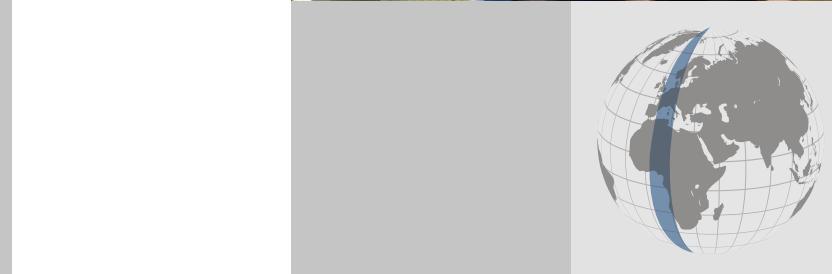
Longitude: 12° E



*How has it been to be a mathematician and a woman during the pandemic?*

*I have to say, for me it has been actually fine. Research partnerships continue, I enjoy the online seminars and connecting with colleagues from around the world.*

*I have a supportive partner and I have two little research assistants that make working from home quite enjoyable – even if I have to sit on the edge of my seat.*



$$\Rightarrow D_N(z) = e^{-izt} \sum_{n=0}^{2N} e^{int}$$

↑ geometric

$$= e^{-izt} \frac{(e^{i(2N+1)t} - 1)}{e^{it} - 1} = e^{i(N+1)t} - e^{-int}$$

*yay!*

$$\sum_{n=0}^{2N} z^n = \frac{z^{2N+1} - 1}{z - 1}$$

Let  $g(t) = \begin{cases} \frac{f(t+x) - f(x_-)}{e^{it} - 1} & -\pi < t < 0 \\ \frac{f(t+x) - f(x_+)}{e^{it} - 1} & 0 < t < \pi \end{cases}$

$g$  is pw  $e^t$  on  $[-\pi, \pi]$

$$\lim_{t \rightarrow 0^-} g(t) = \lim_{t \rightarrow 0^-} \frac{f(t+x) - f(x_-)}{e^{it} - 1} = \lim_{t \rightarrow 0^-} \frac{f'(t+x)}{ie^{it}} = \frac{f'(x_-)}{i}$$

$$\lim_{t \rightarrow 0^+} g(t) = \frac{f'(x_+)}{i}.$$

$\star = \frac{1}{2\pi} \int_{-\pi}^{\pi} g(t) \cdot (e^{i(N+1)t} - e^{-int}) dt = \star$

$g$  is bounded  $\Rightarrow g \in L^2(-\pi, \pi)$

$$\star = \frac{1}{2\pi} \int_{-\pi}^{\pi} g(t) e^{-i(N+1)t} dt + \frac{1}{2\pi} \int_{-\pi}^{\pi} g(t) e^{-int} dt$$

the  $-N-1$  F. coeff of  $g$

both  $\rightarrow 0$  as  $N \rightarrow \infty$

the  $N^{th}$  F. coeff.  
of  $g$

## Laura Fainsilber

Chalmers University of Technology  
Gothenburg | Sweden

Longitude: 12° E



*I've been relatively free to move around, but everybody isolates themselves.*

*I find that it has been a boring period, less stimulating, but not dramatic. So I'm very lucky.*

## Anna Baccaglini-Frank

University of Pisa

Pisa | Italy

Longitude: 10° E

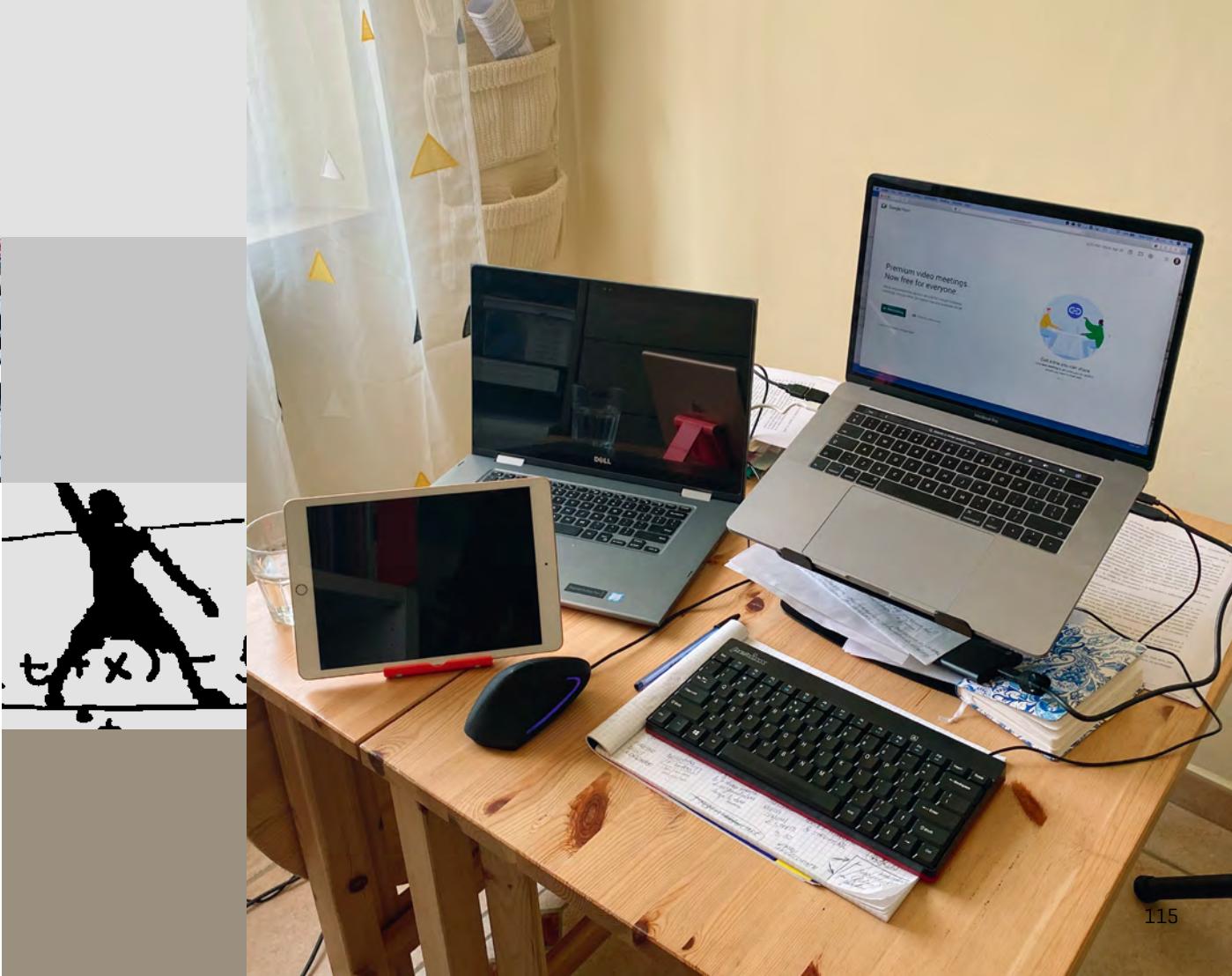


*This modest room of my apartment became my office.*

*I work with two computers and one iPad that surround me, so that I'm able to communicate with as many as I can of my 90 students.*

