



Welcome to the
PhD Summer School on Neutrinos 2021

Here, There & Everywhere

THE NIELS BOHR INTERNATIONAL ACADEMY

Auditorium A at NBI anno 1930



Auditorium A at NBI anno 1930



Wolfgang Pauli

Offener Brief an die Gruppe der Radioaktiven bei der
Gauvereins-Tagung zu Tübingen.

Abschrift

Physikalisches Institut
der Eidg. Technischen Hochschule
Zürich

Zürich, 4. Dez. 1930
Olariastrasse

1 Liebe Radioaktive Damen und Herren,

Wie der Ueberbringer dieser Zeilen, den ich kühnlichst
ansuhören bitte, Ihnen des näheren auseinandersetzen wird, bin ich
angesichts der "falschen" Statistik der N- und Li-6 Kerne, sowie
des kontinuierlichen beta-Spektrums auf einen verweifelten Ausweg
verfallen um den "Wechselsatz" (1) der Statistik und den Energiesatz
zu retten. Nämlich die Möglichkeit, es könnten elektrisch neutrale
Teilchen, die ich Neutronen nennen will, in den Kernen existieren,
welche den Spin $1/2$ haben und das Ausschlussprinzip befolgen und
sich von Lichtquanten ausserdem noch dadurch unterscheiden, dass sie
nicht mit Lichtgeschwindigkeit laufen. Die Masse der Neutronen
müsste von derselben Grössenordnung wie die Elektronenmasse sein und
jedenfalls nicht grösser als 0,01 Protonenmasse. Das kontinuierliche
beta-Spektrum wäre dann verständlich unter der Annahme, dass beim
beta-Zerfall mit dem Elektron jeweils noch ein Neutron emittiert
wird, derart, dass die Summe der Energien von Neutron und Elektron
konstant ist.

Mun handelt es sich weiter darum, welche Kräfte auf die
Neutronen wirken. Das wahrscheinlichste Modell für das Neutron scheint
mir aus wellenmechanischen Gründen (näheres weiss der Ueberbringer
dieser Zeilen) dieses zu sein, dass das ruhende Neutron ein
magnetischer Dipol von einem gewissen Moment μ ist. Die Experimente
verlangen wohl, dass die ionisierende Wirkung eines solchen Neutrons
nicht grösser sein kann, als die eines gamma-Strahls und darf dann
wohl nicht grösser sein als $e \cdot (10^{-13} \text{ cm})$.

Ich traue mich vorläufig aber nicht, etwas über diese Idee
zu publizieren und wende mich erst vertrauensvoll an Euch, liebe
Radioaktive, mit der Frage, wie es um den experimentellen Nachweis
eines solchen Neutrons stände, wenn dieses ein ebensolches oder etwa
10mal grösseres Durchdringungsvermögen besitzen würde, wie ein
gamma-Strahl.

Ich gebe zu, dass mein Ausweg vielleicht von vornherein
wenig wahrscheinlich erscheinen wird, weil man die Neutronen, wenn
sie existieren, wohl schon längst gesehen hätte. Aber nur wer wagt,
ganz und der Ernst der Situation beim kontinuierlichen beta-Spektrum
wird durch einen Ausspruch meines verehrten Vorgängers im Amt,
Herrn Debye, beleuchtet, der mir kürzlich in Brüssel gesagt hat:
"O, daran soll man am besten gar nicht denken, sowie an die neuen
Steuern." Darum soll man jeden Weg zur Rettung ernstlich diskutieren.
Also, liebe Radioaktive, prüfet, und richtet. Leider kann ich nicht
persönlich in Tübingen erscheinen, da ich infolge eines in der Nacht
vom 6. zum 7. Dez. in Zürich stattfindenden Balles hier unabkömmlich
bin. Mit vielen Grüssen an Euch, sowie an Herrn Back, Euer
untertänigster Diener

