

## Joining the team of Luis OS

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I have collected here some notes on joining the team of Luis OS<sup>1</sup>. This should be the starting reading point/reference for new members starting to work directly with me<sup>2</sup>, at the extreme plasma physics (epp)<sup>3</sup> team at GoLP<sup>4</sup>

### §{1} Welcome to the team!

¶ We are very happy you are joining the team and the group. I appreciate discussing and doing science with motivated people, sharing what I have learned, and see team members develop their full potential – it is always a pleasure to welcome motivated new team members!

¶ The research we do covers various topics of plasma physics, in what I have called extreme plasma physics i.e. the collective dynamics of plasmas in the presence of ultra-high electromagnetic (and other) fields and relativistic flows and/or temperatures, in the laboratory or in astrophysics. These plasmas are present in many conditions and can lead to many applications. If you want to understand what is extreme plasma (astro)physics, I suggest you read this preprint [1]. Our research program connects with experiments, either with lasers or relativistic particle beams, and with astro problems associated with GRBs, neutron stars and black holes. It is strongly grounded on theory and numerical simulations. You can find more about our research and about our team members in the [webpage of Luis OS](#) [2] and [the epp team webpage](#) [3].

¶ You are joining the epp team [3], and GoLP [4]. It is important to know where we are coming from: I have founded the epp team in 2001, with Ricardo Fonseca, after my return from UCLA. I have worked before in the Plasma Simulation Group at UCLA, with Prof. John Dawson and Prof. Warren Mori, that have served as inspiration for what we do in our team. We maintain a strong link with the UCLA Plasma Simulation Group since then. The team has significantly grown since 2001. You can find detailed

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<sup>1</sup>These notes are inspired by similar notes prepared by my friend Prof. Filomena Nunes, a nuclear theorist at MSU, in the US.

<sup>2</sup>Please note that now the epp team (and GoLP) has several PIs and different advisors/supervisors follow different styles, so this is not an official policy of the epp team or GoLP (but it should be!) and only pertains to students/interns working directly with me.

<sup>3</sup>First thing to learn as you start working with me is that epp is never capitalized

<sup>4</sup>Second thing to learn is that all the letters in GoLP are capitalized except the o, which should never be capitalized!

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information about the team on the website [here](#), and also about [GoLP](#). GoLP was founded in 1993 by Prof. Tito Mendonça - I was also one of the founding members of GoLP at that time. My professional website [here](#) has lots of information about my track record, positions, students (current and past), publications, op-eds that I have written, etc. I have also some (crude) notes about my scientific genealogy in case you are interested to learn a bit about our scientific origins, which are, from now on, also your scientific roots. You can find that document [here](#). I also maintain a twitter account where I share professional news (my twitter handle is [luis\\_os](#)). More recently, I have moved to BlueSky [luisoliveiraesilva.bsky.social](#).

¶ The motto of GoLP is "Committed to continuously raising the bar", something I first heard on a commercial - maybe for Santa Monica's Mercedes Benz dealer - on KCRW, an NPR-affiliated radio station in the Santa Monica Community College. This choice has been inspired by my own motto "Exceder-se de tal forma que não seja possível conceptuar-se", which Mário Cesariny has attributed to António Maria Lisboa.

¶ Note that now the epp team [3] has several different teams/Pis. If you are reading this, this means that will be working directly with Luis OS; these notes refer only to those working with Luis OS – other Pis or faculty members might have different rules/expectations.

¶ I have a broad range of scientific interests that can be closely connected with the interaction of intense fields with plasmas (Extreme Plasma Physics | High Energy Density Science | High Field Science | Ultra Fast Science). My main focus is on the collective/nonlinear processes underlying these interactions, and their relevance in plasma-based accelerators and secondary sources, relativistic (plasma) astrophysics of compact objects, magnetogenesis, QED processes, and fundamental plasma physics. Most of the work relies on theory and kinetic plasma simulations. I am always looking to expand my scientific horizons – it is likely that some projects will be at that frontier, so do not be surprised if some projects fall outside the core topics of the group. You can check the list of publications of Luis OS via [Google Scholar](#) [5] to find out a little bit more about my scientific interests, scientific contributions, collaborations.

