

**13th AYPT
Austrian Young Physicists'
Tournament**

Leoben, Austria

May 5th - May 7th 2011



Dear guests,

as the new president of AYPT it's a great pleasure for me to welcome you to Leoben. We're meeting for the 13th time already to discuss complex and intriguing physics problems – not only in the competition but also during the meals and the evenings. I'm looking forward to meeting old friends from all over the world and finding new ones.

I wish to thank all the people and institutions who make this event possible: The Montanuniversität Leoben, the numerous sponsors and of course the local organizing team.



Martin Hopf
President AYPT – Forschungsforum junger Physiker

Dear participants and visitors of the 13th AYPT!

What is the point in breaking spaghetti, documenting results and making theories under what conditions they won't break? Richard Feynman once said, reflecting on the saying "The whole universe is in a glass of wine.", that it is true that if we look at a glass of wine closely enough we see the entire universe.

Apart from gaining deeper insight into the universe through uncommon means such as breaking spaghetti, the participants gain valuable skills – presenting their findings, structuring their arguments, discussing – all in a foreign language.

I want to thank all our sponsors, helpers, jurors, the participants and their parents for having understood just that. So once more I am glad to welcome you to Leoben and looking forward to sharing a glass of wine with good friends!

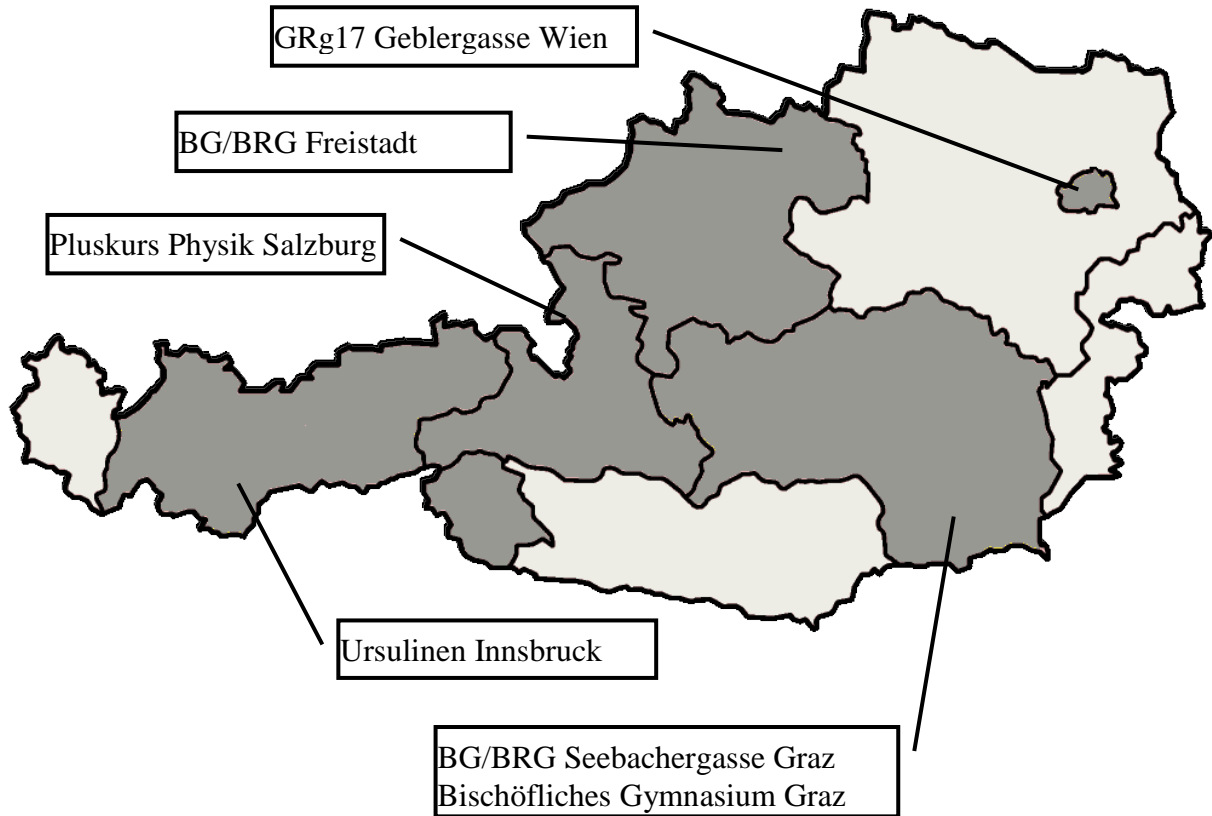


Gerhard Haas
Chief of the Local Organizing Committee

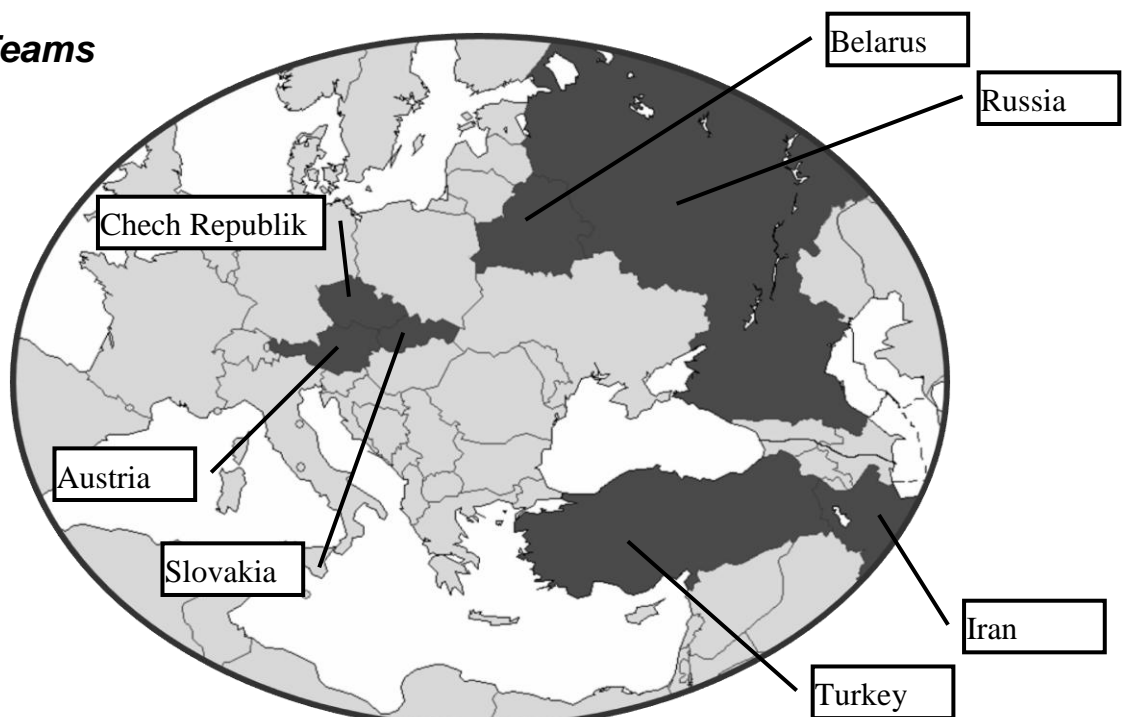


Teams participating in the 13th AYPT 2011

Austrian Teams



Foreign Teams





Official Schedule for the AYPT 2011

Note: This schedule may be subject to change. A representative from each team should check for the latest information each morning at the information desk.

Thursday, May 05th 2011

- **Arrival:** Participants are accommodated at Arcotel Hotel Kongress Leoben, Hauptplatz 1, 8700 Leoben, phone: +43 3842 468 00 and are asked to meet at the reception desk at 05.30pm.
- **06.00 pm:** Opening ceremony, drawing lots at the Aula of the Montanuniversität, afterwards: Dinner at Arcotel
- **After Dinner (07.30pm approx.):** Meeting of Teamleaders with Organizing Committee, at Arcotel

Friday, May 06th 2011

