AVVISO N. 1 PER IL CONFERIMENTO DI UN INCARICO DI COLLABORAZIONE

Con la presente il sottoscritto Alexandre Pousse dichiara di essere candidato all’incarico di collaborazione con il CNR-IMATI per lo svolgimento di un attività di studio nell contesto della risonanza di moto medio tramite il modello detto "mediato".

Come detaigliato nel curriculum, il profilo del candidato satisfa tutti tre requisiti:
1. Dottore di ricerca in Astronomia presso l’Osservatorio di Parigi;
2. 10 anni di esperienza nell’ambito della meccanica celeste;
3. articoli scientifici che utilizzano l’Hamiltoniano medio del problema dei tre corpi.

Inoltre, la presente costituisce una dichiarazione sostituiva di certificazione, ai sensi dell’art.46 del D.P.R. n. 445/2000, nella quale il sottoscritto Alexandre Pousse dichiara, sotto la propria personale responsabilità:
1. di non aver riportato condanne penali;
2. di non essere destinatario di provvedimenti che riguardano l’applicazione di misure di prevenzione, di decisioni civili e di provvedimenti amministrativi inscritti nel casellario giudiziale ai sensi della vigente normativa;
3. di non essere a conoscenza di essere sottoposto a procedimenti penali;

Barcellona, il 11/07/2022

[Signature]
AVVISO N. 1 PER IL CONFERIMENTO DI UN INCARICO DI COLLABORAZIONE

Il CNR Istituto di Matematica Applicata e Tecnologie Informatiche “Enrico Magenes”, Sede Secondaria di Milano, intende avvalersi della collaborazione di un esperto di elevata professionalità per lo svolgimento della seguente attività:

Studio sull’utilizzo effettivo di orbite in risonanza di moto medio di tipo “horseshoe” nel problema piano dei tre corpi circolare ristretto per satelliti artificiali e analisi del limite di validità del modello detto “mediato” sulla base dei dati reali di asteroidi naturali.

Lo studio si intenderà realizzato alla consegna di due manoscritti dettaglianti le equazioni analitiche che descrivono le basi teoriche della dinamica analizzata, l’analisi numerica delle condizioni iniziali trovate sulla base del problema mediato e l’analisi dei dati forniti dal sistema JPL Horizons per gli asteroidi che sono in moto coorbitale nel sistema solare.

Requisiti del collaboratore:

Il Collaboratore sarà scelto mediante valutazione comparativa dei curricula presentati, considerando la capacità acquisita nonché i titoli culturali e professionali conseguiti, ai sensi del Disciplinare per il conferimento degli incarichi, art. 4 ed in particolare, per lo svolgimento dell’attività si richiede:

1. Titolo di dottore di ricerca in Matematica Applicata o Astronomia o Ingegneria Aerospaziale;
2. Competenze avanzate in meccanica celeste, teoria delle perturbazioni e metodi di propagazione numerica di equazioni differenziali ordinarie;
3. Conoscenza approfondita dell’Hamiltoniano “mediato” del problema dei tre corpi circolare ristretto nel caso pia

Il candidato dovrà inoltre produrre una dichiarazione sostitutiva di certificazione, ai sensi dell’art. 46 del D.P.R. n. 445/2000, nella quale dichiara, sotto la propria personale responsabilità:

[1] di non aver riportato condanne penali;
[2] di non essere destinatario/a di provvedimenti che riguardano l’applicazione di misure di prevenzione, di decisioni civili e di provvedimenti amministrativi iscritti nel casellario giudiziale ai sensi della vigente normativa;
[3] di non essere a conoscenza di essere sottoposto a procedimenti penali;

L’incarico è conferito sotto forma di collaborazione occasionale. La durata dell’incarico è fissata in: 28 giorni a decorrere dalla data di sottoscrizione del contratto.

Il compenso totale previsto per lo svolgimento dell’incarico è fissato in Euro 1.300,00 (lordo percipiente) che verrà pagato alla consegna dei due manoscritti oggetto dell’attività.