*I try not to get too distracted by my eight-year-old daughter who walks by and my cat. They also come by during my teaching and my international seminars and conferences a lot of the time.*

*Most days I am dressed from this side up and I wear sweatpants underneath.*

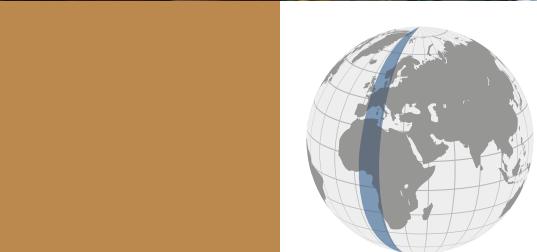
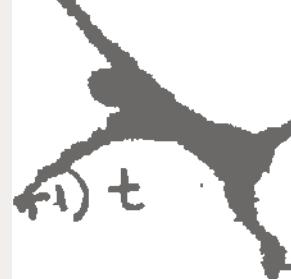


## Benedetta Noris

Polytechnic University of Milan  
Milan | Italy

Longitude: 9° E

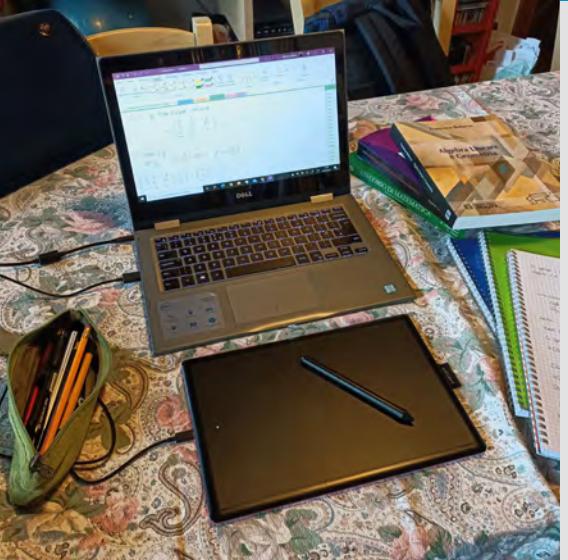
*This year, during the pandemic, it has been difficult to find both the time and the concentration to do research. Concentration, because it is difficult to concentrate when subjected to severe psychological stress: fear, isolation, a sense of uncertainty. It has been difficult to find the time, because in Italy the primary schools have been closed for almost 5 months, so my six-year-old daughter was at home and I had to look after her.*



# Valentina Grazian

University of Milan  
Milan | Italy

Longitude: 9° E



For more than a year I have spent my days in this room, giving online lectures, attending online seminars, participating in online meetings.

In April 2020 I started a postdoc, but I've physically been at the university only once.

Clearly, under these circumstances it is almost impossible to start new research projects with new collaborators.

For a young researcher like me, this may compromise the entire career.

$$\begin{aligned}(12, 7, 13) \\ (7, 13) = \frac{1}{32} (3, 1) \\ \frac{3^2}{3} = 11 - \frac{1}{3} [11, 3] \\ (13, 12) = \frac{1}{32} (1, 28) \\ \dots = \dots\end{aligned}$$



## Maria Stella Adamo

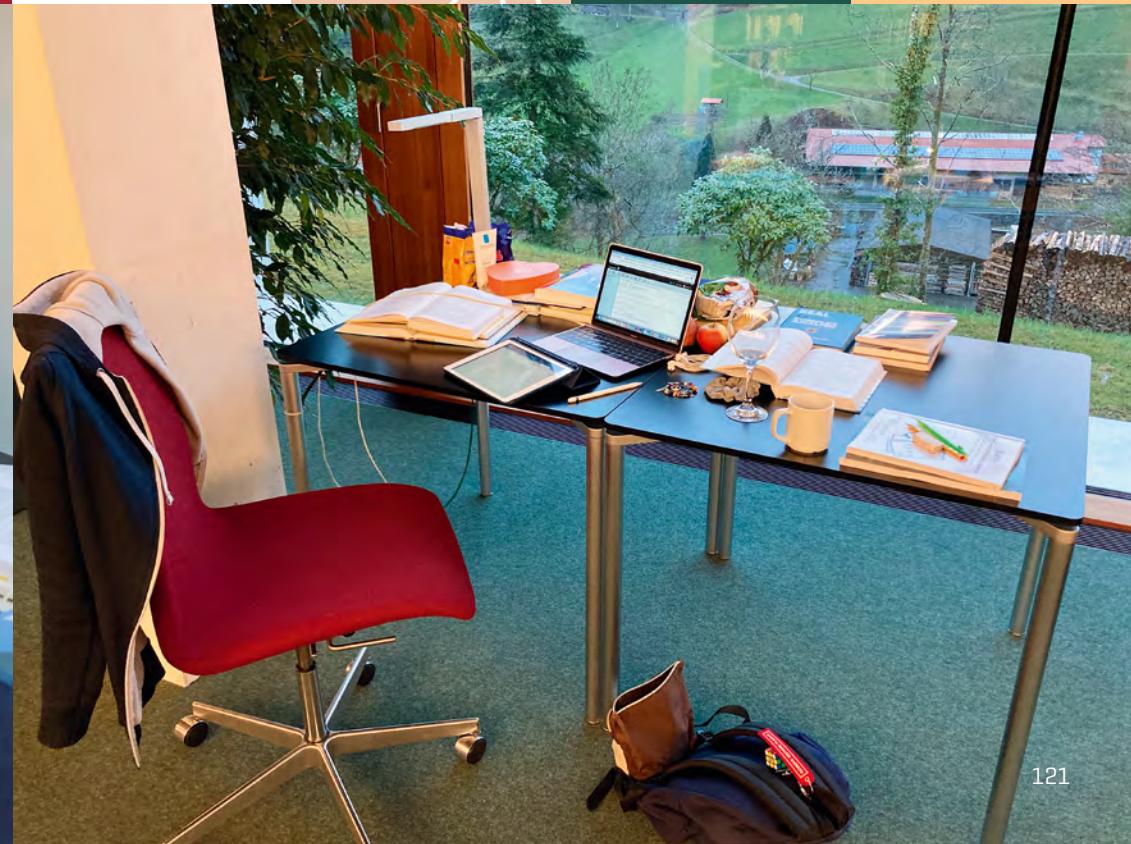
Oberwolfach Research Institute for Mathematics  
Oberwolfach | Germany