- **08.30 am:** Jury Briefing (Office Room)
- **09.00 am:** First Selective Fight
- **01.00 pm:** Lunch
- **02.30 pm:** Second Selective Fight
- **07.00 pm (approx.):** Barbecue party in the court of BG/BRG neu

Saturday, May 07th 2011

- **09.00 am:** Third Selective Fight (Teams may choose problem)
- **01.00 pm (approx.):** Lunch
- **02.00 pm:** Finals
- **afterwards:** Winner's ceremony, closing ceremony
- **05.30 pm (approx.):** AOC meeting
- **afterwards:** Departure

If not stated otherwise, all activities take place at the Montanuniversität Leoben.



Fight Schedule

This table will be used to determine which teams will compete in which groups. At the opening ceremony each team will be associated with a number, by lot. By filling out the table below, putting each team next to its number, the fight schedule will be obtained. This table is intended for 10 teams. If one (or more) of the registered team(s) drop out, a new table will be distributed before the drawing of lots.

First Selective Fight

Group A	
Reporter	Lot 1
Opponent	Lot 2
Reviewer	Lot 3
Group B	
Reporter	Lot 4
Opponent	Lot 5
Reviewer	Lot 6
Group C	
Reporter	Lot 7
Opponent	Lot 8
Reviewer	Lot 9
Group D	
Reporter	Lot 10
Opponent	Lot 11
Reviewer	Lot 12

Second Selective Fight

Group A	
Reporter	Lot 8
Opponent	Lot 6
Reviewer	Lot 10
Group B	
Reporter	Lot 11
Opponent	Lot 9
Reviewer	Lot 1
Group C	
Reporter	Lot 2
Opponent	Lot 12
Reviewer	Lot 4
Group D	
Reporter	Lot 5
Opponent	Lot 3
Reviewer	Lot 7

Third Selective Fight

Group A	
Reporter	Lot 6
Opponent	Lot 7
Reviewer	Lot 11
Group B	
Reporter	Lot 9
Opponent	Lot 10
Reviewer	Lot 2
Group C	
Reporter	Lot 12
Opponent	Lot 1
Reviewer	Lot 5
Group D	
Reporter	Lot 3
Opponent	Lot 4
Reviewer	Lot 8



The Regulations of the Austrian Young Physicists' Tournament

I. Austrian Young Physicists' Tournament

The Austrian Young Physicists' Tournament (AYPT) is a competition among teams of secondary school students in their ability to solve complicated scientific problems, to present solutions to these problems in a convincing form and to defend them in scientific discussions, called Physics Fights (PF). It is carried out by the association "AYPT – Forschungsforum junger Physiker" according to the articles of association, appendix A. The Austrian Organizing Committee (AOC) for the AYPT is selected by the Executive Committee (EC) of the association.