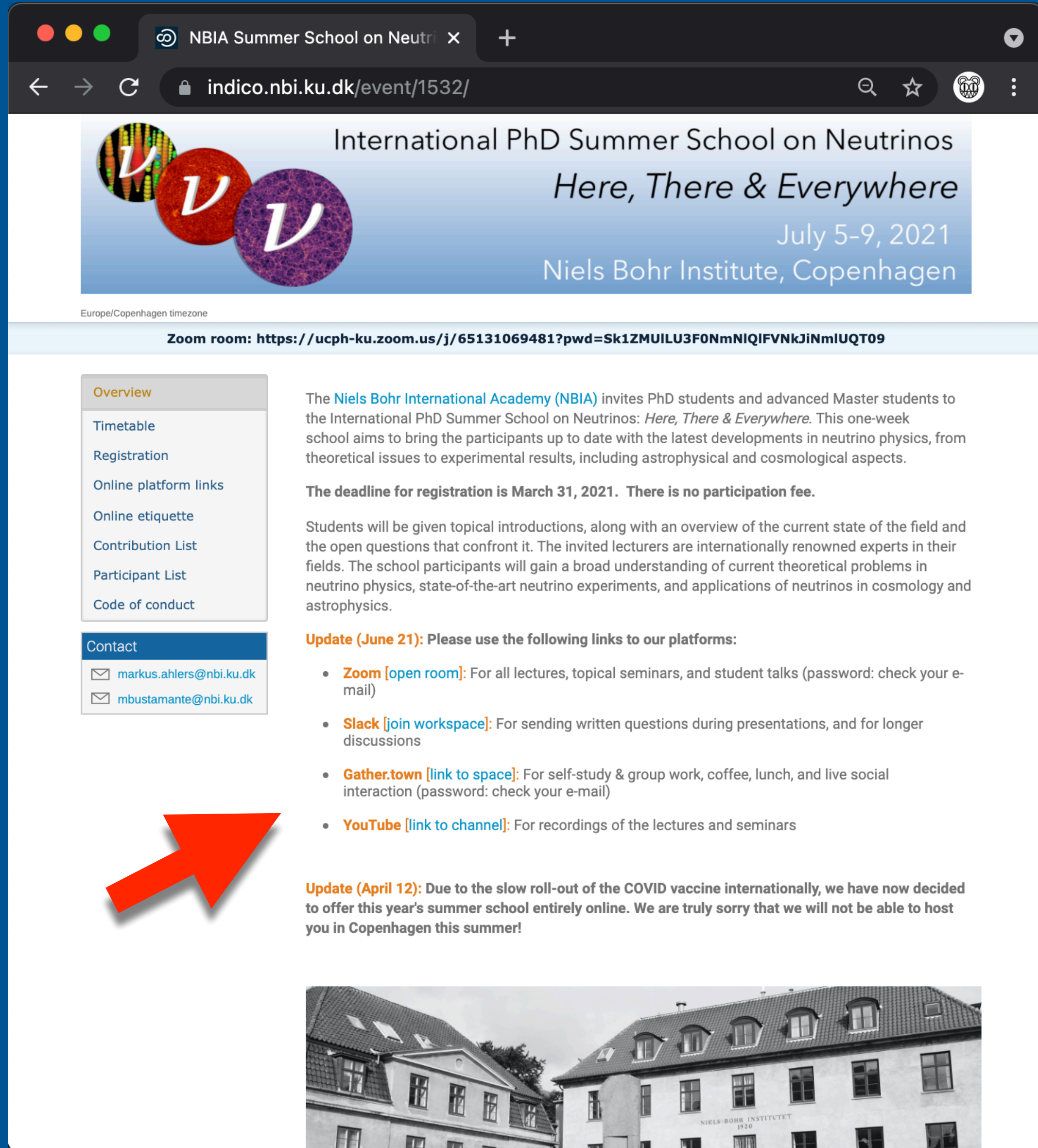
ges. W. Pauli

1. Dear Razioactive Ladies and Gentlemen!
2. I have hit upon a desperate remedy to save...the law of conservation of energy.
3. ...there could exist electrically neutral particles, which I will call neutrons, in the nuclei...
4. The continuous beta spectrum would then make sense with the assumption that in beta decay, in addition to the electron, a neutron is emitted such that the sum of the energies of neutron and electron is constant.
5. But so far I do not dare to publish anything about this idea, and trustfully turn first to you, dear radioactive ones, with the question of how likely it is to find experimental evidence for such a neutron...
6. I admit that my remedy may seem almost improbable because one probably would have seen those neutrons, if they exist, for a long time. But nothing ventured, nothing gained...
7. Thus, dear radioactive ones, scrutinize and judge.