Longitude: 8° E

*The pandemic has caused me anxiety and stress, because it has accentuated the perception of my future as uncertain.*

*But the affection of my family and loved ones, my friends, and even doing math, have been helpful in this period.*

*However, I have spent a lot of time abroad for my research in recent months, being away from my family and friends. I hope we can hug each other again soon.*



## Mary Fomboh

University of Buea  
Buea | Cameroon

Longitude: 9° E

*Covid-19 has brought along with it a lot of challenges. At the beginning, it was so difficult, especially within the period when we had lockdown.*

*We were expected to teach online, carrying out online teaching for a group of students, less than 20% of them having computers.*

*Getting on the internet was quite difficult and challenging.*



## Mary-Joy Ezugorie

University of Nigeria Nsukka  
Nsukka | Nigeria

Longitude: 7° E



*Due to the fact that we must observe social distance, face masking etc., we were not able to study mathematics in group as intended.*

*I was really drawn backwards mathematically, because you sit all day lazing about.*

*Corona virus should just go please.*



## Alessandra Frabetti

Université Claude Bernard Lyon 1  
Lyon | France

Longitude: 5° E

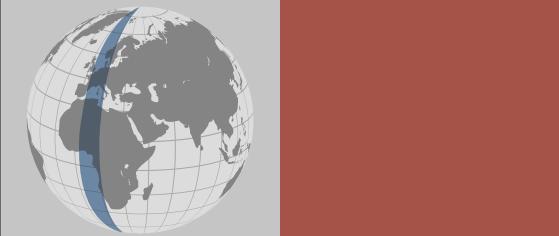


*I have to say that I perfectly adapted to the situation. I have let the students guide my online teaching and I discovered many possibilities to use videos, written documents, and I perfectly adapted myself to it. I can even do things that I couldn't do before.*

*It's true, I'm always here in this room, in front of my messy desk. It is true, that I feel no longer like cooking, I can't stand even the idea of cooking, that's true.*

*But on the other hand, all activity slowed down and finally, after so many years of feeling like "living late", behind the schedule, I finally feel I'm breathing at a normal rhythm.*

*And when I'm finished with working activity, late, and finally get up from my chair, I have close to me my cello. Here it is. It is my hobby, and as soon as I can I devote myself to it.*



## Olanike Rachael Oluwaseyi

University of Ilorin

Ilorin | Nigeria

Longitude: 4° E



*During the lockdown caused by Covid-19 things were really hard for me as a student of mathematics because I lost major concentration in my research.*

*My job and my husband's job weren't going well either. During this time was also when I got pregnant and had a baby. Thank you.*



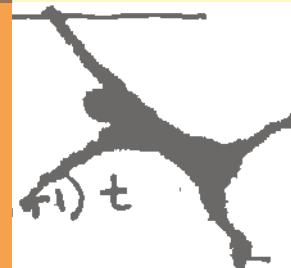
# Olubunmi Abidemi Fadipe-Joseph

University of Ilorin  
Ilorin | Nigeria

Longitude: 4° E



*The period of corona virus was terribly difficult. Food was very scarce and expensive. The government did not pay salary. People were begging for food to eat. We could not go to work and no adequate research was done. Thank you.*



## Ini Adinya

University of Ibadan  
Ibadan | Nigeria

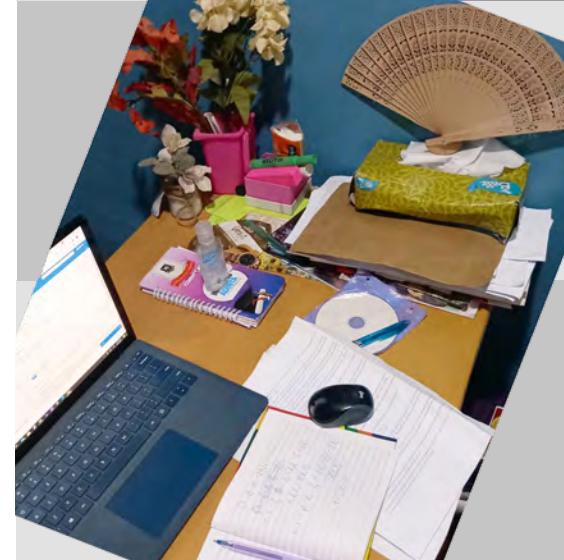
Longitude: 4° E



*During the lockdown occasioned by Covid, I was able to do some research with a group of my colleagues, online, within and outside my region.*

*Secondly, I attended several online workshops, conferences, seminars, which formerly wouldn't have been possible, mainly due to funding and my workload.*

*Finally, I had ample quality time with my husband and children.*



## Deborah Olufunmilayo Makinde

Obafemi Awolowo University  
Ile Ife | Nigeria

Longitude: 4° E

*Covid-19 came as a great shock that was not expected by anybody.*

*During the emergence of the pandemic, there was a compulsory stay-at-home which led to a stand-still in my research activities, because all the energy was directed towards survival.*

*This now is not quite easy, but I believe there are better days ahead.*



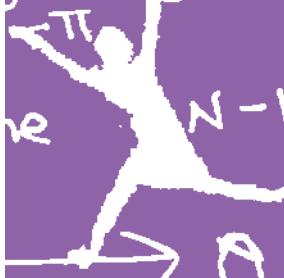
## Gabriela Araujo-Pardo

National Autonomous University of Mexico  
Brussels | Belgium

Longitude: 4° E

*Coincidentally, during this year of pandemic, I've been for one year in Belgium, since February 2020, the beginning of my sabbatical year.*

*I have thought a lot, how it would have been, had the pandemic hit me ten years earlier, in Mexico City, without a permanent position and with two teenage kids, who – more most of all – wanted to spend time outside the house.*



**Longitude**  
**0° to 9° W**



## Marj Bachelor

University of Cambridge  
Cambridge | United Kingdom

Longitude: 0°



*Covid-19. The whiteboard bolted to the dining room wall has made collaboration possible, but I miss the casual conversations, particularly those that I didn't intend to have with my colleagues. Isolation can be terminal to creative mathematics.*

## Angela Tabiri

African Institute for Mathematical Sciences  
Accra | Ghana

Longitude: 0°



*At the beginning of the pandemic there were some negative effects including the cancellation of physical conferences and workshops.*

*The positives include my ability to join online seminars and conferences in Europe and America from Ghana.*