II. The problems of the AYPT

The problems of the AYPT will be the same as for the IYPT (International Young Physicists' Tournament), in accordance with article II. of the Regulations of the International Young Physicists' Tournament. The Executive Committee, however, may exclude some of the IYPT problems. The decision about chosen and excluded problems has to be made public not later than on the 15th of December. If no choice is made public until December 15th all IYPT problems will be used for the AYPT.

III. The participants of the AYPT

1. *The Austrian teams:* Any Austrian secondary high school may send one (or more) team(s) to the AYPT.
2. *Foreign teams:* The AOC may invite any number of foreign teams. Those teams compete in the same way as the others but they are not taken into account when compiling the Austrian National Team (see Section XIV).
3. *The membership of the teams:* The AYPT team is composed of five secondary school students. The secondary school graduates could participate in the AYPT in the year of their graduation. The participation of university students is not allowed. The AOC may allow participation of teams of four or three students. The composition of the team cannot be changed during the Tournament. The team is headed by a captain who is the official representative of the team during the PF.
4. The team is accompanied by a team leader.

IV. The Jury

The Jury is nominated and organized by the AOC. Team leaders may be included in the Jury. The team leaders cannot be members of the Jury in the PF where their teams participate and should not, if possible, grade any one team more than twice. Moreover team leaders should (if possible) not be chairman of the Jury.

V. The agenda of the AYPT

The agenda of the AYPT is to set up an Austrian National Team which will be sent to the International Young Physicists' Tournament (IYPT).

The AYPT is carried out in a period determined by the AOC.

All teams participate in the Selective PFs. Selective PFs are carried out according to a special schedule determined by the AOC according to the number of participating teams, following the rule that, if possible, no team meets another team more than twice. This schedule should be known before numbers are ascribed to the teams by lot. The best teams participate in the Final PF.



VI. The Physics Fight regulations

Three or four teams participate in a PF, depending on the total number of teams. In the course of a PF the members of a team communicate only with each other.

Before the beginning of a PF, the Jury and the teams are introduced by the chairman and the captains, respectively.

The PF is carried out in three (or four) Stages. In each Stage, a team plays one of the three (four) roles: Reporter, Opponent, Reviewer (Observer). In the following Stages of the PF, the teams change their roles according to the scheme:

Three teams PF

Stage	1	2	3
1	Rep	Rev	Opp
2	Opp	Rep	Rev
3	Rev	Opp	Rep

Four teams PF

Stage	1	2	3	4
1	Rep	Obs	Rev	Opp
2	Opp	Rep	Obs	Rev
3	Rev	Opp	Rep	Obs
4	Obs	Rev	Opp	Rep

Every PF is attended by at least one so-called "Fight Assistant" (FA).

The tasks of the FA are:

- The FA handles the PF clock and helps the chairman of the Jury to take care that the specified times are not exceeded.
- In case of technical problems the FA helps the teams with presentation devices provided by the organizers such as TV sets, VHS video recorders, video beamers, ...
- The FA writes down all jury grades to a special grading form and takes care that all jury members sign that form to confirm correctness.
- If possible the FA calculates the result of the PF using a computer program and announces the result as soon as all jury members have confirmed and signed the grading form.
- The FA assists the chairman of the Jury in taking care that all teams follow the regulations of the tournament.

VII. The Stage regulations

<i>The performance order in the Stage of a PF:</i>	<i>Reserved time in minutes:</i>
The Opponent challenges the Reporter for the problem	1
The Reporter accepts or rejects the challenge	1
Preparation of the Reporter	5
Presentation of the report	12
Questions of the Opponent to the Reporter and answers of the Reporter	2
Preparation of the Opponent	3
The Opponent takes the floor, maximum 5 min. and discussion between the Reporter and the Opponent	15
Questions of the Reviewer to the Reporter and the Opponent and answers to the questions	3
Preparation of the Reviewer	2
The Reviewer takes the floor	3
Concluding remarks of the Reporter	2
Questions of the Jury	5

In the Final PF the procedure of challenge is omitted.



The official language of the AYPT is English. During a PF every communication between the competing teams as well as between the teams and the Jury has to be made in English.

VIII. The teams performance in the Stages

The Reporter presents the essence of the solution to the problem, attracting the attention of the audience to the main physical ideas and conclusions.

The Opponent puts questions to the Reporter and criticizes the report, pointing to possible inaccuracy and errors in the understanding of the problem and in the solution. The Opponent analyses the advantages and drawbacks of both the solution and the presentation of the Reporter. The discussion of the Opponent should not become a presentation of his/her own solution. In the discussion, the solution presented by the Reporter is discussed.

The Reviewer presents a short estimation of the presentations of Reporter and Opponent.

The Observer does not participate actively in the PF.