Organization

- Zoom (PW: neutr!no)
 - for all lectures, topical seminars, and student talks
- YouTube
 - for recordings of the lectures and seminars
- Slack
 - for sending written questions during presentations, and for longer discussions
- gather.town (PW: neutr!no)
 - for self-study & group work, coffee, lunch, and live social interaction

All Info on Indico (www.nbia.dk/neutrino2021)



International PhD Summer School on Neutrinos
Here, There & Everywhere
July 5-9, 2021
Niels Bohr Institute, Copenhagen

Europe/Copenhagen timezone

Zoom room: <https://ucph-ku.zoom.us/j/65131069481?pwd=Sk1ZMUIlU3F0NmNIQlFVNkjiNmIUQT09>

Overview

The [Niels Bohr International Academy \(NBIA\)](#) invites PhD students and advanced Master students to the International PhD Summer School on Neutrinos: *Here, There & Everywhere*. This one-week school aims to bring the participants up to date with the latest developments in neutrino physics, from theoretical issues to experimental results, including astrophysical and cosmological aspects.

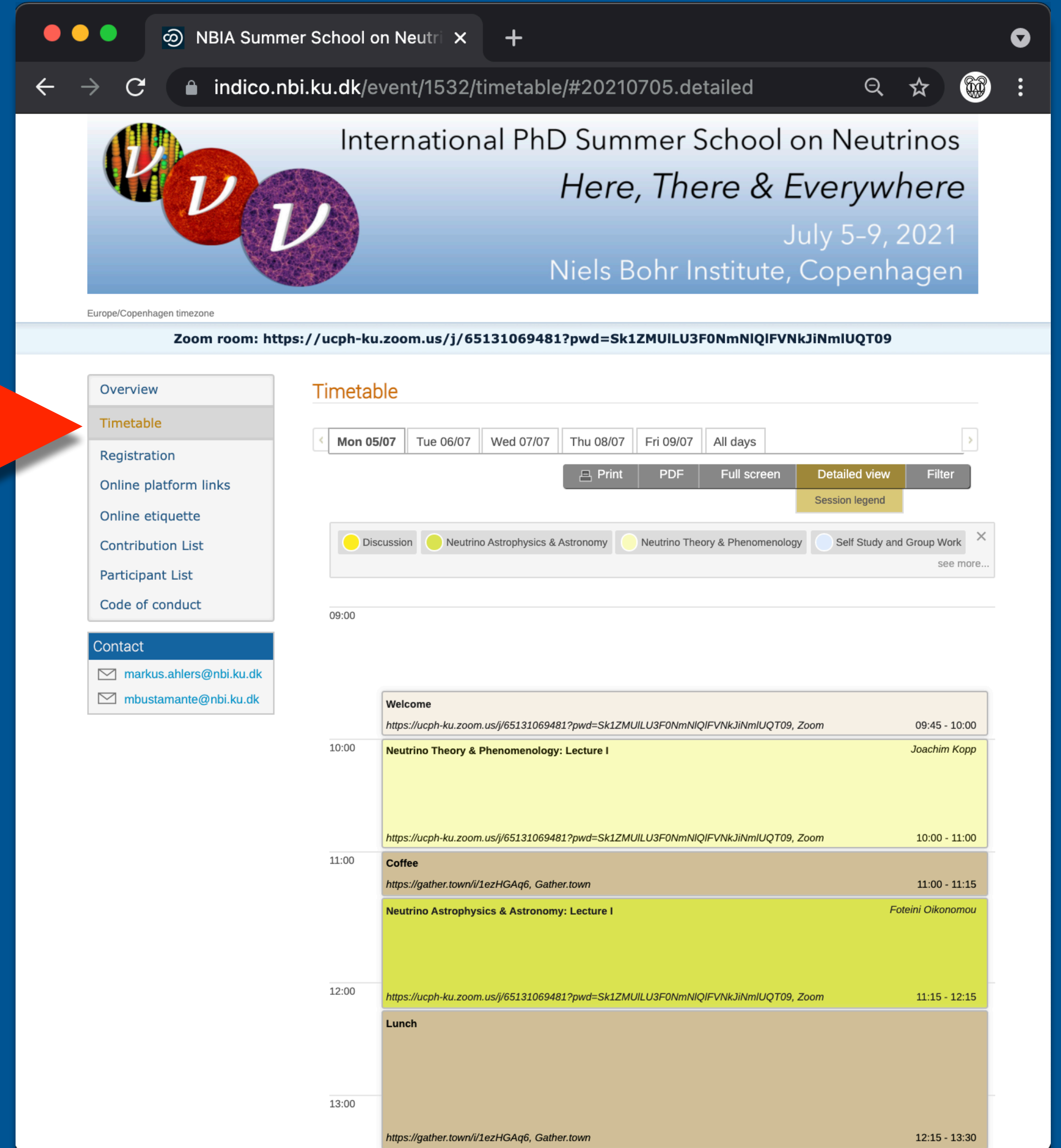

The deadline for registration is March 31, 2021. There is no participation fee.

Students will be given topical introductions, along with an overview of the current state of the field and the open questions that confront it. The invited lecturers are internationally renowned experts in their fields. The school participants will gain a broad understanding of current theoretical problems in neutrino physics, state-of-the-art neutrino experiments, and applications of neutrinos in cosmology and astrophysics.

Update (June 21): Please use the following links to our platforms:

- Zoom** [open room]: For all lectures, topical seminars, and student talks (password: check your e-mail)
- Slack** [join workspace]: For sending written questions during presentations, and for longer discussions
- Gather.town** [link to space]: For self-study & group work, coffee, lunch, and live social interaction (password: check your e-mail)
- YouTube** [link to channel]: For recordings of the lectures and seminars

Update (April 12): Due to the slow roll-out of the COVID vaccine internationally, we have now decided to offer this year's summer school entirely online. We are truly sorry that we will not be able to host you in Copenhagen this summer!



