Verbale della Commissione di indirizzo e autovalutazione (CIA) del Dipartimento di Chimica 22/12/2022

La commissione si riunisce il giorno 22/12/2022 alle ore 11:00 in forma telematica (tramite la piattaforma GMeet) con l'ordine del giorno sotto riportato:

1. **Comunicazioni**
2. **Proposta di chiamata diretta del Prof. Lapo Bogani**
3. **Varie ed eventuali**

La riunione si apre alle ore 11:00.

Sono indicati con P i presenti e con G gli assenti giustificati.

Membri effettivi:

Berti Debora	P
Bilia Anna Rita	P
Fratini Emiliano	P
Frediani Marco	P
Giorgi Claudia	P
Goti Andrea	P
Marrazza Giovanna	P
Nativi Cristina	P
Occhiato Ernesto	P
Severi Mirko	P
Smulevich Giulietta	P
Sorace Lorenzo	P
Turano Paola	P

Partecipanti senza diritto di voto:

Valtancoli Barbara	P	(Direttore DIP)
Pasquini Emanuela	P	(RAD)

Presiede la seduta il Prof. Andrea Goti.
Il Prof. Fratini Emiliano assume le funzioni di segretario verbalizzante.

1. Comunicazioni

Il Direttore fa un breve resoconto dell'ultima riunione del Senato Accademico comunicando che:

La Rettrice ha comunicato che il 16 febbraio si terrà la cerimonia di inaugurazione dell'anno accademico a cui saranno presenti il Ministro Bernini e la Prof.ssa Silvana Sciarra, Presidente della Corte Costituzionale.

Considerando i problemi di bilancio legati agli aumenti verificatosi nell'ultimo periodo è stato necessario contrarre le spese. Per tale motivo per la programmazione ordinaria saranno distribuiti solo 9,6 PuOR da impiegarsi per passaggi da RTDb) a PA.
Per quanto riguarda la programmazione straordinaria gli 88 PuOr assegnati per il 2022 saranno destinati 44 a personale docente e 44 a personale TA.
I 44 PuOr destinati al personale docente saranno così suddivisi: 23 assegnati ai Dipartimenti, i rimanenti destinati a interventi finalizzati e strategici.

In Senato Accademico sono stati illustrati i criteri su cui dovrà basarsi la programmazione del personale che saranno presto comunicati tramite apposita circolare.

Il bilancio presentato prevede inoltre un aumento delle entrate tramite il prelievo del 3% sui fondi ricerca e un possibile aumento delle tasse degli studenti. Quest'ultimo intervento verrà valutato al momento della scrittura del manifesto.

In Senato Accademico è stata approvata la trasformazione della natura giuridica interna del Centro di Ricerca di Risonanze Magnetiche da centro di ricerca (art. 34 dello Statuto) a centro di servizi di ateneo (art. 36 dello Statuto), con conseguente disattivazione del CERM quale centro di ricerca e la costituzione del Centro di servizi CERM.

Il Dott. Luca Bardi è stato nominato dirigente dell'area risorse umane.

2. Proposta di chiamata diretta del Prof. Lapo Bogani

Il direttore ricorda che si è presentata l'opportunità per la chiamata diretta di Lapo Bogani, Full Professor in Nanomateriali Molecolari all'Università di Oxford, Dipartimento di Materiali, a Professore Ordinario ai sensi dell'art. 3 del Decreto Ministeriale n. 919 del 22 luglio 2022 - "*Identificazione dei programmi di ricerca di alta qualificazione, finanziati dall'Unione europea o dal MUR di cui all'art. 1, comma 9, della legge 4 novembre 2005, n. 230, e successive modificazioni*".
Il Prof. Lapo Bogani è risultato vincitore del Programma di ricerca di alta qualificazione ERC Consolidator Grants 2017 col progetto Molecular Magnetic Graphene Nanoribbons - MMGNRs di durata quinquennale ed iniziato nell'anno 2019.
Il Prof. Lapo Bogani, il cui CV risulta di altissimo valore scientifico, ricopre la qualifica di Full Professor in Nanomateriali Molecolari all'Università di Oxford. Le ricerche del Prof. Bogani sono altamente multidisciplinari, comprendendo aree di interesse della Fisica, della Chimica, di Elettronica e Scienza dei Materiali. Sono focalizzate alla creazione ed allo studio delle proprietà di nanomateriali elettronici e magnetici, con particolare attenzione a sistemi molecolari composti da poche decine di atomi fino al livello di singola molecola, di cui vengono studiate le proprietà classiche e quantistiche, e che vengono integrati in nanomateriali e in dispositivi elettronici e spintronici.