During one PF only one member of a team takes the floor as Reporter, Opponent or Reviewer; other members of the team are allowed to make brief remarks or to help with the presentation technically. No member of a team may take the floor more than twice during one Selective PF or, as Reporter, more than three times in total during the whole tournament. During the Final PF any team member can take the floor only once.

IX. The rules of problem-challenge and rejection

1. All problems presented in the same PF must be different.
2. Selective PF

The Opponent may challenge the Reporter on any problem with the exception for a problem that:

- was rejected by the Reporter earlier;
- was presented by the Reporter earlier;
- was opposed by the Opponent earlier;
- was presented by the Opponent earlier.

If there are less than five problems left to challenge, the bans d), c), b), a) are successively removed, in that order.

During the Selective PFs the Reporter may reject the challenge of five different problems in total without penalty. For every subsequent rejection the coefficient of the Reporter (see section X) is decreased by 0.2. This reduction continues to apply during the following Selective PFs.

The AOC decides how many Selective PFs are held. If more than 2 Selective Fights will be held, the AOC may decide that the following rules apply to one of the Selective Fights (Note: This decision has to be made public before the start of the tournament):

- The procedure of challenge is omitted. All teams may choose the problem they want to present. The only exception is that a team may not present a problem, which they presented earlier in the Selective Fights.
- In case teams of one group choose the same problem, priority is given to the team with the higher TSP (see section XI).
- Teams must choose their problems for the last Selective Fight as soon as possible after the results of the preceding Selective Fight are official. The choice must be made public immediately.
- The problem which a team presents in this PF may not be presented again in the Final PF by the same team.



3. Final PF

As soon as possible after the announcement of the results of the Selective PFs the teams participating in the Final choose their problems. In case teams choose the same problem, priority is given according to the order of presentation in the Final (see section XII). The choice should be made public immediately.

X. The grading

After each stage the Jury grades the teams, taking into account all presentations of the members of the team, questions and answers to the questions, and participation in the discussion. Each Jury member shows integer marks from 1 to 10. The mean of the highest and the lowest marks is counted as one mark which is then added to the remaining marks. This sum is used to calculate the mean mark for the team. The mean marks are multiplied by various coefficients: 3.0 or less (see section IX) for the Reporter, 2.0 for the Opponent, 1.0 for the Reviewer and then transformed into points.

XI. The resulting parameters

1. For a team in the PF

The sum of points (*SP*) is the sum of mean marks, multiplied by the corresponding coefficients and rounded to one decimal.

2. For a team in the Tournament

The total sum of points (*TSP*) equals the sum of *SP* of the team in all Selective PFs. The highest *TSP*, denoted as *HTSP*, serves as reference (see section XIII).

XII. The Final

The three teams having the highest *TSP* in the Selective PFs participate in the Final. In case teams have equal *TSP*, their participation in the Final is decided by the most balanced teamwork during the Selective PFs, in case of equality by lot. The order of presentation in the Final is also determined by the *TSP*, in case of equality by the most balanced teamwork, in case of continued equality by lot: the higher the *TSP*, the lower the number in the scheme of section IV.

XIII. The final team ranking of the AYPT

The winner of the Final obtains the 1st place. If two or three teams have the same *SP* result in the final, the winner is nominated according to the highest *TSP*. The other two teams participating in the Final share the 2nd place. For teams not participating in the Final, the AOC decides, according to the *TSP* obtained, which teams will share the 3rd place.

XIV. Compiling the Austrian National Team

After the end of the AYPT the decision about the composition of the Austrian national team is made according to the procedure outlined in appendix A of the articles of association.

XV. The status of the regulations of the AYPT

The regulations are established by the EC and may be changed only by the EC of the association.

Vienna, December 16th 2006

Leopold Mathelitsch
(President)

Gerhard Haas
(Secretary)