*Also, I have been invited to speak at online conferences abroad without worries about visa issues or boarding flights.*

*Thank you.*



## Stefanie Gerke

Royal Holloway University of London  
Egham | United Kingdom

Longitude: 1° W



*With respect to my research the last year was a total wipe out.*

*First I had to furnish this office, buy a table, a chair and a microphone so that I could work at all.*

*My biggest problem was, that whenever I left this door my work time had finished, since my children only went to school for 12 weeks in the last year.*

*But I learnt lots of other things, in particular about mathematics in primary school and how much fun one can have with simple strategy games and mathematical puzzles.*

*This did not help for my research though...*



## Eugenie Hunsicker

Loughborough University  
Loughborough | United Kingdom

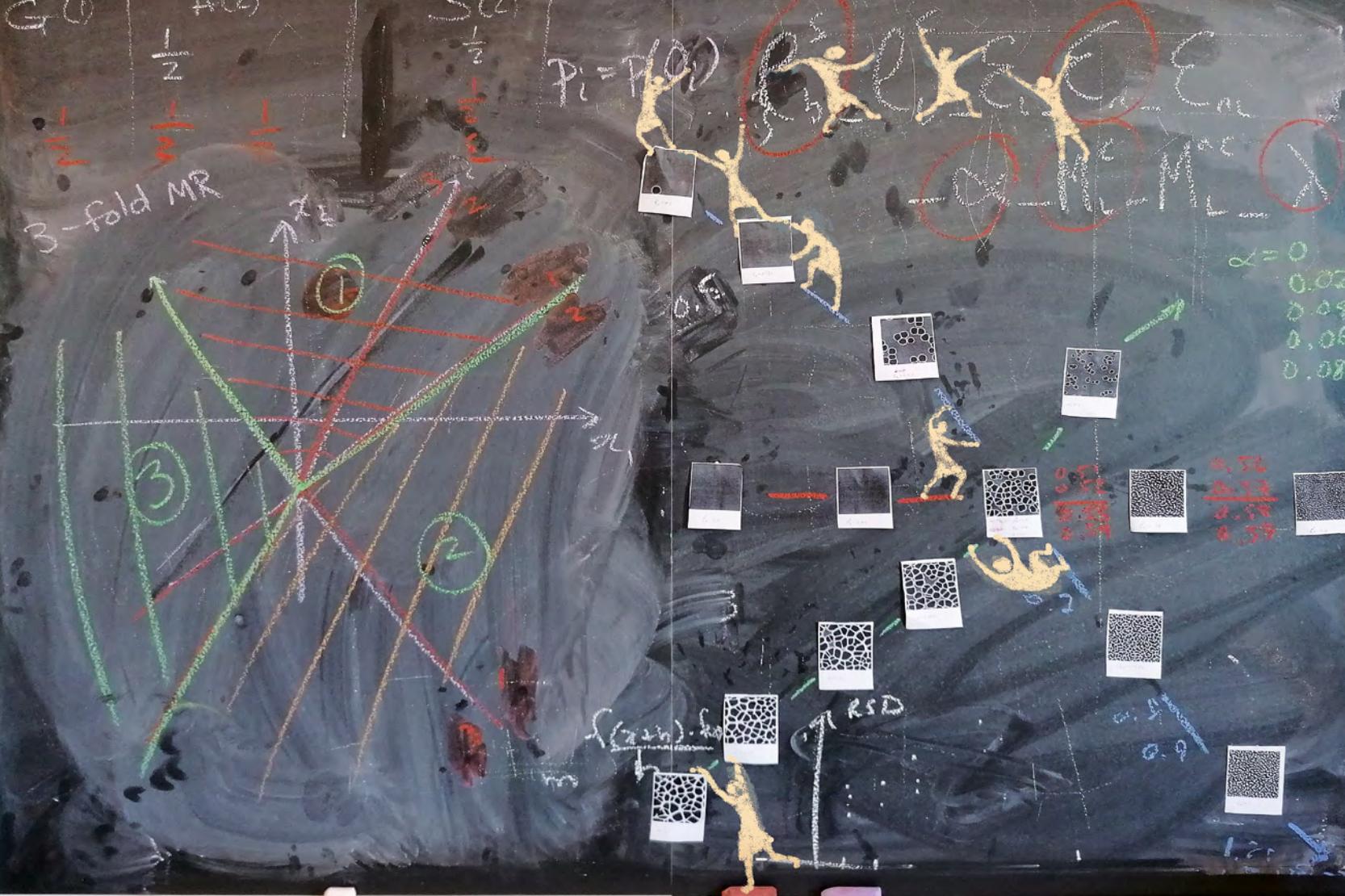
Longitude: 1° W



I sit all day at the dining room table, on my laptop, in meetings, 7, 8, 9 hours.

And when I look up from my meetings I see, staring in my face, a huge pile of papers that I need to deal with and sort ... and on my right is a huge pile of laundry that I need to fold and put away.

And when I get up to go to the kitchen, there's a huge pile of dishes that needs to be rinsed and put away.



© ACHYAP artwork  
based on board by  
Eugenie Hunsicker

## Juliet Ojiako

Loughborough University  
Loughborough | United Kingdom

Longitude: 1° W



*I greet you all. Since the corona virus pandemic started, everything has changed, life has not been easy both professionally and personally.*

*Professionally, I would say that I am doing my best leaving no stone unturned.*

*However, personally, I will say it's been the best time of my life because I have created time to reflect and meditate about my life, the world at large and the purpose of living.*

*Peace be with you all.*



## Bethany Marsh

University of Leeds  
Leeds | United Kingdom

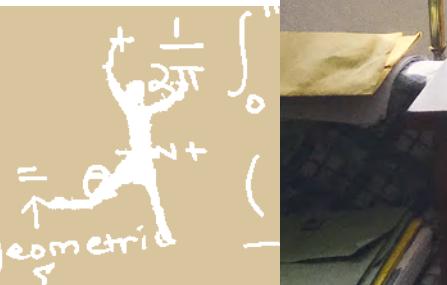
Longitude: 1° W



150

*The pandemic has been a very hard time for everyone, and for me it's meant a lot of time on my own.*

*As a mathematician I am very used to being in my head and in my thoughts and I've tried to use the alone time to bring a bit more balance into my life, and that's been time in green spaces, walking through woods, and also singing, which has brought me much solace during the difficult times.*



151

## Marie-Françoise Roy

University of Rennes  
Rennes | France

Longitude: 1° W



*For women in mathematics, this Covid crisis also made it possible to organise meetings, video conferences, virtual gatherings that allow many women in the world to meet.*

*We did not have such opportunities before the crisis.*

*So there are many negative aspects in the Covid crisis, but also positive aspects, that bring us closer to one another.*