### §{2} Getting started

¶ If you are a MSc, PhD student, or post-doc researcher, and as part of the

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onboarding process to get you going at the team, you must check-in here: <http://golp2.tecnico.ulisboa.pt> [6]. This is a (mandatory) very important step that you should take as soon as possible. If you are an intern (e.g. part of the GoLP Internship program), all the necessary internal registration has already been done for you so you do not need to do anything.

¶ I have also written some notes for prospective Ph.D. students that I advise you to read (even if you are an intern, MSc student, or post-doc) in order to understand my philosophy. These notes are available [here](#) [7]. Any comments are highly appreciated.

¶ For Ph.D. students I have also prepared a document with guidelines for the preparation of the Ph.D. project, available [here](#) [8]. This should be prepared during the first year of your Ph.D. and it is an important guide/roadmap for your Ph.D. and an important document for your CAT examination (taken up to 24 months after your start of the Ph.D.). Please read it carefully and discuss it with Luis OS.

¶ Luis OS will introduce you to the team in the first joint meeting of the team, and also to the admin and tech teams that support GoLP – be mindful that everyone is a key part of the team, and everyone is engaged in the individual and global successes; check our Code of Conduct to see how we expect the team members to conduct themselves.

¶ In the beginning, you will get a warm-up research project, usually attached to other ongoing work in the group – Luis OS (eventually with some other team member) will design the project to match your interests and also the scientific interests/projects/questions of the team. The project will include also a background bibliography. This will be a living Overleaf project that you will update as you progress on your project.

¶ Regardless of the specifics of the project, the starting point is always to read a few things to get some background knowledge. Here are some important resources that will get you to understand the terminology and many of the discussions in the team meetings:

- Plasma Physics warm-up – F. Chen [9]. Read/study Chapters 1 – 4; 6 up to the section on the two-stream instability (including that section); 7; Reproduce the theoretical calculations for i) the Weibel instability [10], ii) the two-stream instability [9]. This will give a good feel for the plasma fluid equations and the plasma kinetic equations.

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- Optics/Lasers warm-up: – P. Milonni and J. Eberly [11]. Read/study chapters: 14.2-14.5, 14.7-14.8, 14.13
- Do not forget to ask Luis OS for a (paper) copy of the NRL Plasma Formulary which is a very handy resource [12].

¶ Note these are introductory references, that will get you familiar with some of the terminology – as the work progresses you will realize that you will need to deepen your knowledge. Luis OS and other team members can point you to other relevant references (and also work with you on the fundamentals of bibliography search) – do not hesitate to reach out (this will speed up significantly your progress).

¶ Our work is computational and theoretical – the balance always depends on the topic and the project. First, you will very soon realize that we all use Macs. It is also important that you get familiarized with working in a Unix environment (the MacOS provides that via the Terminal application), the local clusters we have access to (e.g. accelerates), and the supercomputer or HPC resources that we use e.g. in EuroHPC allocations – the sooner you get familiar with these environments the easier will be to take advantage of these resources:

- To get access to our local machines get in touch with our IT support team (as of January 2025, Pablo Bilbao and/or Thales Silva);
- For the HPC accounts get in touch with Thales Silva and/or Luis OS to be pointed to the person that will take the steps to give you the account on the supercomputers.

¶ At some point, while doing research in plasma physics, you are most likely to come across particle-in-cell codes<sup>5</sup>. These come in many flavors (but not all PIC codes are the same...) – at our team, we use OSIRIS and zpic. OSIRIS is a state-of-the-art particle-in-cell (also known as PIC) code (that also runs on laptops), while zpic is tailored for smaller problems and for education (and can also be ran over Jupyter notebooks). OSIRIS is on the GoLP github [here](#) [13] (you need a github account and be added to the

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<sup>5</sup>J.M. Dawson is one of the first pioneers (with O. Buneman), and he has trained several generations of PhD students and post-docs that have contributed to computational and theoretical plasma physics using PIC codes

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repositories – get in touch with Pablo Bilbao and/or Thales Silva to get access) and zpic is on github [here](#).