Il Direttore ha contattato i Decani dei Settori Scientifico Disciplinari del Dipartimento più affini al profilo scientifico del Prof. Bogani. I decani dei settori CHIM/02, CHIM/04 e CHIM/06 riferiscono che i loro settori non manifestano interesse alla chiamata. Il settore CHIM/03, considerata l'assenza di altre possibilità, si è reso disponibile a valutare la chiamata

del Prof. Bogani nell'ottica di attrarre talenti.
Il Presidente, avendo già acquisito il parere dei decani, chiede conferma anche ai rappresentanti dei settori CHIM/02, CHIM/04 e CHIM/06 nella CIA se dopo discussione e approfondimento sia ribadita la decisione di non manifestare interesse per una eventuale chiamata sui rispettivi settori di appartenenza.

La Prof.ssa Berti interviene dichiarando che la possibile afferenza sul SSD CHIM/02 è stata discussa ampiamente all'interno del settore alcuni mesi orsono; lei era personalmente favorevole ad un inquadramento del Prof. Bogani sulla Chimica Fisica, ma il settore si era espresso a schiacciante maggioranza in maniera contraria.

Accertata l'indisponibilità alla chiamata su questi settori, il Presidente chiede ai rappresentanti del SSD CHIM/03 di confermare l'interesse per la chiamata. Intervengono i Prof. Turano, Sorace e Giorgi per esprimere le seguenti considerazioni.

Vista la conferma della posizione negativa precedentemente espressa dagli altri settori i rappresentanti del SSD CHIM/03 indicano la disponibilità del loro settore alla chiamata diretta, premessi i seguenti aspetti:
1) Dal CV del prof. Bogani risulta evidente come, dopo un'iniziale attività di ricerca prevalentemente incentrata sui temi del SSD CHIM/03 (su cui ha ottenuto l'ASN nel 2013), il suo interesse scientifico si è spostato verso la caratterizzazione di nanomateriali a base di carbonio.
2) Dalla VQR 2015-19 emerge che a fronte di un posizionamento eccellente per il SSD CHIM/03 altri SSD fra quelli consultati risultano avere necessità di consolidare il proprio posizionamento.
3) Il settore CHIM/03 ha ottenuto, dopo il termine della VQR 2015-2019 due finanziamenti ERC (Synergy - R. Sessoli; Starting - M. Perfetti) che rafforzano l'eccellenza del settore. La chiamata di un ulteriore vincitore di ERC andrebbe quindi ad aggiungersi all'unico settore che già ne può vantare due.
Pertanto, i rappresentanti del settore CHIM/03 sulla base delle consultazioni intercorse con gli altri membri del SSD chiedono che la CIA supporti le seguenti richieste:
a) chiedere all'Ateneo un impegno a trovare spazi e collocazione, anche esterna al Dipartimento, per la strumentazione che il Prof. Bogani porterà a UNIFI, in considerazione della multidisciplinarietà delle possibili applicazioni della strumentazione;
b) chiedere all'Ateneo, viste le premesse di cui ai punti 1 e 2, che l'inserimento del Prof. Bogani nel DICUS non incida negativamente per il SSD CHIM/03 sui parametri utilizzati per determinare la programmazione ordinaria del personale.
Anche alla luce dei nuovi indicatori di Ateneo per la programmazione anticipati nelle comunicazioni della Direttrice ritengono inoltre di sottolineare i seguenti punti:
c) visto che la motivazione del settore CHIM/03 per questa operazione è quella di contribuire alla premialità dell'Ateneo, il settore si aspetta che di ciò si tenga conto nella attribuzione dei contributi legati alla premialità;
d) che il Dipartimento, per la programmazione futura, si impegni ad applicare i parametri premiali legati all'eccellenza scientifica indicati dall'Ateneo.

Non essendoci altri interventi, il Presidente, ricordando che:

- la chiamata del Prof. Bogani è da considerarsi aggiuntiva ed esterna alla programmazione ordinaria del personale;
- i PuOr necessari per la chiamata non graveranno sul budget del Dipartimento, in quanto

come previsto dalla delibera n. 126 del 29 marzo 2022 del CdA dell'Università di Firenze i PuOr necessari per la chiamata saranno cofinanziati dal MUR nella misura del 50% e il costo restante sarà a carico dell'Ateneo;

mette in approvazione la seguente delibera.