## Eabhnat Ní Fhloinn

Dublin City University  
Dublin | Ireland

Longitude: 6° W



*Hello everyone and welcome to my new office, here in a corner of my daughter's room for the past year now.*

*You know, I spent a lot more time with my three children this year and that was a really great thing for me, and for them too I think.*

*In terms of work, and particularly research, that was a lot harder, but I think a lot of people faced the same challenge.*



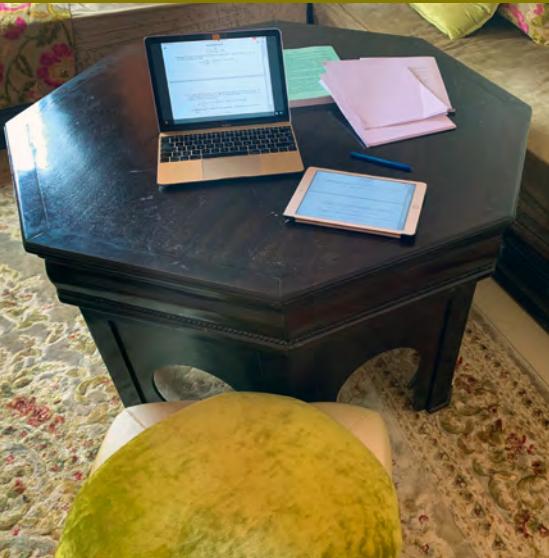
## Zakia Ankhili

National School of Applied Sciences  
Marrakesh | Morocco

Longitude: 8° W



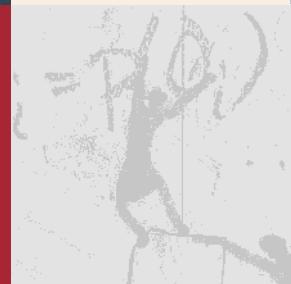
The Covid-19 pandemic has widely changed  
the Moroccan educational system due to  
online courses.



## Juliane Oliveira

University of Porto  
Porto | Portugal

Longitude: 8° W



Although I have been  
producing results  
applied to Covid-19,  
never in my life I felt  
so tired, distressed,  
anxious and  
oppressed.

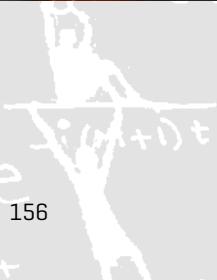
I am trying to  
maintain myself  
in this uncertain  
present, hoping to  
continue doing math  
in future.



## Liliana Garrido da Silva

University of Porto  
Porto | Portugal

Longitude: 8° W



*The pandemic has mainly intensified my feelings of concern and protection for those closest to me.*

*Anxiety and uncertainty about the future, both personal and professional, have become prevalent.*

*Productivity has decreased substantially, but, not demanding too much from me has been the way to stay calm.*

## Susana Martins

Instituto Politécnico de Viana do Castelo  
Viana do Castelo | Portugal

Longitude: 9° W



*The pandemic has come to transport us from our workplace to home! Our home became our workplace.*

*In particular, as a teacher, I was able to bring out the best in my profession, which is the smile and emotions of the students.*

*Although distance education works and we managed to transmit some knowledge, it does not work to the fullest.*

*I have a lot of difficulty teaching without passing emotions and through the computer the emotions are not the same.*

# Sofia Castro

University of Porto  
Porto | Portugal

Longitude: 8° W

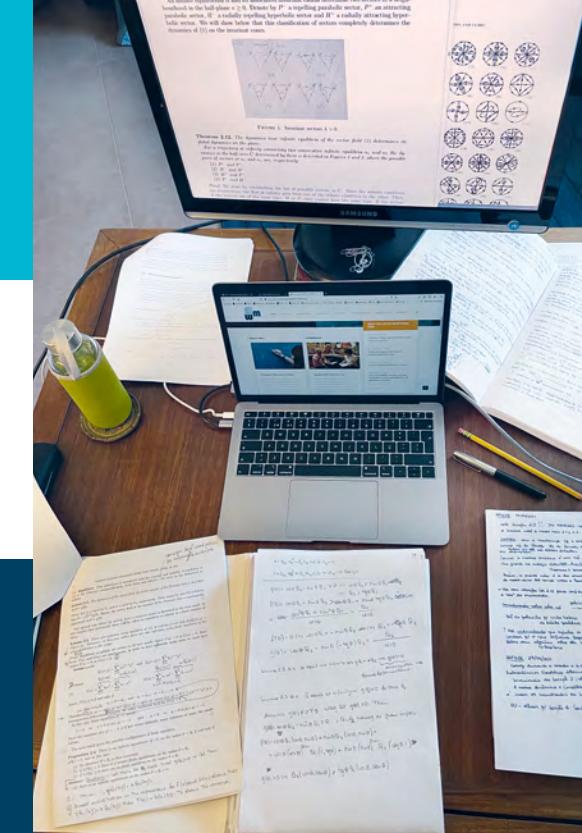


Handwritten mathematical notes on a blue background. The notes include a diagram of a person, equations involving  $e^x$ , and a summation formula:

$$\sum_{n=0}^{2N} e^{\lambda n} = \frac{f(t+x) - f(x)}{e^{\lambda t} - 1}$$

And when we thought we were getting to the limit, the pandemic demanded yet more of us – and we delivered.

It is good to know that our capabilities are big.  
But are they also visible?