Le domande in forma libera, corredate del curriculum vitae e da fotocopia di un documento di riconoscimento in corso di validità, dovranno essere inoltrate mediante Posta Elettronica Certificata all’indirizzo pec protocollo.imati@pec.cnr.it entro 14 giorni dalla pubblicazione del presente avviso sul sito Internet del CNR www.cnr.it – Servizi – Lavoro e Formazione.
Il curriculum del professionista incaricato, in base agli artt. 10 e 15 del D.Lgs. 33/2013, sarà pubblicato in rete nell’apposita sezione “Trasparenza, valutazione e merito” del sito istituzionale del CNR.
Secondo quanto indicato nel punto 9a delle "Linee guida in materia di trattamento di dati personali, contenuti anche in atti e documenti amministrativi, effettuato per finalità di pubblicità e trasparenza sul web da soggetti pubblici e da altri enti obbligati” (pubblicato sulla Gazzetta Ufficiale n. 134 del 12 giugno 2014), il curriculum oggetto di pubblicazione dovrà contenere solo le informazioni pertinenti (titoli di studio e professionali, esperienze lavorative, ulteriori informazioni di carattere professionale) evitando di riportare dati eccedenti quali, ad esempio, i recapiti personali.

Il conferimento dell’incarico è regolato dal “Disciplinare per il Conferimento di incarichi di collaborazione” disponibile sul sito del CNR in allegato alla circolare 36/2008.

IL RESPONSABILE di IMATI-CNR
Sede secondaria di Milano
Dott. Antonio Pievatolo
CURRICULUM VITAE:  ALEXANDRE POUSSE, Ph.D.

Post-doctoral Researcher
• Astronomy • Celestial Mechanics • Dynamical Systems • Mathematical Physics •

Personal Informations

Contact Pro. Via Alfonso Corti 12, 20133 Milano, Italia
email CNR: alexandre@mi.imati.cnr.it
email: poussealexandre@gmail.com
Website: http://www.poussealexandre.com


Academic Positions

†: Istituto di Matematica Applicata e Tecnologie Informatiche “Enrico Magenes”,
‡: Consiglio Nazionale delle Ricerche.
2-year post-doctoral research fellowship in the context of the project “co-orbital motion and three-body regimes in the solar system” funded by Fondazione Cariplo through the program: “Promozione dell’attrattività e competitività dei ricercatori su strumenti dell’European Research Council—Sottomisura rafforzamento” and supervised by Dr. Elisa Maria Alessi.
Website: http://arm.mi.imati.cnr.it/imati/mypage.php?idk=PG-11

{Career break} From December 2018 to July 2020. Further details on page 8.

[Dec. 2017 – Nov. 2018] Assegnista di Ricerca, Università degli Studi di Padova,
Dipartimento di Matematica ed applicazioni “Tullio Levi-Civita”,
1-year post-doctoral research fellowship funded by the H2020-ERC Project 677793, “Stable & Chaotic Motions in the Planetary Problem” led by Dr. Gabriella Pinzari.
Website: https://ercprojectpinzari.wordpress.com

Dipartimento di Matematica ed applicazioni “Renato Caccioppoli”,
1-year post-doctoral research fellowship funded by the H2020-ERC Project 677793.

1-year grant for research and teaching activities, affiliated to the ASD-team† of IMCCE‡,
†: Astronomie et Systèmes Dynamiques, leaded by Prof. Jacques Laskar,
‡: Institut de Mécanique Céleste et de Calcul des Éphémérides.
Website: https://www.imcce.fr/recherche/equipes/asd/

3-years grant for research and teaching activities, affiliated to the ASD-team of IMCCE.

Skills

Languages
French: native. Italian: reading & speaking (advanced), writing (intermediate).
English: reading & speaking (good), writing (advanced).

Computer
Programming in Fortran, C, bash, Gnuplot, Mathematica, Matlab & TRIP (computer algebra system dedicated to celestial mechanics, link: https://www.imcce.fr/Equipes/ASD/trip/trip.php),
Word Processing in LATEX, Graphics edition with GIMP & Inkscape
OS: Linux (Ubuntu, Mint), Windows & Mac. Office suite: Microsoft Office & Libreoffice.
On my researches

I work in the framework of Astronomy, Applied Mathematics and Dynamical Systems. More specifically, I study problems issued from Celestial Mechanics in the purpose of showing the existence or the persistence of certain particular dynamics followed by asteroids, moons, exoplanets, artificial satellites and possible spacecrafts.