¶ As a computational physics warm-up, install and run OSIRIS on a very simple simulation (can be the two-stream instability or the Weibel instability), and compare it with the same simulation results as in zpic (which has many of these examples online for educational purposes). Since zpic shares the same philosophy as OSIRIS it is very instructive to use the zpic examples to design your first OSIRIS simulations.

¶ If you have taken classes covering some or all of these topics, excellent! A fast refresh will get you up to speed and ready to embark on your project.

¶ In the team everyone uses Macs – the machines that you will be provided with will also be Macs (learn how to use (and love) them!). Also, there are a number of tools with which you should become acquainted to:

- for electronic communication, we use email and MS Teams; make sure you are on the epp team in MS Teams and you are signed in on the epp team mailing list;
- get familiar with OneDrive for sharing/storing information (e.g. large attachments); this is free and associated with your IST id;
- get also familiar with using Google Calendar – the one-on-one meetings are scheduled through here and the Calendar is a powerful tool to keep track of the activities at GoLP and the epp team (there are a few calendars that you should subscribe – the epp team webpage has information on this);
- presentations should be done with Keynote (free on the Macs) and with the GoLP template. The template is available on the files sections of MS Teams [here](#) [14] (you need to be on MS Teams, on the epp team);
- for scientific documents use  $\LaTeX$  (e.g. Overleaf or other systems), while for other (shorter) documents MS Word is preferable (since it is more universal and has powerful tools associated e.g. track changes, translation, Thesaurus, etc.) - you have also access to a free version MS Word via IST (see the DSI/IST webpage for his) – it might be tempting to stick to Pages but this is not very mobile friendly (hard

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to open a Pages file on a mobile phone, even on Macs) nor the best way to collaborate with others;

- use the templates for the journals that you will be submitting your manuscript, or a LaTeX template report for Lic., MSc. or Ph.D. thesis, prepared by my former Ph.D. student (and  $\LaTeX$ wizard) Paulo Abreu a long time ago (I just changed the IST logo and Universidade Técnica de Lisboa to Universidade de Lisboa) – [template for thesis](#) <sup>6</sup>; I do not recommend using other templates for your thesis, even if they, apparently, look fancier (I will be happy to discuss why I have this opinion);
- by default, all documents are produced in English (and you should expect to have all the communication in English), make sure to use the available tools to polish your writing; I strongly suggest you sign in to use the (free version) of Grammarly (that nicely integrates with many of the electronic writing tools e.g. web-based/browser apps (such as Overleaf or gmail) and MS Word;
- before starting to write, carefully plan ahead and discuss the plan in detail with Luis OS. I will be happy to guide you through the preparation of your drafts - the more you plan, the faster will you write the paper;
- in the preparation of scientific documents (e.g. papers), you should first consult and get feedback from your peers i.e. ask them to read/provide feedback, proofread, and help you correct typos on your papers/documents; also be available to give back feedback and help your peers in the team or group;
- there are several (productivity) tools/hacks/frameworks that I can recommend e.g. for note taking, to-do lists, etc. If you want to know what are my strategies, workflows and general work organization <sup>7</sup> I will be happy to share what I do/use;

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<sup>6</sup>This template clearly does not follow the IST rules because mandating or using Sans Serif fonts for a report is plain dumb

<sup>7</sup>I use the GTD philosophy

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- AI tools are becoming quite widespread and their use strongly facilitates several tasks – these can/should be used but be very mindful/careful on how you use them and, more importantly, be prepared to explain how you have used them. Many journals have specific rules for the use of AI and also when preparing academic documents (e.g. thesis) there are many restrictions; get to know them such very carefully before using AI tools. See for instance the rules for the APS/Physical Review journals [here](#).

### **§{3} Work expectations**

¶ Working Hours – Keeping a regular schedule is very important to build steady working habits and ensure healthy progress in research. Share your work schedule with Luis OS. In the team, there are no mandatory schedules (except for presence at the weekly meetings) but being in a group is also interacting (socially and professionally) with other scientists so try to overlap with the regular office hours as much as possible. If you are taking courses or working as a TA, please include that in your schedule too. Make sure to update the schedule at the start of each semester. If you are a graduate student on a fellowship, you are expected to work 35 hours per week on research.