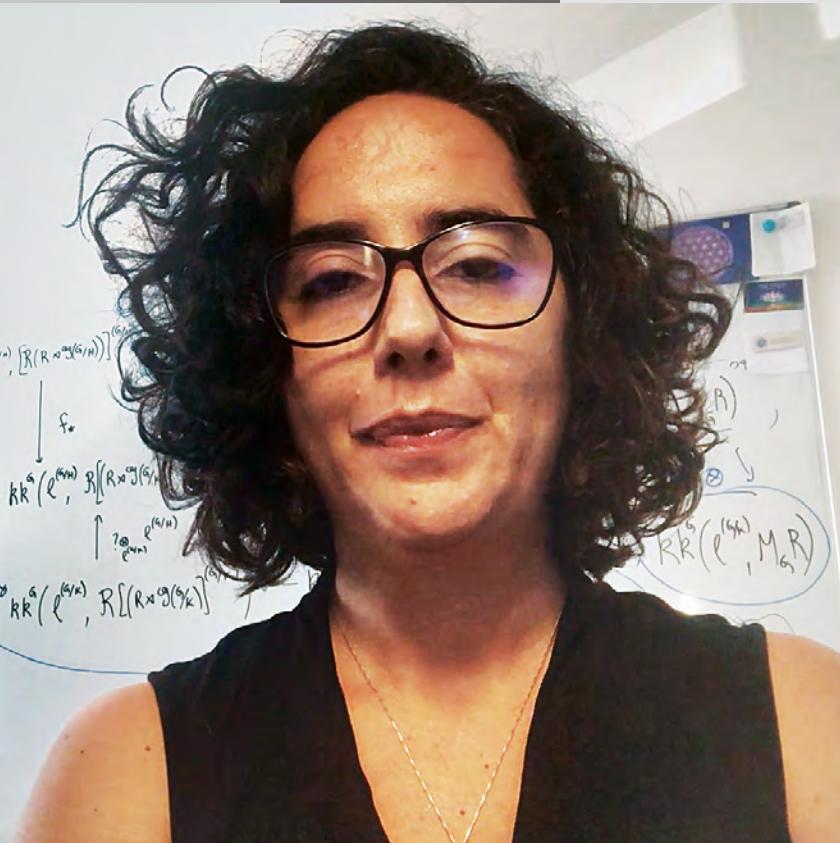
**Longitude  
56° W to 123° W**



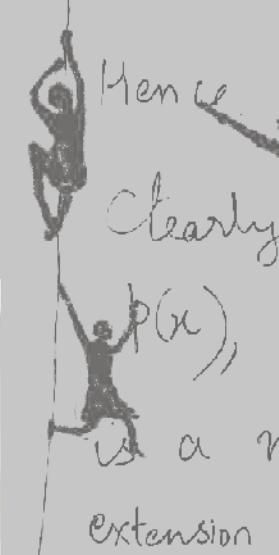
# Eugenia Ellis

University of the Republic  
Montevideo | Uruguay

Longitude: 56° W



162



*In this pandemic, the biggest challenge for me has been on the social level.*

*As a mathematician I am used to working remotely in research, but not being able to count on hugs, affection and the presence of loved ones has been a challenge.*



163



## Alicia Dickenstein

University of Buenos Aires  
Buenos Aires | Argentina

Longitude: 58° W



*I have been working here from home for more than a year, but for me it has not been as terrible as for my young colleagues who have small children.*

*And I am very concerned about the unequal distribution of vaccines on the planet.*



## Mariana Gabriela Torres

Universidad Nacional de la Patagonia Austral  
Patagonia | Argentina

Longitude: 65° W



*When the Covid-19 pandemic began, I felt disoriented not knowing how I could transmit mathematical knowledge remotely.*

*After a year, I feel that it's been an opportunity to reinvent and transform the process of teaching and learning of mathematics in virtuality.*



## Mariel Saez

Pontifical Catholic University of Chile  
Santiago | Chile

Longitude: 71° W



*I don't like to complain, because I'm better off than many others during pandemic times. I am healthy, I have a good space to live and work, I have a job, in contrast to many others.*

*However, despite all that, I feel more tired and busy than usual, without really understanding why.*

*Loneliness has also been difficult, being away from family and friends and the uncertainty of what is going to happen.*

*Not being able to plan anything has been tiresome.*



## **María Isabel Cortez**

Pontifical Catholic University of Chile  
Santiago | Chile

Longitude: 70° W



*For me, the pandemic has meant a lot of loneliness, because I live alone and the quarantine periods have been quite hard.*

*I like to live alone and enjoy spending time on my own, but it is different when loneliness is chosen to when it is imposed, as in this case.*

*This has affected all aspects of my life, personal and professional.*



## Andrea Vera Gajardo

Universidad de Valparaíso  
Vina del Mar | Chile

Longitude: 71° W



*For me the pandemic meant that the boundary between the physical space in which I develop my work and my domestic space, in which I live, eat, have fun, etc., that boundary disappeared and I think that this is highly unhealthy.*



## Matilde Lalín

University of Montreal  
Montreal | Canada

Longitude: 73° W

*At the beginning of the pandemic, the hardest part was that primary schools closed, and my husband and I had to take charge of our children's education, in addition to continuing with our jobs.*

*Later, our children went back to school, but now, the problem is that, with the exception of a few collaborators, I feel isolated from the mathematical community.*



## Paola Alejandra Balda Álvarez

National Pedagogical University  
Bogotá | Colombia

Longitude: 75° W

*As a math teacher I intend to propose new ways of working in the classroom that include experimentation, teamwork and exploration.*

*When the pandemic began I was faced with a great challenge how to turn the students' houses into learning mathematics laboratories.*

*This confrontation produced a lot of frustration and anguish, which, added to the confinement and long hours in front of a computer and attending to many things at home, caused my health to break down.*

*However, here I am, I keep working to improve my practice and balance all aspects of my life in order to continue being a great professional and a good person for the people around me.*