My activities are connected to the perturbation methods elaborated in the scope of the research of planet in the solar system (e.g., Le Verrier and the discovery of Neptune in 1846) and outside (exoplanets since 1995), as well as in the understanding of their stability. Let us mention that the problem of the stability of the solar system is one of the most ancient problem in science, for which Euler, Lagrange, Poincaré and, nowadays, Laskar provided important contributions. For instance, Poincaré exhibited chaotic orbits from this deterministic problem and considerably improved the mathematical study of the nonlinear phenomenons in Nature.

My works focus on the existence and stability of periodic or diophantine quasi-periodic invariant tori in the 3-body problem, in order to understand peculiar trajectories of asteroids and satellites in some resonant regime or possible exo-planetary configurations. I’m especially interested by the co-orbital dynamics (two bodies that orbit the Sun with the same period). A major example is given by the moons Janus and Epimetheus that gravitate Saturn with the same period on coplanar and circular orbits that swap every 4 years after a relatively close encounter. I precise that this mechanism of orbital exchange could be relevant in the framework of space mission design. The work is currently in progress. Finally, I recently started to study the non trivial motion of artificial satellites (e.g., the Galileo constellation) generated by diffusion mechanisms and resonant structures due to the combined gravitational effect of the Earth, of the Moon and of the Sun.

Mainly through algebraic computations (construction of normal forms with computer algebra systems), rigorous estimations of analytic developments and with the help of numerical studies, I intend to improve the understanding of the dynamics followed by celestial objects in the solar system and outside.

Publications

(*) A.P. is the first author. (†) is for alphabetic order and (‡) notifies the first author among my collaborators.

   (OpenAccess: https://doi.org/10.1007/s11071-022-07229-5)

   (OpenAccess: https://doi.org/10.1007/s00220-020-03690-8)

   (OpenAccess: https://doi.org/10.1007/s10569-016-9749-1)

   (OpenAccess: https://doi.org/10.1007/s40314-015-0288-2)

   (OpenAccess: https://doi.org/10.1007/s10569-013-9487-6)
2. “A stable heliocentric disposal strategy for LPO missions, inspired by the natural co-orbital motion of Saturn’s moons”, (+) with E. M. Alessi (2021), Congress proceedings of 72nd International Astronautical Congress (IAC), Dubai (UAE).


Peer-reviewed popular science journal or website.


Ph.D. Thesis.


Cursus

[Sep. 2016] Ph.D. in Astronomy (Specialization in Gravitational Dynamical Systems), PSL† University-Observatoire de Paris †Paris Sciences et Lettres
title: “Les quasi-satellites et autres configurations remarquables en résonance co-orbitale” (“Around quasi-satellites and remarkable configurations in the co-orbital resonance”).
• Advisors:
  – Prof. Philippe Robutel, CNRS Senior scientist (equiv Prof.), ASD-IMCCE-Observatoire de Paris,
  – Prof. Alain Vienne, Université Lille-I, Pegase-IMCCE-Observatoire de Paris.
• Ph.D. committee:
  – Prof. Jacques Féjoz, Université Paris-Dauphine, ASD-IMCCE-Observatoire de Paris, president,
  – Prof. Antonio Giorgilli, Università degli Studi di Milano, referee,
  – Prof. Anne Lemaitre, Naxys, Université de Namur, referee,
  – Dr. Andrea Venturelli, Université d’Avignon, examiner.
• Link: https://www.theses.fr/2016PSLEO006 (Nota bene: since 2016, honorifics ceased to be used for the completion of a Ph.D.)

  – mention “bien” (equivalent to “magna cum laude”)

[Jun. 2011] Research M.Sc. year 1 with Maîtrise degree (Master 1 Recherche) in Mathematics (Specialization in Analysis), Université “François Rabelais” de Tours.
  – mention “bien” (equivalent to “magna cum laude”)


  – mention “bien” (equivalent to “magna cum laude”)


  – mention “assez bien” (cum laude)
Teaching experiences

From October 2012 to September 2016, I have been involved in various teaching activities. During my Doctoral fellow (Oct. 2012 - Sep. 2015) and my ATER (Oct. 2015 - Sep. 2016) at the Paris Observatory, I carried out 4-years of teaching activities for the Research M.Sc degree (Master Recherche Astronomie & Astrophysique) and some "University degrees" (DU, i.e. Diplôme Universitaire). All in all, I headed 45 hours of lecture-exercises (“chargé de cours et des Travaux Dirigés”), 68 hours of exercices (“chargé des Travaux Dirigés”), and about 60 hours of night observing sessions. More details are summarized below.