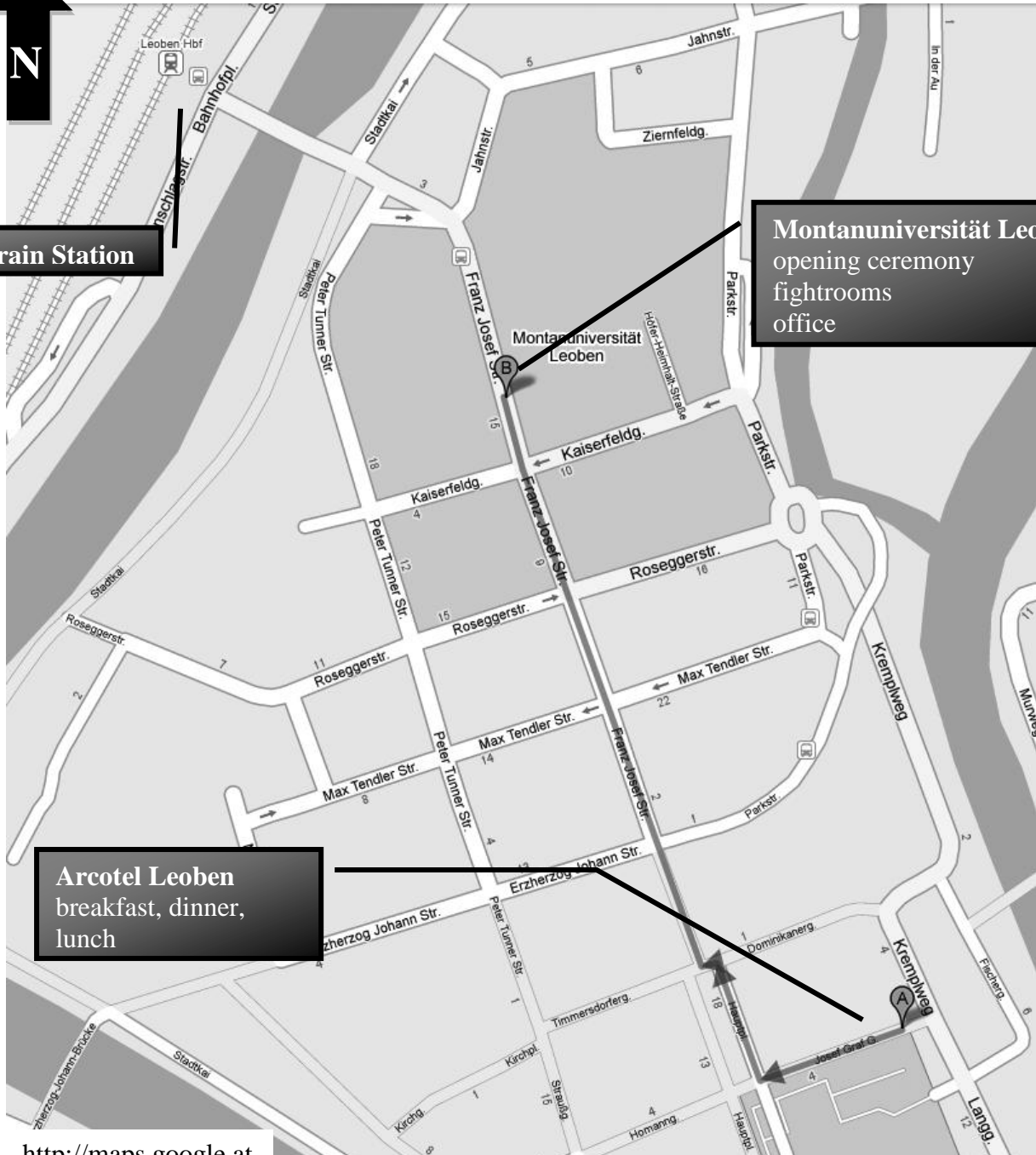
Problems for the AYPT 2011

Note: According to the regulations of the AYPT the problems for the AYPT are the same as for the IYPT. These problems, which have been formulated by the IOC, are used in the AYPT in accordance with article 2 of the IYPT regulations.

- 1. Adhesive tape:** Determine the force necessary to remove a piece of adhesive tape from a horizontal surface. Investigate the influence of relevant parameters.
- 2. Air drying:** Table utensils (dishes, cutlery, etc.), after being washed, dry differently. Investigate how the time of drying depends on relevant parameters.
- 3. Bouncing flame:** Place a flame (e.g. from a Bunsen burner) between two charged parallel metal plates. Investigate the motion of the flame.
- 4. Breaking spaghetti:** Find the conditions under which dry spaghetti falling on a hard floor does not break.
- 5. Car:** Build a model car powered by an engine using an elastic air-filled toy-balloon as the energy source. Determine how the distance travelled by the car depends on relevant parameters and maximize the efficiency of the car.
- 6. Convection:** In a container filled with a liquid, heat transport will occur when the bottom of the container is heated and the top surface is cooled. How does the phenomenon change when the container rotates about its vertical axis?
- 7. Cup drum:** A plastic cup is held upside-down and tapped on its base. Investigate the sound produced when the open end of the cup is above, on or below a water surface.
- 8. Domino amplifier:** A row of dominoes falling in sequence after the first is displaced is a well known phenomenon. If a row of "dominoes" gradually increases in height, investigate how the energy transfer takes place and determine any limitations to the size of the dominoes.
- 9. Escaping powder:** When a hot wire is plunged into a beaker of water with powder (e.g. lycopodium) floating on the surface, the powder moves rapidly. Investigate the parameters that alter the speed of movement of the powder.
- 10. Faraday heaping:** When a container filled with small spheres (e.g. mustard seeds) is vibrated vertically with a frequency between 1 – 10 Hz, so called Faraday heaping occurs. Explore this phenomenon.
- 11. Fingerprints:** Fill a glass with a liquid and hold it in your hands. If you look from above at the inner walls of the glass, you will notice that the only thing visible through the walls is a very bright and clear image of patterns on your fingertips. Study and explain this phenomenon.
- 12. Levitating spinner:** A toy consists of a magnetic spinning top and a plate containing magnets (e.g. "Levitron"). The top may levitate above the magnetic plate. Under what conditions can one observe the phenomenon?
- 13. Light bulb:** What is the ratio between the thermal energy and light energy emitted from a small electric bulb depending on the voltage applied to a bulb?
- 14. Moving cylinder:** Place a sheet of paper on a horizontal table and put a cylindrical object (e.g. a pencil) on the paper. Pull the paper out. Observe and investigate the motion of the cylinder until it comes to rest.
- 15. Slow descent:** Design and make a device, using one sheet of A4 80 gram per m² paper that will take the longest possible time to fall to the ground through a vertical distance of 2.5m. A small amount of glue may be used. Investigate the influence of the relevant parameters.
- 16. Smoke stream:** A glass jar is covered with cellophane. A tightly folded paper tube of length 4-5 cm is inserted hermetically into the jar through the cellophane cover. The tube is oriented horizontally. If one burns the outside end of the tube the dense smoke flows into the jar. Explore this phenomenon.
- 17. Vikings:** According to a legend, Vikings were able to navigate in an ocean even during overcast (dull) weather using tourmaline crystals. Study how it is possible to navigate using a polarizing material. What is the accuracy of the method?