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Timetable

Mon 05/07 Tue 06/07 Wed 07/07 Thu 08/07 Fri 09/07 All days

Print PDF Full screen Detailed view Filter

Session legend

Discussion Neutrino Astrophysics & Astronomy Neutrino Theory & Phenomenology Self Study and Group Work

09:00

09:45 - 10:00	Welcome https://ucph-ku.zoom.us/j/65131069481?pwd=Sk1ZMUIlU3F0NmNIQlFVNkjiNmIUQT09 , Zoom	Joachim Kopp
10:00 - 11:00	Neutrino Theory & Phenomenology: Lecture I https://ucph-ku.zoom.us/j/65131069481?pwd=Sk1ZMUIlU3F0NmNIQlFVNkjiNmIUQT09 , Zoom	
11:00 - 11:15	Coffee https://gather.town/i/1ezHGAq6 , Gather.town	
11:15 - 12:15	Neutrino Astrophysics & Astronomy: Lecture I https://ucph-ku.zoom.us/j/65131069481?pwd=Sk1ZMUIlU3F0NmNIQlFVNkjiNmIUQT09 , Zoom	Foteini Oikonomou
12:15 - 13:30	Lunch https://gather.town/i/1ezHGAq6 , Gather.town	

Zoom Background

PhD Summer School on Neutrinos 2021
THE NIELS BOHR INTERNATIONAL ACADEMY



Here,
There &
Everywhere

Discussions via Slack

The screenshot shows a Slack interface for the workspace "NBIA Neu...". The left sidebar contains a list of channels: #discussion_sessi..., #general (selected), #lectures_astro, #lectures_cosmo, #lectures_theory, #random, #self_study, #student_talks, #topical_seminars, and an "Add channels" button. Below the channels are direct messages with several participants, including Markus Ahlers, Ankur Nath, Damiano Fiorillo, Foteini Oikonom..., Gabriela Rodrigu..., Ian Padilla-Gay, Jessica Lastow, Simon Chiche, and Tetiana Kozynets.

The main area displays the "# general" channel. At the top, there is a search bar with the text "Search NBIA Neutrino Summer School 2021" and a notification icon. Below the channel name, there are links to various tools: 1 Pinned, Zoom room, Gather.town, YouTube, Timetable, and World Clock. A pinned message by Mauricio Bustamante, dated 3:11 PM, is shown. The message content is as follows:

Mauricio Bustamante 3:11 PM

Dear all,

The NBIA Neutrino Summer School "Here, There & Everywhere" starts tomorrow, Monday, July 5, at 09:45 sharp (Central European Summer Time)! Find your local time on the [World Clock](#).