¶ You can work more, but be mindful of your health. If you are a graduate student with teaching duties, you may find that you will need more time to do research. To make sure you keep motivated, it is essential to block enough hours per week to participate in team and group activities and make progress on research. If you are an undergrad typically you will work 10 hours a week, although this number can be adjusted case by case (will be higher when working on your final Lic. project or MSc thesis project full time).

### **§{4} Logistics**

¶ You will have a desk with a desktop computer in a shared office. Be careful and mindful about working in a shared space. Please respect everyone and their need for focus. Check carefully the GoLP Code of Conduct to see our expectations.

¶ You will have your desktop machine set up by our team. They will also

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help you install specific software, namely OSIRIS. Any computing issues can be addressed by contacting first either Pablo Bilbao or Thales Silva.

¶ For other logistic matters, please reach out to [Dr. Claudia Romão](#).

¶ For many of the common admin tasks (e.g. travel to a conference, acquisitions, request for office maintenance) there are standard procedures: usually, all these go through <http://golp2.tecnico.ulisboa.pt>. Whenever you have questions, discuss these either during the meetings (brown bag, one-on-one, or team meetings) and consult with [Dr. Claudia Romão](#) – make sure to discuss first with Luis OS travel and acquisitions.

¶ We strive to have an office environment where everyone can work – while it is fine to discuss in the office, please note that your colleagues need to focus (and different people might require different levels of focus/silence/etc.). Be mindful of your colleagues. Please avoid overexcited discussions or having video calls in the office since this can disturb your colleagues. Find an empty office/desk/meeting room/break room, and use that. If you identify possible ways to improve the office ambiance and work environment, do not hesitate to bring them up in the brown bag meetings or in the one-on-one meetings with Luis OS.

¶ Meetings – Social interactions are an important component of the scientific endeavor, in formal or informal contexts. At the team of Luis OS we run three types of regular meetings:

- Brown bag lunch weekly meeting – every week on Thursday at 11.30am - bring your lunch and your laptop and be ready to present/share some of your most recent work, findings, and questions, in an informal setting with everyone in the team – these meetings start at 11.30am and finish at 2pm (held on Sala de Visualização Avançada in the Civil Engineering Building V0.01);
- One-on-one meetings – every two weeks, Luis OS will meet with each one of the team members to assess the progress and discuss possible directions, questions, problems, and future steps. Be prepared with a set of slides to frame the discussion (and share them prior to the meeting such that I have time to think about the meeting points) – these meetings have a 25-minute duration and are scheduled via Google Calendar, following an email I send out every week. I under-



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stand (the preparation for) these meetings can be stressful but do not forget their goal: support you on your progress and in your project;

- epp team meeting – this is a weekly seminar meeting<sup>8</sup>, usually on Fridays, where we will always have a speaker talking, a lightning round, and a monthly round table (MRT). The seminar should be 30 minutes long (but it is ok to have another duration) such that there is plenty of time for discussions. On the lightning round, you are supposed to give a 2-minute pitch on what happened in the last week. For the MRT, you should prepare a one- or two-slide deck to showcase the main results of the last month to everyone on the team;
- You are also expected to join the gatherings involving the whole group (GoLP) and/or team (epp team);
- Luis OS might also drop by (in person or virtually) and invite those that are around for a coffee or tea or some other refreshment – if taking the invitation will perturb your workflow do not hesitate to decline it!
- Do not hesitate to drop by (in person or virtually) if you have exciting news or just want to chat – if I am available, I will be happy to discuss it with you. If I am not available, drop me a message on MS Teams or an email. I am always very keen to learn about your advances, discoveries, and progress, to help out on a difficult problem, or just to discuss physics.

¶ Every person on the team is expected to attend the two weekly team meetings. Our team can also hold several research group meetings by project, usually with collaborators. Typically, you will only have to attend one of these depending on your project. Clarify the schedule with Luis OS in your first one-on-one meeting. Also, note that since most of our work is computational and based in Osiris it is helpful to attend the OSIRIS developers' meetings that occur every other week (and are announced on the epp team mailing list).