Leoben City Map



Central Train Station

Montanuniversität Leoben
opening ceremony
fightrooms
office

Arcotel Leoben
breakfast, dinner,
lunch

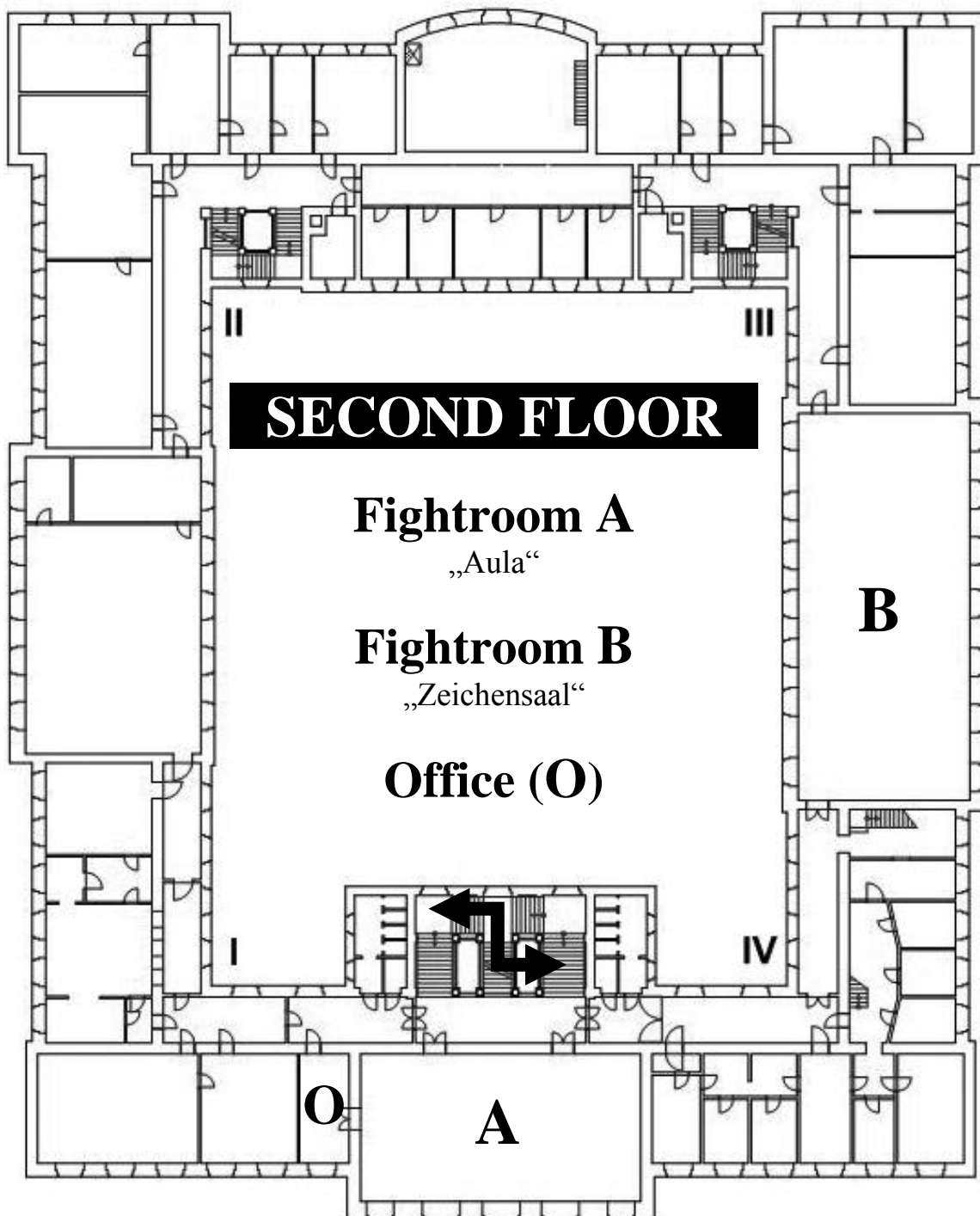
<http://maps.google.at>



Fight Locations

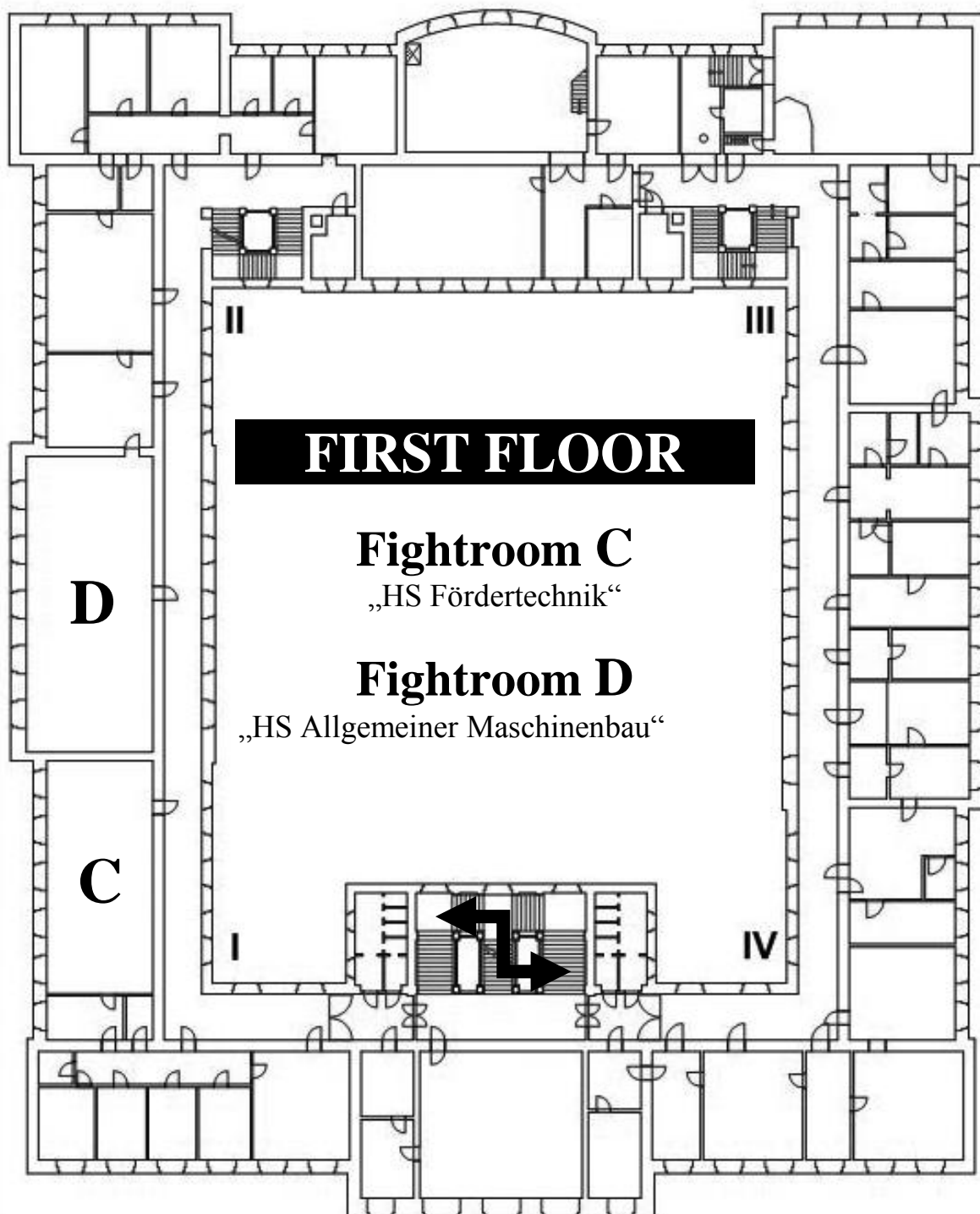
This section will provide you with details of the locations of the fight rooms within the university building(s). Please keep in mind that in Austria floors are labelled starting from zero. So the ground floor (German: "Erdgeschoß", "EG") is the "0th" floor. The 1st floor is the one *above* the ground floor.

Second Floor





First Floor





Basic information about Austria

This section summarizes the most important general information about Austria. It is intended to help our guests from abroad. For any further information please contact one of the organizers (wearing yellow badges).

Currency

The official currency in Austria is **Euro**, abbreviated **EUR** or **€**

1 Euro = 100 Cent (abbr. "ct")

There are 8 different coins:

3 " e v . " 4 " e v . " 7 " e v . " 3 2 " e v . " 4 2 " e v . " 7 2 " e v . " 3 " € . "

There are 7 different bank notes:

7 " € . " 1 0 " € . " 2 0 " € . " 5 0 " € . " 1 0 0 " € . " 2 0 0 " € . " 5 0 0 " € . "

Electricity

Electric power plugs are operated at 230 Volt AC with a frequency of 50 Hertz. All plugs are European standard plugs.

Tap Water

The tap water in Austria is of good quality and safe to drink.

Emergency Phone Numbers

There are several emergency phone numbers available. All these numbers can be dialled from any phone free of charge and without any prefix.

122 Fire Brigade

133 Police

144 Ambulance

112 Universal European Emergency Number

Remember to call these numbers only in case of a serious emergency.

C f [U b] n Y f g D ' D \ c b Y ' B i a V Y f g

In case you got lost or otherwise need assistance you can contact the organizers through one of the following phone numbers:

+43 676 7019116

Gerhard Haas

+43 699 12053015

Georg Hofferek

(Note: Use the numbers above when dialling from a mobile phone. On hardwired phones within Austria dial "0" instead of "+43".)