- **Teaching assistant: Applied Quantum Physics**, M.Sc. level, students from the Université Pierre & Marie Curie, Paris 6 & Paris Observatory.
  
  Basis on quantum physics and applications on the study of the interactions between electromagnetic radiation and matter.

  32h of exercices (Lectures given by T. Fouchet & C. Antoine), Detailed program on the website: [http://www.lesia.obspm.fr/perso/thierry-fouchet/quantique/](http://www.lesia.obspm.fr/perso/thierry-fouchet/quantique/)

- **Teaching assistant: Théories Mathématiques pour la Physique**, M.Sc. level, students from the Paris Observatory.

  An introduction to the mathematical methods of Classical Mechanics, from variational principle to fundamental notions: Lagrangian, Hamiltonian, integral invariants and symplectic structures.

  36h = 14h (in 2014) + 22h (in 2016) of exercices (Lectures given by L. Niederman),

  Some notes are available on my website: [https://www.poussealexandre.com](https://www.poussealexandre.com)

- **Assistant Astronomer: Night observing sessions at the Observatoire de Haute Provence (OHP)**

  Monitoring a group of 5-6 students on a professional telescope (80cm of diameter, non-automatized) in order to teach celestial coordinates, star-pointing and naked eye observation.

  3 × 4-nights sessions, which corresponds, all in all, to 60h of practical work (Leading Astronomer: M. Puech), More details on the DU on the website: [https://ufe.obspm.fr/DU/DU-en-presentiel/DU-Explorer-et-Comprendre-l-Univers/](https://ufe.obspm.fr/DU/DU-en-presentiel/DU-Explorer-et-Comprendre-l-Univers/)

- **Lecturer: Théories Mathématiques pour la Physique, Remise à niveau**

  pre-course of “Mathematical theories for physicists”, M.Sc. level, students from the Paris Observatory.

  In this pre-course, recalls on analysis and differential calculus from Licence (B.Sc. level) were given (especially for student with only a background in physics).

  45h = 3 × 15h of lectures & exercices.

  Some notes are available on my website: [https://www.poussealexandre.com](https://www.poussealexandre.com)

- **Online Tutoring of 4 students participating to the DU “Fenêtre sur l’Univers”**, Distance-learning courses on Astronomy of the Paris Observatory,

  Thematic courses of different levels (from Licence to Master 1) and equivalent to a face-to-face course of 420h which cover all areas of astronomy. The courses are followed remotely on a website by the students which benefit from personalized tutoring with an astronomer/astrophysicist.

  The formation in now called “Lumières sur l’Univers” and the Course materials are available on the website: [https://media4.obspm.fr/LU/](https://media4.obspm.fr/LU/)

  More details on the DU on the website: [https://ufe.obspm.fr/Formations-en-ligne/](https://ufe.obspm.fr/Formations-en-ligne/)

- **Contribution to the website project “L’Astronomie dans l’Apprentissage des Mathématiques”**

  “Astronomy in the mathematics teaching” supported by the Paris Observatory & Université Lille-1

  The philosophy of the present project is to use Astronomy as a source of examples in the learning of Mathematics in the aim of enhancing the attractiveness of mathematics for young people. In that framework, I created a maths courses and exercices linked to astronomical cycles.

Seminars, Conferences, Workshops & Schools

15. “On the remarkable configurations of the co-orbital resonance” (Invited Talk), COOMOT - International workshop on Co-orbital Motion (Milano, Italy), March 2022.

Recording: https://www.coomot.imati.cnr.it/inv_talks.php?ref_code=COOMOT.


13. "A stable heliocentric disposal strategy for LPO missions, inspired by the natural co-orbital motion of Saturn’s moons" (Talk), 72th International Astronautical Congress (IAC), Session C1.6 (Dubai, UAE), October 2021.