¶ Any time you need to, you should ask Luis OS to meet with you one-on-one for longer times than what is scheduled on a bi-weekly basis (it is

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<sup>8</sup>this weekly meeting has been running continuously since 2001

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also usual to schedule a one-on-one meeting with you when more time is needed to discuss your work).

¶ Please come prepared to all meetings with a summary of your progress since the last meeting, and the questions/points you want to discuss. It is also helpful to share those points with Luis OS before the meeting, such that everyone is prepared. At every meeting, after discussing your progress, new tasks/directions might be identified to follow up. Please make sure to take notes on the list of tasks, and include these in your running report for the following meeting.

¶ Communicating with Luis OS – I have prepared a document on the interactions with me (i.e. Luis OS); this is a **very important** point, for which there is a specific document [here](#) [15]. I think this is helpful in setting expectations for everyone. Please read it carefully and discuss it with Luis OS if you have any questions.

¶ You are also expected to join the gatherings involving the whole group, which are announced globally e.g. via the GoLP mailing list (these include GoLP VIP seminars and GoLP All Hands meetings). I expect everyone that works with me to be a role model team member, not only in terms of the high quality of the science, presentations, discussions and respect/interactions with others but also by giving back to the team the effort that everyone puts on supporting your work; this means also collaborating in the preparation/ad hoc committees of the different team/group activities.

¶ Seminars – In addition to team meetings, and unless you have class at that time, you are expected to participate in GoLP All Hands meeting (once a month), and all the GoLP VIP seminars (usually once a month). I also encourage everyone to attend the OSIRIS developers' meetings (every other Tuesday at 6.30pm via zoom). Seminars are one of the most important ways by which we keep up with research developments in the field and in the team/group. While in the beginning these may seem incomprehensible, as you get more familiarized with your research, you will start getting more and more out of these seminars, and by the end of your Ph.D., you will thank Luis OS for having made this an expectation. If you do not feel confident to ask questions during the seminars, bring your questions to the informal team meetings. These discussions contribute to maintaining a fun and exciting intellectual environment!

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¶ You are also expected to participate in the seminars organized within the Ph.D. program (times vary) and/or the Physics Department Colloquium. These talks tend to be at a perfect level for incoming MSc and Ph.D. students. Through these, you will get the breadth of research ongoing at the department and other research centers. Most importantly, you will be connecting with your fellow graduate students and making friends outside your research group.

¶ Running report – For every project you work on, you will create a running report. Every week you should update the report with the new results. This report should contain enough information so that someone else can reconstruct your work. The report can be prepared as a set of slides e.g. the ones that are discussed/presented in our weekly meetings or, as a running paper/manuscript (this approach would be handy when writing the paper/thesis/reports that result from the project). It should include useful figures and movies (even if just drafts, not final or polished) to illustrate your results/conclusions to the other team members. Running reports are kept in a directory accessible to all members associated with a given paper/project that you should prepare (preferably on OneDrive, via a closed team in MS Teams).

¶ Talks – Throughout your time with us, you will be asked to give talks on your work. Every time you present your work in a team or group meeting gives you an opportunity to practice. Take it seriously. When you have completed a project or you have already significant progress close to completion, you will be given the chance to present your work to a larger audience (at a conference or seminar outside the group). Luis OS and the whole team will help you prepare your talk. This includes slide reviews and practice talks. Talks are very important, especially, those outside the team. Outside the brown bag meetings, the talks should be at the highest possible level - you are not only representing yourself and everyone on the team.

¶ Publications – The preparation of the first draft of your first publication with our team (typically associated with the warm-up project) should be prepared in close interplay with Luis OS. It is important to sketch and plan for the write-up, and all the preparation will be critical to make the process as easy as possible, and ready to include in your first-year Ph.D. report. As you proceed through your Ph.D., you will get more independent but you

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should always discuss in detail the plan for any paper before embarking on the writing process. By the end of your Ph.D., you will have written several papers. If you are the primary person working on a project/paper, your name will be the first author. With equal contributions, the author ordering in our team is students, followed by postdocs, then senior researchers, and the faculty member coming last.