Proposta di ***chiamata diretta del Prof. Lapo Bogani ai sensi dell'art. 3 del Decreto Ministeriale n. 919 del 22 luglio 2022 - "Identificazione dei programmi di ricerca di alta qualificazione, finanziati dall'Unione europea o dal MUR di cui all'art. 1, comma 9, della legge 4 novembre 2005, n. 230, e successive modificazioni"*** come Professore di I fascia afferente al settore concorsuale 03/B1 - Fondamenti delle Scienze Chimiche e Sistemi Inorganici, settore scientifico-disciplinare CHIM/03 - Chimica Generale ed Inorganica, nelle more della pubblicazione del D.M. relativo ai criteri di ripartizione del Fondo di Finanziamento Ordinario (FFO) per l'anno 2023, per le seguenti motivazioni.

Il Prof. L. Bogani è risultato vincitore del Programma di ricerca di alta qualificazione ERC - Consolidator Grant ERC 2017 (01-01-2019/31-12-2023) con il progetto Molecular Magnetic Graphene Nanoribbons finanziato con 1729668 €.
Il Prof. L. Bogani, il cui CV (vedi allegato) risulta di altissimo valore scientifico, ricopre la qualifica di Full Professor of Molecular Nanomaterials presso la University of Oxford, si occupa di sintesi e caratterizzazione spettroscopica avanzata di nanomateriali a base di grafene. Analizzato in dettaglio il CV, dopo ampia discussione, la CIA approva, per quanto di sua competenza, la proposta di chiamata diretta ai sensi dell'art. 3 del Decreto Ministeriale n. 919 del 22 luglio 2022 - "Identificazione dei programmi di ricerca di alta qualificazione, finanziati dall'Unione europea o dal MUR di cui all'art. 1, comma 9, della legge 4 novembre 2005, n. 230, e successive modificazioni" del Prof. Lapo Bogani, il cui curriculum corrisponde pienamente alle esigenze del Dipartimento di seguito specificate.
La ricerca scientifica nell'ambito dei nanoribbons magnetici di grafene, base dell'ERC Consolidator Grant di cui il prof. L. Bogani è titolare, si basa su un approccio radicalmente innovativo. Si tratta infatti di ottenere questi sistemi attraverso un approccio bottom-up invece del più comunemente metodo top-down. Questa ricerca apre un'area completamente nuova nella sintesi chimica e potrà ridefinire la nostra conoscenza sperimentale e teorica del comportamento di spin molecolari su grafene. Oltre ad arricchire le possibilità e le competenze di sintesi chimica presenti all'interno del Dipartimento il prof. Bogani porterà il proprio know-how relativo a tecniche di caratterizzazione spettroscopica avanzate, applicabili anche ad ambiti radicalmente diversi. Infine, l'eccezionale track-record nella sintesi e caratterizzazione di nanostrutture a base di carbonio del prof. Bogani potrà completare l'offerta didattica e formativa del Dipartimento in un settore scientifico-tecnologico di rilevanza strategica.
La congruenza del profilo scientifico del Prof. L. Bogani con il SSD CHIM/03 è attestata dalla Abilitazione Scientifica Nazionale per la I fascia conseguita in data 23/12/2013 nel settore CHIM/03.

Il Dipartimento, in considerazione dell'elevato spessore scientifico del prof. Bogani e dell'interesse multidisciplinare delle sue linee di ricerca, chiede all'Ateneo:

- l'impegno a trovare spazi e collocazione anche esternamente al Dipartimento di Chimica per la strumentazione che il Prof. Bogani porterà all'Università di Firenze, in considerazione dell'interesse multidisciplinare della sua ricerca;
- che il suo inserimento nel DICUS non gravi sui parametri del settore disciplinare del

chiamato (CHIM/03) che concorrono a determinare la programmazione del personale;
- che eventuali premialità per la chiamata vadano a beneficio del Dipartimento ed in particolare del SSD di inquadramento.

Approvato all'unanimità

3. Varie ed eventuali

Nessuna.

La seduta si conclude alle ore 12.20.

Presidente: Prof. Andrea Goti
Segretario: Prof. Emiliano Fratini

ALLEGATO

LAPO BOGANI, CURRIULUM VITAE

PUBLICATION LIST

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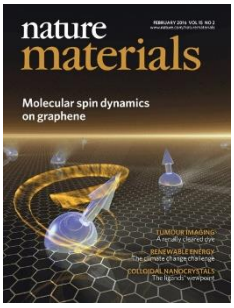

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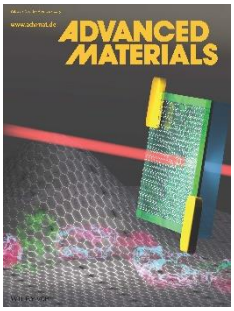

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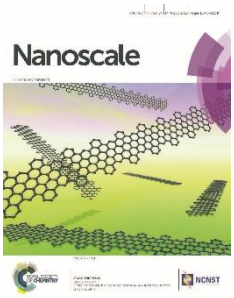