12. “Taking advantage of the Averaged Problem in order to compute solutions in the Restricted 3BP. Co-orbital motions & Rigorous treatment" (Online Talk), IAU Symposium 364 Multi-scale (time and mass) dynamics of space objects (Iasi, Romania), October 2021.


6. “Around quasi-satellites and remarkable configurations in the co-orbital resonance" (Seminar), Seminario di Fisica Matematica dell’Università degli Studi di Padova (Italy), June 2017.

5. “Co-orbital motion in the co-planar restricted three-body problem: family of quasi-satellite periodic orbits" (Talk), EPSC (Nantes, France), September 2015.


1. “On the co-orbital motion of two planets in quasi-circular and co-planar orbits focused on the Anti-Lagrange orbits" (poster), CELMEC VI (Viterbo, Italy), September 2013.
10. “COOMOT International workshop on Co-orbital Motion”, Milano (Italy), March 2022.
6. EPSC: European Planetary Science Congress, La Cité des Congrès, Nantes (France), September 2015.
5. AAS DDA 2015: American Astro. Society Dynamical Division of Astronomy, Caltech University, Pasadena (USA), May 2015.
2. CELMEC VI: Sixth International Meeting in Celestial Mechanics, San Martino al Cimino, Viterbo (Italy), September 2013.

3. ETH-ITS Winter school on Conservative Dynamics, Engelberg (Switzerland), February 2017.
1. GRGS Summer school, “Localisation précise par moyens spatiaux", Yverdon-les-bains (Switzerland), September 2012.

3. Centro de Giorgi, Scuola Normale Superiore di Pisa (Italy), 1-week in December 2018, invited by Dr. J. E. Massetti.
2. Università degli Studi di Padova, 2-weeks in June 2017, invited by Dr. G. Pinzari.

3. Member of the LOC (Local Organizing Committee) of “COOMOT International workshop on Co-orbital Motion" Hybrid workshop, (Milano, Italy), March 2022.

1&2. Member of the LOC of the “Stable and Chaotic Motions in the Planetary Problem" summer school (Asiago, Italy) and the “Perspectives in Hamiltonian Dynamics" conference (Venezia, Italy), June 2018.
Miscellaneous

Administration.
Qualification aux fonctions de Maître de Conferences, Section 25-26-34, February 2017.
French habilitation to apply for Associate Professor position in pure math., applied math. and astronomy.

Representative of the Ph.D. students (Jan. 2014 – Dec. 2015)
in scientific and institute councils of IMCCE-Observatoire de Paris.

Peer review contributions.
Peer-reviewed journals: Advances in Space Research; Celestial Mechanics and Dynamical Astronomy.

Projects.
3. Team member (Aug. 2020 – today) of the Project “Co-orbital motion and three-body regimes in the solar system” funded by Fondazione Cariplo through the program “Promozione dell’attrattività e competitività dei ricercatori su strumenti dell’European Research Council – Sottomisura rafforzamento, led by Dr. Elisa Maria Alessi, CNR IMATI, Milano.

Website: https://ercprojectpinzari.wordpress.com.

1. Former member (May 2016 - 2018) of the MathAmSud Project SIDIHAM
(Hamiltonian Dynamical Systems, Celestial Mechanics, Weak KAM Theory).
Scientific coordinator for France: A. Venturelli, University of Avignon.

Academic References

Research activities.
• Dr. Elisa Maria Alessi, IMATI-CNR Milano
(P.I. of the Project “Co-orbital Motion and Three-Body Regimes in the Solar System” and close collaborator) em.alessi@mi.imati.cnr.it
• Dr. Laurent Niederman, Université Paris-Saclay & ASD-IMCCE-Observatoire de Paris (Close collaborator) laurent.niederman@u-psud.fr
• Dr. Gabriella Pinzari, Università degli Studi di Padova (P.I. of the ERC Project “Stable and Chaotic Motions in the Planet. Ph.”) pinzari@math.unipd.it
• Prof. Philippe Robutel, ASD-IMCCE-Observatoire de Paris (Ph.D. thesis advisor & close collaborator) Philippe.Robutel@obspm.fr

Teaching activities.
• Dr. Charles Antoine, Université Pierre & Marie Curie, Paris 6 (Senior Lecturer) antoine@lptmc.jussieu.fr
• Dr. Laurent Niederman, Université Paris-Saclay & ASD-IMCCE-Observatoire de Paris (Senior Lecturer) laurent.niederman@u-psud.fr
• Dr. Mathieu Puech, GEPI-Observatoire de Paris (Leading Astronomer) mathieu.puech@obspm.fr
Other academic experiences

[Oct. 2019] Corrections of “concorso INdAM” (Instituto Nazionale di Alte Matematica), Roma
Website: https://www.altamatematica.it

Application of genetic algorithms in order to improve space debris orbit determination.