We meet on Zoom for all lectures, topical seminars, and student talks:
ucph-ku.zoom.us/j/65131069481?pwd=Sk1ZMUlLU3F0NmNIQlFVNkjiNmIUQT09
[Password (please do not share it): neutr!no]

Important links:

- School timetable: indico.nbi.ku.dk/event/1532/timetable
- Gather.town: For self-study & group work, coffee, lunch, and live social interaction: gather.town/i/1ezHGAq6 [password (please do not share it): neutr!no]
- YouTube: For recordings of the lectures and seminars: www.youtube.com/channel/UCYAN7o4WtgzjxbeJf0SqZnw

What you need to do before the conference (important!):

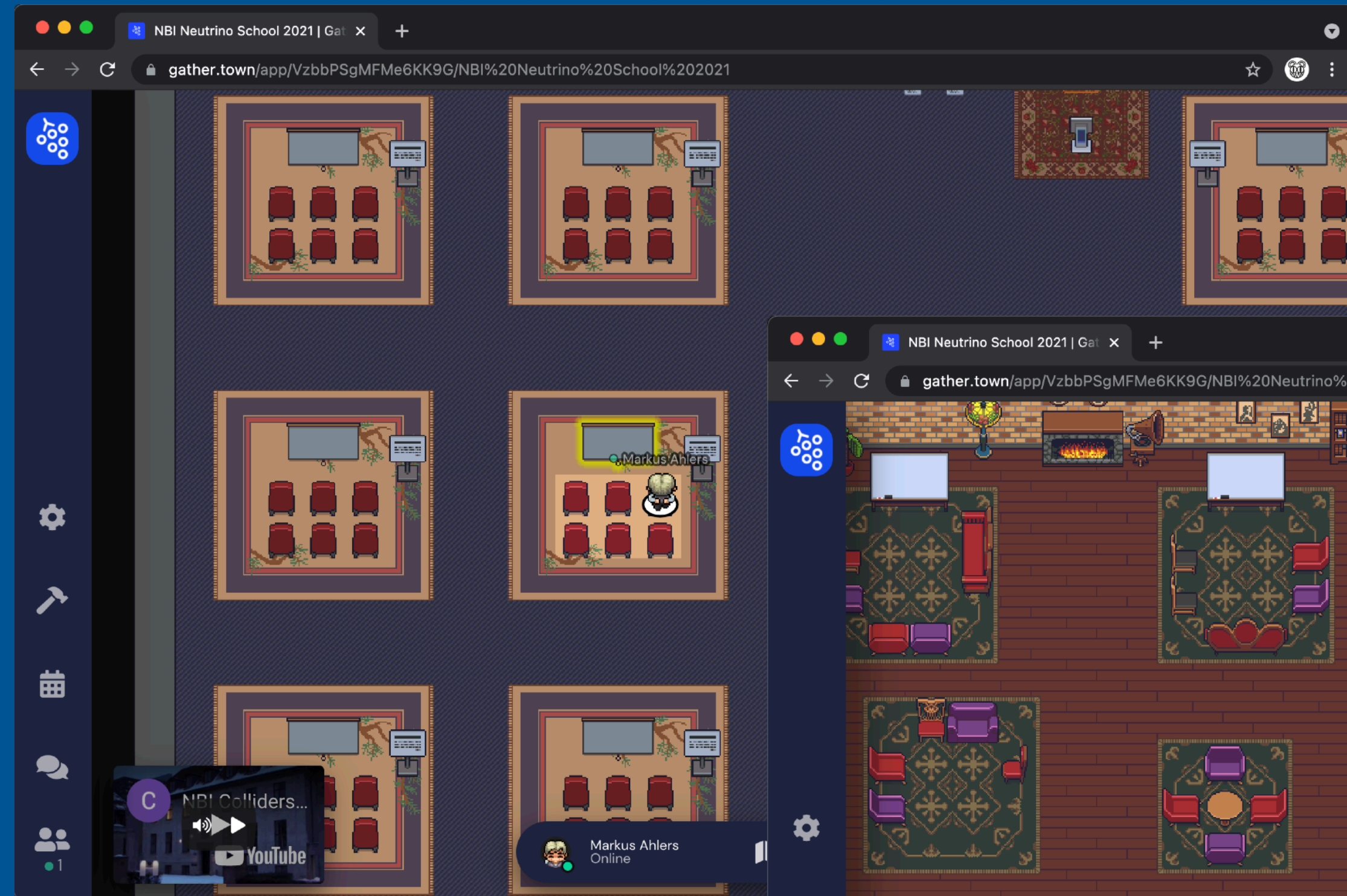
- Install the Zoom client and create a Zoom user if you do not have one (zoom.us)
- If you are giving at talk, find the day and time of your talk
- Sign up to gather.town and explore the school rooms
- Subscribe to the School YouTube channel
- **Please upload your slides (as pdf), at the latest, on the morning before your talk (contact us if you have problems)**

You can [download an NBI-themed Zoom background](#) to use when giving your talk. This is a picture of Niels Bohr's office at the NBI.