Addresses and Locations

The hotel and the university are within 5-10 minutes walking distance. A map of the city center is provided within this booklet. In case you get lost you can use the following addresses to ask for your way.

Hotel

The address of your hotel is:
Arcotel Hotel Kongress Leoben (Phone: +43 3842 46800)
Hauptplatz 1, 8700 Leoben

University

The competition takes place at the University of Leoben.
Montanuniversität Leoben
Franz-Josef-Straße 18, 8700 Leoben

BRG Leoben neu

The barbecue party takes place in the court of „BRG Leoben neu“ High School.
BG/BRG Leoben neu
Moserhofstraße 7a
8700 Leoben

Information on Law for the Protection of the Youth

Each federal state in Austria has its own law for the protection of the youth. The city of Leoben is located in the state of Styria. The following section will sum up briefly the most important aspects of the relevant law for the protection of the youth of the state of Styria. The organizing committee takes no responsibility for participants violating this law.

In Austria you must be older than 18 years to be considered a legal adult. People who are younger are restricted by the law as stated below.

Alcohol

In Styria it is illegal to buy and/or consume alcoholic beverages if you are below the age of 16. For buying/consuming beverages with more than 14 percent (of volume) of alcohol you must be over the age of 18.

Tobacco

For buying/consuming cigarettes or other tobacco products you must be over the age of 16.

Night Time

Children and adolescents below the age of 14 are not allowed to be out on the streets without supervision by an authorised adult between 09.00pm and 05.00am.

Between the age of 14 and the age of 16 the respective time is 11.00pm to 05.00am. Between the age of 16 and the age of 18 it is from 02.00am to 05.00am.



The Association AYPT \ddot{E}

Forschungsforum junger Physiker

The AYPT is executed for the tenth time already. The history of the AYPT dates back to the year 1999. In 2002 the legal association AYPT – Forschungsforum junger Physiker has been founded (originally named “AYPT – Österreichisches Turnier junger Physiker”) to organize further AYPTs, to represent Austria in the IYPT and to promote the goals behind the AYPT and IYPT.

Detailed information about the association AYPT – Forschungsforum junger Physiker can be obtained on the official website <http://www.aypt.at/> which is available in German and English language.

To help people keep track of important announcements concerning the AYPT the association also offers an email-newsletter.

See <http://www.aypt.at/en/contact/newsletter/> to learn how to subscribe to it.

Membership

If you would like to support the association in realizing further AYPTs and promoting the cause of AYPT and IYPT then please consider becoming a member of the association. An application form is provided within this booklet. Just cut it out, fill it out and hand it to one of the organizers. Further forms can be obtained from the organizers or from the website www.aypt.at. For legal reasons the application form is provided in German language only. Non-German speakers can contact the organizers for help in filling out the form if necessary.

There are two different types of membership:

- ordinary membership
- extraordinary membership

Ordinary members have to pay an annual membership fee of (at least) 10 Euro. Donations in terms of (voluntary) higher fees are always welcome.

Extraordinary members only support the goals of the association ideational and do not have to pay a minimum fee but donations are welcome from them as well.

Extraordinary members are, in contrast to ordinary members, not entitled to vote in the general assembly. Details can be found in the Articles of Association, available on the website www.aypt.at.



p.A. Institut für Experimentalphysik der Universität Wien
1090 Wien, Boltzmannngasse 5

Antrag auf Mitgliedschaft

I c h s t e l l e A n t r a g f ü r d e s n e n e s f ü r, A Y P T u n g e r P h y s

ordentliches Mitglied *)

(jährlicher Mitgliedsbeitrag: 10 Euro)

außerordentliches Mitglied *)

(jährlicher Mitgliedsbeitrag: Freie Spende)

*) zutreffendes bitte ankreuzen

beizutreten.

Persönliche Daten:

Frau Herr

Titel:

Vorname(n):

Nachname:

Adresse:

Straße und Hausnummer:

Postleitzahl: Ort:

Sonstiges:

Email Adresse:

Telefonnummer (optional):

Faxnummer (optional):

Ich bestätige, dass ich das vorliegende Formular vollständig und korrekt ausgefüllt habe. Ich erkläre mich damit einverstanden, dass meine Angaben elektronisch gespeichert und verwaltet werden. Eine Veröffentlichung der Angaben (ausgenommen Name) im Mitgliederverzeichnis findet nur auf meinen ausdrücklichen, jederzeit widerrufbaren Wunsch statt. Keinesfalls werden meine Daten an Dritte weitergegeben.

Ich erkläre mich mit den Statuten des Vereins einverstanden.

Ort, Datum: Unterschrift:

Sponsors and Supporters

The association AYPT - Forschungsforum junger Physiker thanks all its sponsors and supporters. Without their support it would not be possible to execute the AYPT.



BMW_F^a

Bundesministerium für Wissenschaft und Forschung



**Josef
Krainer
Fonds**

Never stop thinking



UNESCO Austria



STADTGEMEINDE LEOBEN

The logo for Montanuniversität Leoben features the text "MONTANUNIVERSITÄT" in a serif font, with "LEOBEN" in a larger, bold serif font below it. The text is set against a dark grey background.

MONTANUNIVERSITÄT LEOBEN