[Jun. – Aug. 2011] 2-months Research Internship, Geoazur laboratory (Grasse, France), Observatoire de la Côte d’Azur. Advisor: Dr. G. Metris.
“Study of the two fixed centers problem (or Vinti problem) for geometric integration algorithms”.
Website: https://geoazur.oca.eu/fr/acc-geoazur/584-metrologie-spatiale-geoazur


Other working experiences

[Summers 2003 – 2010] Seasonal worker (2009 and 2010 as supervisor) during the period of June to August for the seed agricultural company Euralis Semences, Blois (France). Website: http://euralis-seeds.com

On my Career Break

[Dec. 2018 – Jul. 2020] Career break in order to approach my professional calling with a renewed motivation and fresh perspectives. Early 2019, I moved to France to be reunited with my family, pursued some scientific works in freelance (revision and acceptance of Robutel-Pousse-Niederman 2020 on CMP), practiced sports and walked along the ancient via Francigena from Pavia to Roma. Since Autumn 2019, I went back to Italy and continue with my life in Rome. Among others, I was introduced to complex systems (applied to urbanism; Matières et Systèmes Complexes Laboratory, Univ. Paris Diderot) and start a formation for tour guides, on the Ancient and Baroque Rome).
Interests, Hobbies & Sports

“Storia e Arte”: I am passionate about History, especially the Italian History (e.g. Ancient Rome, Venice, Baroque Rome, Milano) and Arts.

- Between 2012 and 2015, during my PhD, I had a chance to visit each section of the Louvre.
- Early 2020, after 3 years of personal study of Rome, I decided to start a formation in order to apply for the local tour guide licence. Therefore I took Tour guide courses on Ancient and Baroque Rome. Unfortunately, Covid stops this perspective as well as my move to Milan for my academic activity.

2020: Courses “Roma Antica” and “Roma Barocca”;  
2 × 10 lectures of 2h, Associazione culturale Rome4U - Roma e Lazio per te, Roma  
Website: https://romaelazioperte.blogspot.com/p/corsi.html

- I always keep in mind the goal to become a Tour guide, that is why I recently took courses on Arts in Milan and History of Arts

2020, Courses “dalla Milano Romana all’ 400’”;  
2021, Courses “dalla Milano del’ 500’ alla modernità” and “Storia dell’Arte nell’ 800’”;  
2022, Courses “Storia dell’Arte nell’ 900’”;  
4 × 13 lectures of 1.5h, Ufficio del tempo libero, Milano  
Website: https://www.ufficiotempolibero.it

- I am obviously concerned about Sciences, especially Astronomy (popularization and night sessions with telescope) and passionate about Old maps, and Urbanism. One of my interest is to connect all these issues to Arts and History through writing or other contents. I am sincerely convinced that the Italian territory is a perfect place for that purpose.

- Finally, I have some basis on the History of cinema.

2017, Courses “Storia del Cinema”, Circolo “la carrozza d’oro”, Roma  
Website: https://lacarrozzadorocineclub.wordpress.com

Sports: In the past, I practiced Table tennis (Association Pongiste de La Chapelle Vendômoise, 1997-2008), Boxing (Club Cenvint Paris 13, 2013), Fencing (Les Duellistes Club Paris, 2015). Today I practice Running (Trails, 10K, Half-marathons in Rome and France, and maybe a Marathon for 2023) and Trekking (e.g. from Pavia to Roma along the ancient via Francigena, 2019).

Lo sottoscritto Dott. Alexandre Pousse ha concesso l’autorizzazione dell’eventuale pubblicazione di questo Curriculum Vitae nei termini di Legge.

Milano,  
July 11, 2022,  
Dr. Alexandre Pousse.