We are available to help you; you can contact us via Slack (preferred) or e-mail. We are looking forward to seeing you tomorrow!

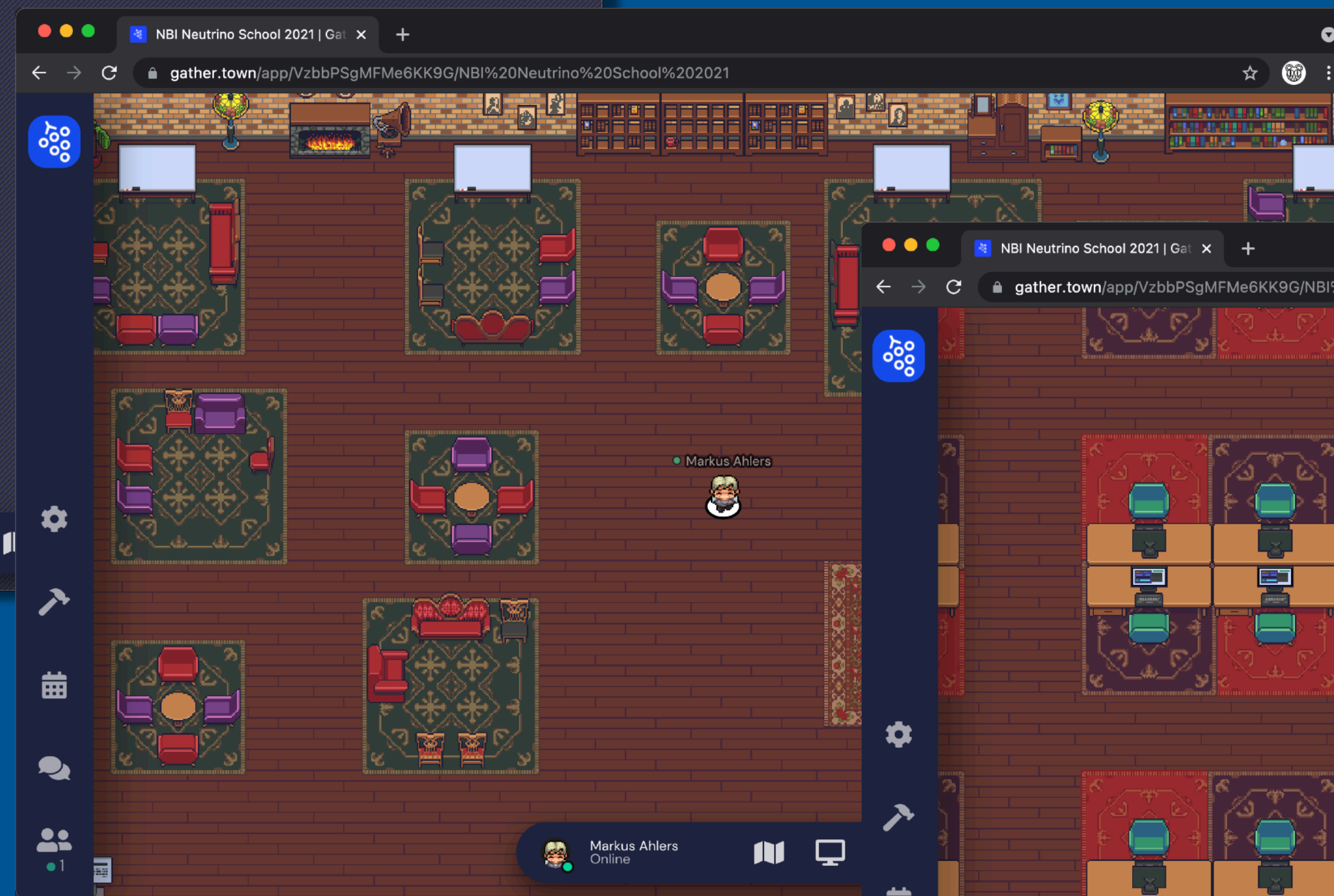
At the bottom, there is a message input field with the placeholder text "Send a message to #general" and a rich text editor toolbar with icons for bold, italic, link, code, and other formatting options.