# Rochy Flint

Columbia University  
New York City | USA

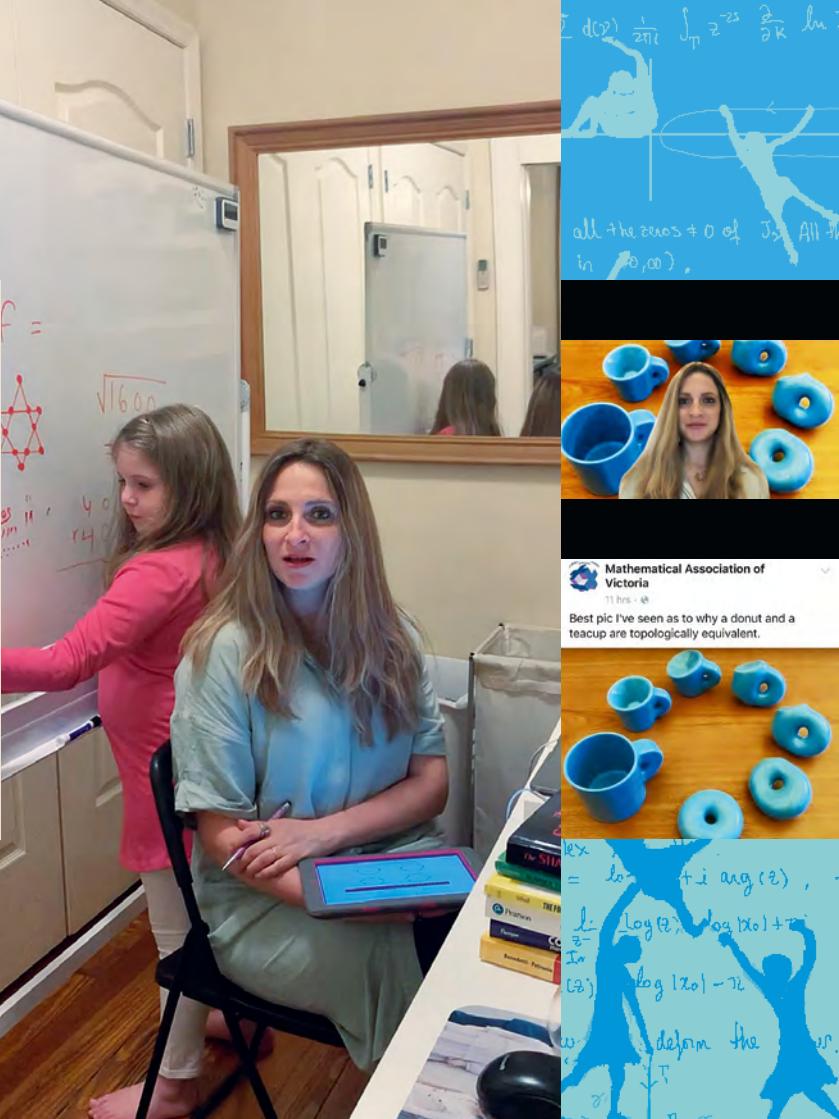
Longitude: 74° W

Welcome to my Covid era workspace.

It's an alcove within my bedroom and this is the space where I teach, I conduct my research, my collaboration, all meetings – everything happens within this space.

I also get to do homework with the children, sort some laundry.

One thing I am quite grateful for in this era is to have something called Zoom virtual backgrounds.





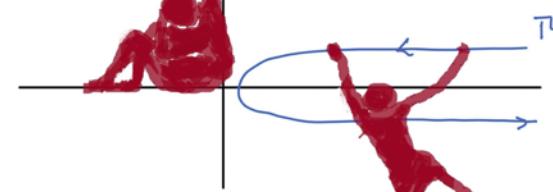
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based on board by  
Clara Aldana

*Due to my personal situation, the pandemic has affected me enormously.*

*In general, my work stopped being something that I enjoyed and changed into something that I do because it is my duty. The situation has been very difficult and overwhelming.*

$\Gamma$  in  $(0, \infty)$ .  
volume  $\pi$  that  $y \neq 0$ . Notice over  $\Gamma$  is let  $\log$ , the complex  $z = re^{i\theta}$ ,  $\theta \in [0, 2\pi]$   
 $\log(z) = \log(r) + i\arg(z)$ ,  
 $\theta \in [0, 2\pi]$ ,  $\log(z_0) = \log|z_0| + i\arg(z_0)$   
 $\log(z) = \log|z| + i\arg(z)$ ,  $\arg(z) \in (-\pi, \pi]$

$$\zeta_N(s) = \sum d(\nu) \frac{1}{2\pi i} \int_{\Gamma} z^{-2s} \frac{\partial}{\partial k} \ln J_\nu(z) dz, \nu \geq 0$$



$\Gamma$  contains all the zeros  $\neq 0$  of  $J_\nu$ . All the zeros of  $J_\nu$  are contained in  $(0, \infty)$ .

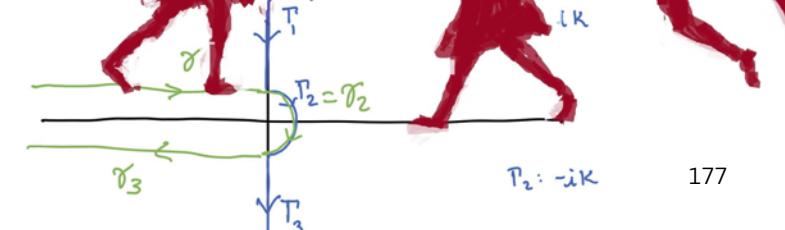
let us assume now that  $y \neq 0$ . Notice that  $\ln$  in the integral over  $\Gamma$  should be  $\log$ , the principal branch of the complex logarithm.

$$\log(z) = \log|z| + i\arg(z), -\pi < \arg(z) < \pi$$

$$\text{For } z_0 < 0, \frac{d}{dz} \log(z) = \frac{1}{z} \log|z_0| + \pi i$$

$$\frac{d}{dz} \log(z) = \frac{1}{z} \log|z_0| - \pi i$$

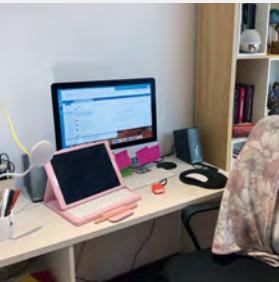
Now we will deform the contour.



# Eddy Pariguan

Pontifical Javerian University  
Bogotá | Colombia

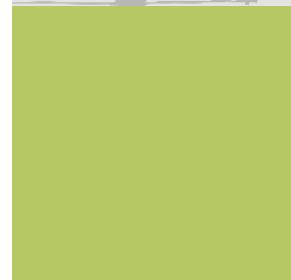
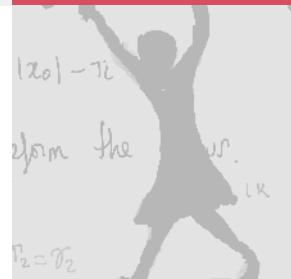
Longitude: 75° W



*In times of the pandemic, my workload has significantly increased.*

*Spending so many hours in front of the computer has caused my vision and my health to deteriorate.*

*I really miss the classroom and interacting with my students.*



## Astrid Olave

National University of Colombia  
Bogotá | Colombia

Longitude: 75° W

*The pandemic has brought blessings like sharing more with my family, not losing time in the traffic and working every day with this tranquil view.*

*Yet, I hope to return to the University, because definitely, mathematics can better be known, learned and done in person.*



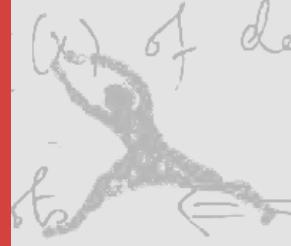
## Ivon Dorado

National University of Colombia  
Bogotá | Colombia

Longitude: 75° W



*The uncertainty brought by the pandemic has been absolutely exhausting. For me it is very hard seeing the difficult and diverse situations my students have to face. And we women, especially some women in mathematics, are leading a process to get support for them. We have also created a group to study gender equity issues within our faculty. There are some assets, but the time I could spend in research has been minimal.*