¶ Time off – All members of our team must take a vacation at least once a year, in addition to the short trips for the typical holidays (e.g. Christmas). The length of your vacation can vary and should always be discussed with Luis OS. If the team member is in good standing, the normal vacation time is a total of 4 weeks per year (approx. 25 days) – please take this into account when planning. Vacation time must also be reported on [the GoLP 2 platform](#) [6] for project management purposes only.

### **§{5} Expectations with conduct at work**

¶ The essence of research is that you are doing something nobody else has done. It is normal to feel like you have no idea what is going on. We do not expect you to know everything from the start. Don't be ashamed to let us know you do not understand. We need to know when/where you need help. What we do expect from you is your curiosity and your motivation to solve the problem you are working on. Ask a lot of questions to any of the group members and use any resources you may find helpful! I will also be happy to facilitate contacts with people outside the group (everyone in the world) who can help.

¶ Learn about ethics and conduct in science - a very useful resource is the report from the National Academy of Sciences "On Being a Scientist" available [here](#) [16]. This is a very important and critical point and you must be aware of these topics. Do not forget to discuss with Luis OS any questions that might fall on this very important issue.

¶ GoLP also has a code of conduct that you should be aware of and read carefully, that I fully endorse, and that everyone working with me should strictly follow.

### **GoLP Code of Conduct**

GoLP is committed to promoting a creative supportive environment for all its members and visitors.

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We want to promote free interaction, freedom of thought and expression, the open exchange of ideas, and respectful scientific debate, and we also want to ensure that everyone gets a chance to participate, have their ideas heard, feel respected, and have a safe, good, and healthy working environment.

We want to promote the professional and personal development of all our members, in particular of young students in the early stages of their scientific careers.

We then expect all GoLP members to:

**Be kind and supportive** Do not insult, put down others, or gossip. Make scientific criticism constructive. Listen to others and give everyone a chance to speak and contribute. We encourage you to view the group as a collective whose success is determined by the success of all the individuals. If you notice a fellow member struggling, please try to help.

**Treat people with respect** Harassment and bullying will not be tolerated in any form. Harassment includes exclusionary comments or jokes, inappropriate or unwanted physical contact, sexual attention or innuendo, deliberate intimidation, stalking, and photography or recording of an individual without consent. It also includes offensive comments related to gender, sexual orientation, disability, age, physical appearance, body size, race or religion. Bullying is any intimidation of others. Bullying may be unintentional; this does not make it acceptable.

**Be considerate during talks, discussions, meetings, and in the office** Do not interrupt when someone else is speaking. Refrain from side conversations. During talks, respect requests from the speaker or other audience members to hold further questions or discussion until a later time. Be aware of how much 'air time' you are using – give other people a chance to speak or ask questions, especially people more junior than you. Maintain your office space and common areas tidy and organized and guarantee that conversations, discussions, and meetings do not disturb the work of other team members.

**Treat the ideas of others with respect** Properly acknowl-

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edge previous contributions whether in talks, press releases of papers, or any other form of communication.

At GoLP, we do not tolerate:

- Bullying, intimidation, personal attacks, harassment, vulgar exchanges;
- Repeated and/or sustained disruption of talks or other events;
- Behavior that interferes with another's full participation;
- Sexual harassment, unwelcome sexual attention, stalking, harassing photographing or photographs or recording or recordings, inappropriate physical contact.

**§{6} Professional organizations** The scientific community coordinates through professional organizations. These can play a very important role in our scientific lives. For plasma physicists (like us) there are two main professional organizations: 1) Division of Plasma Physics of the American Physical Society ([APS DPP website](#)) and 2) the Plasma Physics Division of European Physical Society ([EPS PPD website](#)). The team members usually attend the annual meetings of these divisions. Please learn more about their work and consider joining these organizations.

Luis O. Silva, January 5, 2025

<http://web.tecnico.ulisboa.pt/luis.silva>

For the most updated version of this document, check [here](#)

## References

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- [2] Luis OS website, <http://web.tecnico.ulisboa.pt/luis.silva/>.
- [3] epp team website, <http://epp.tecnico.ulisboa.pt>.
- [4] GoLP website, <http://golp.tecnico.ulisboa.pt>.
- [5] Luis OS GS profile.
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