Coffee Breaks & Workspace in gather.town

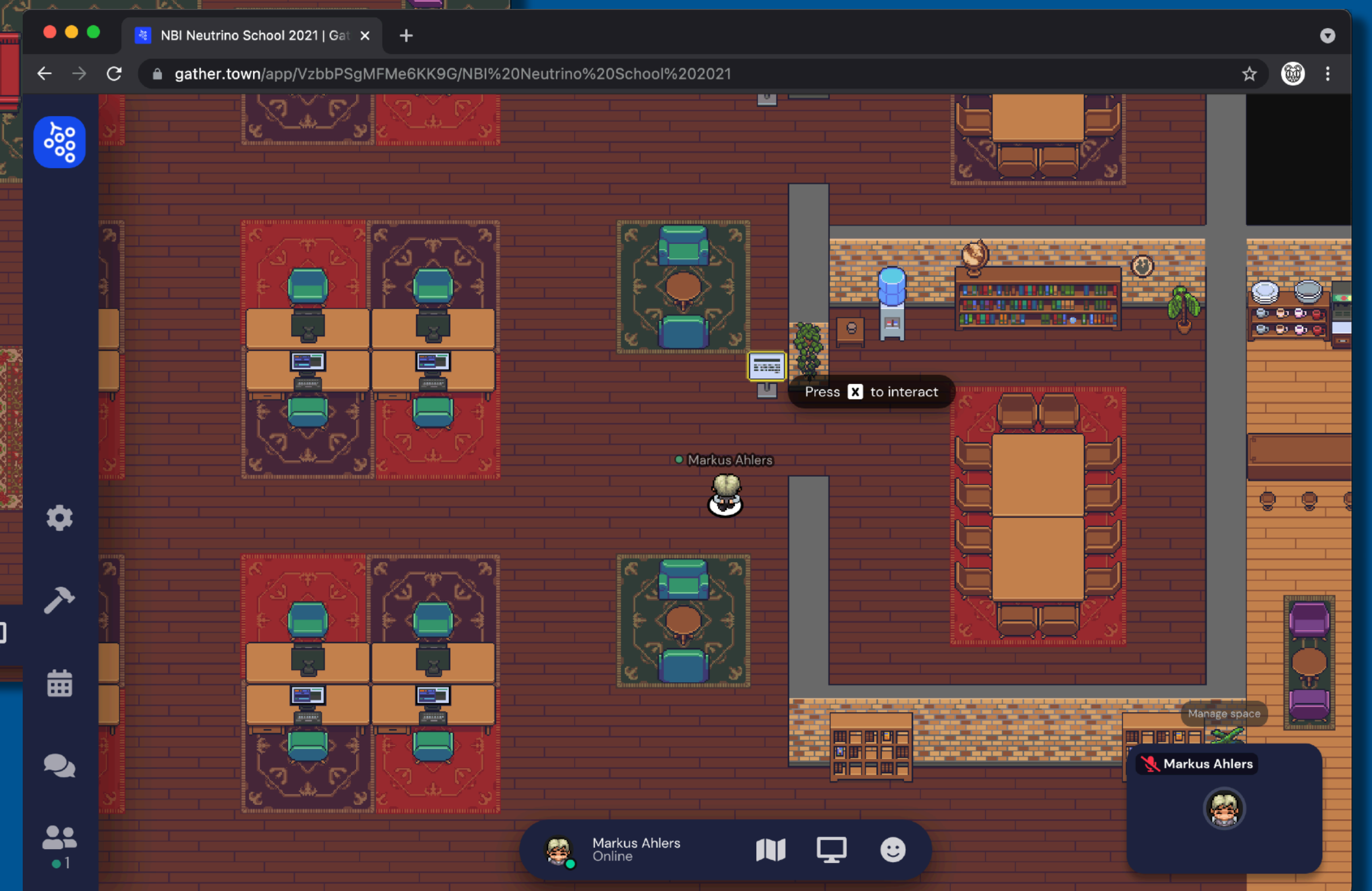


lecture videos

coffee break & discussions



workspace



Lecture Topics

Here



Neutrino Theory
& Phenomenology

Joachim Kopp

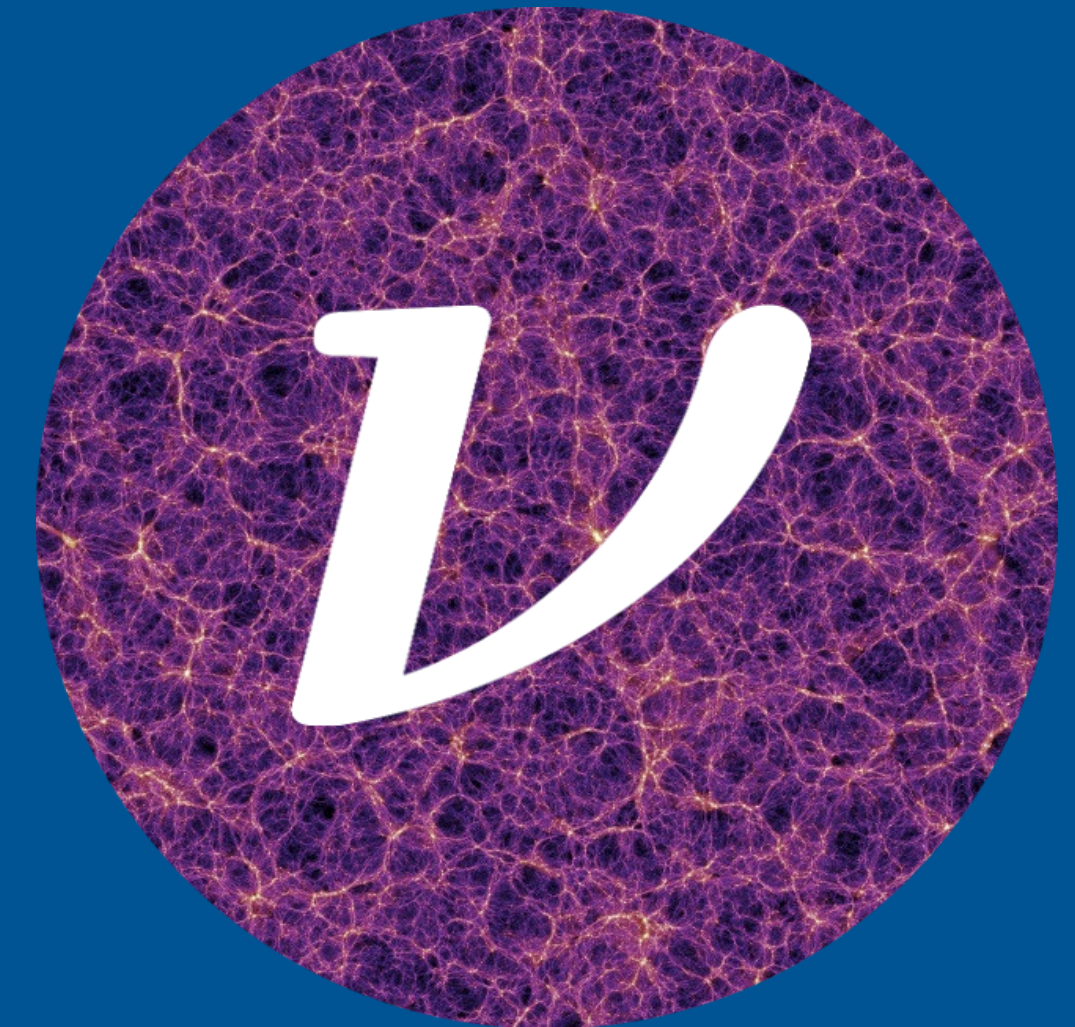
There



Neutrino Astrophysics
& Astronomy

Foteini Oikonomou

Everywhere



Neutrino Cosmology

Olga Mena

+ topical seminars by NBI members

Local Organizers

If you have questions don't hesitate to get in contact with us:

Markus Ahlers

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Slack: @Markus Ahlers

Mauricio Bustamante

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Slack: @Mauricio Bustamante