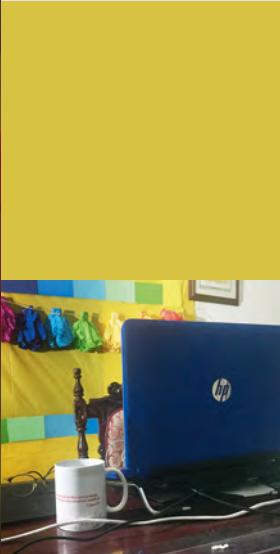
## Diana Toquica

National University of Colombia  
Bogotá | Colombia

Longitude: 75° W



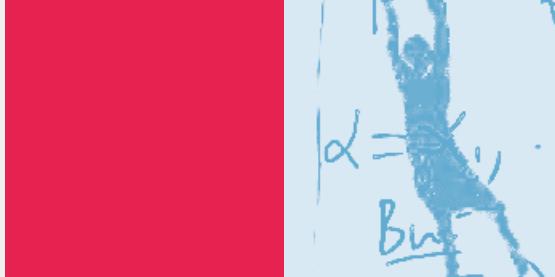
*In this pandemic, I have realised, how strong, able and brave I can be. Now I know that I can achieve anything.*



## Jeanette Shakalli

Panamanian Foundation  
for the Promotion of Mathematics  
Panama City | Panama

Longitude: 79° W



*Due to the pandemic, we had to transform all our in-person activities to virtual events, which are free and open to the general public. Thanks to the virtuality, we have been able to create a community of students, teachers, parents and the general public interested in discovering and exploring the beauty and richness of mathematics.*

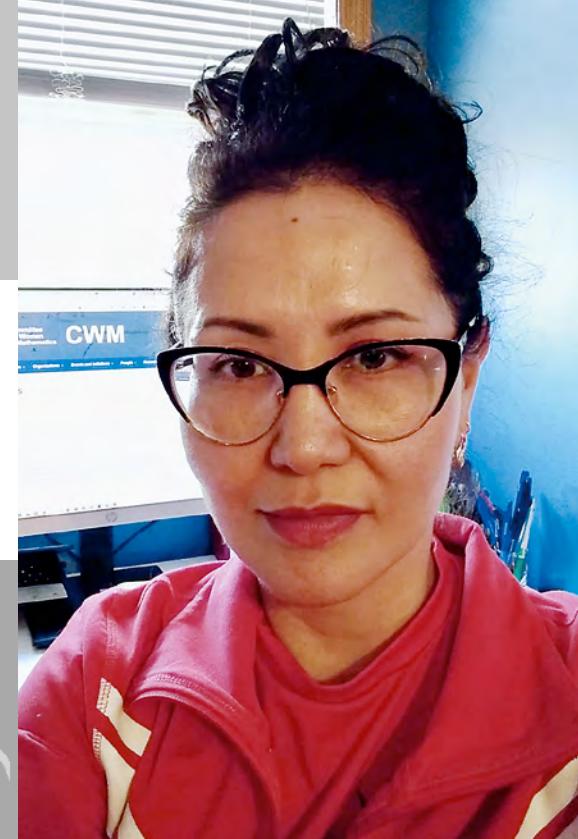


## Bakhyt Alipova

University of Kentucky  
Campton | USA

Longitude: 84° W

*I started doing more of the research that had always been left for later – fundamental research, computing, virtual discussion with colleagues and students. Maybe it was useful, but live communication is very lacking!*



## Sujatha Ramdorai

University of British Columbia  
Vancouver | Canada

Longitude: 124° W



*The Covid pandemic has caused deep disruptions in all walks of life, around the world, and academics is not an exception.*

*While it might appear that using technology for online teaching renders less disruption, the opposite is true.*



*It is distressing to see students struggling to absorb material and learn math, while they are scattered along different time zones and geographies.*

*It leaves us teachers feeling frustrated as much as the students.*

*As a woman researcher who is already coping with a chronic health issue, having to navigate technology that keeps changing every week, is extremely stressful.*

*The difficulty in not being able to discuss research projects with collaborators and students face to face severely compromises effectiveness in communication.*

*A sense of academic claustrophobia and all the distractions that come with „working from home“ leaves one feeling weary and anxious. Access to journals and books is not easy and this further slows down progress.*

*While there are common issues faced by all researchers, some aspects of coping with the pandemic is more burdensome for women.*



*I worry about the younger researchers without tenure and also about the school girls who might never return back to school post pandemic in India.*

*We should ensure ways to address these problems that are likely to remain for the next several years and see that the gender gap does not become permanent and more accentuated because of the pandemic.*

Completion of proof:  $G = \text{Aut}_F K$ ; given  $K^G = F$

$|K|$  Need to show  $K_F$  is normal.  
 $\Leftrightarrow K$  is the spl. fld. of a set of  
 $F$  polynomials on  $F$ .

Let  $a \in K$  s.t.  $K = f(a)$ . Let

$$p(x) = \prod_{\sigma \in G} (x - \sigma(a))$$

$p(x) = p(x)$  | Coefficients of  $p(x)$   
 $\text{are expressible in terms}$   
 $\text{of elementary symmetric}$   
 $\text{polynomials of roots.}$

Hence  $\phi(a) \in F[x]$ .

Clearly  $K$  splits

$p(x)$ , hence  $K$   
 is a normal  
 extension of  $F$ .  $\blacksquare$

Ran. Suppose  $\text{char } F \neq 0$ .  $K_F^{\text{finite}}$   
 $K_F$  is normal  $\Leftrightarrow [K : F] \leq [K : F]$

$K_F/F$  and  $K_F$  are normal.  
 $\sigma \in \text{Aut}_F K$ , then  $\sigma(\alpha)$  is again  
 a root of  $f(x)$ , so  $\sigma(\alpha) = \alpha_j$ ,  
 for some  $j$ ,  $1 \leq j \leq n$ , where

$\alpha = \alpha_1, \dots, \alpha_n$  are the roots of  $f(x)$ .  
 But  $\theta = \theta = \sum_{i=1}^{n-1} \alpha_i \cdot \alpha_j^i$

$\Rightarrow$  The polynomial  $g(x)$  of degree  $n$   
 has  $n$  distinct roots  $\Leftrightarrow$   
 forces  $g(x) = 0$ ;  $\Rightarrow \alpha_0 - \theta = 0$   
 $\therefore \theta = \alpha_0$   
 $\Rightarrow \theta \in F$

If: Clearly  $K^G \supseteq F$ ; need to show  $K^G \subseteq F$

Proof by induction on  $[K : F] = n$

Assume true for  $K_F$  normal with  
 $[K : F] < n$ . Then if  $K_F$  with  
 $[K_i : F_i] < [K : F]$ , then assertion is true

Let  $\theta \in K^G$ , need to show  $\theta \in F$

Suppose  $f(x) \in F[x]$  is irreducible of deg  $r$  and  $f$   
 splits completely in  $K$ . Let  $\alpha \in K$  be one of the roots of  $f$ .  
 Write  $f(x) = (x - \alpha) \cdot g(x)$ , with  $\deg g(x) < r$ .

Put:  $F_1 = F(\alpha)$ ,  $G_1 = \text{Aut}_{F_1} K$ .

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for Mathematical Sciences

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