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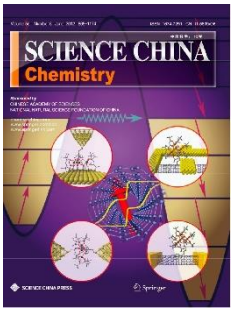

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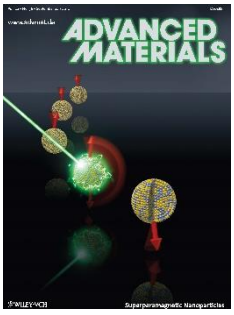

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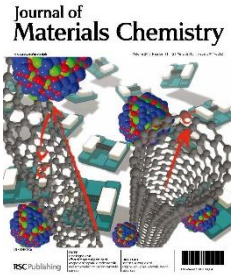

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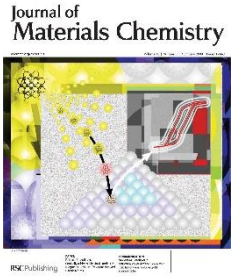

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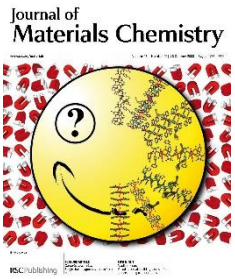

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SERVICE

- January-March 2023- Consulting staff seconded to His Majesty's Government ministry for Business, Energy and Industrial Strategy.
- 2022-2023- Member of the Departmental Search and Nominations Committee.
- 2019-2022- Chair of the Departmental Equality and Diversity Committee.
- 2016-2019- Chair of the Departmental IT Committee.
- 2016-2020- Member of the Department Finances Committee.
- Reviewer for ERC Grants, at all levels: Starting, Consolidator and Advanced grants
- Member of the EPSRC College of Referees
- Reviewer for all major academic funding bodies, including: the EU, German DFG, Dutch NOW, British EPSRC, the Royal Society, the Marie Curie programme, French ANR, American DOE, Singaporean NRF, Israelian ISF, etc...
- Referee for all major journals in Physics, Materials and Chemistry, including NPG journals (Nature Nanotechnology, Nature Materials, Nature Chemistry, Nature Reviews, Nature Communciations, etc…), APS journals (PRL, PRB, etc…), ACS journals (Nano Letters, ACS Nano, JACS), Chell Press (Chem, Matter), Wiley Journals (Advanced Materials, New Journal of Physics, Small, Advanced Functional Materials, Advanced Electronic Materials, Angewandte Chemie, Chemistry Europan Journal, Chemistry Asian Journal, etc…), RCS Journals (Chemical Sciences, ChemComm, Journal of Materials Chemistry, etc…).
- Outreach activities for local schools and the Department.

PRESENT GRANTS

As PI:

- RS-URF Quantum spin states in chemically-made molecular graphene (ending in 2023, likely to become extendable of 6 months for covid). ~£ 0.8M.
- ERC-CoG originally ~£1.7M (ending 31 December 2023, extension requested)
- RS-grant (Topological States in Porphyrin-based Nanoribbons) ending in October 2022 ~£ 20k
- RS-grant ~£ 85k
- Host of a Marie Curie fellow (to end in 2023) ~£ 150k

Co-I, with resources allocated from these grants:

- 4D-NMR European Collaborative grant 101099676 - GAP-101099676 ~£ 0.5M.
- QuEEN (EPSRC) Programme Grant ~£5.3M, presently being extended to January 2023
- NS2NF (EPSRC) Platform grant ~£1.5M, presently being extended to June 2023
- Capital Equipment proposal for a ^{3}He SQUID ~£1.7M.

Under submission:

- EPSRC proposal with Prof. Harry Anderson ~£0.8M
- EPSRC Open Fellowship, already discussed with EPSRC officials.
- IAA for nanotechnologies for musical instruments. Two NDAs already in place with the companies Fender and Daddario.

PAST GRANTS

The funding received includes some of the most competitive EU and international grants, in all countries where he worked. These funds include, among others:

- Quantum Technology Capital (EPSRC) ~£1.5M, concluded in 2019.
- ERC Starting Grant 338258 OptoQMol (on a 7% success rate). 1.5 M€
- Hosted 3 Marie Curie fellows. 150 k€ each
- DFG Grossgeräteantrag. 520 k€
- Alexander von Humboldt Sofja Kovalevskaja research grant (8 selected every 2 years among all disciplines). 1.7 M€
- IAA grant of the University of Oxford (~£ 100k)
- Two CSG grants of the University of Oxford (~£ 150k each)
- DFG Schwerpunktprogramm SPP1601 project. 170 k€ (collaboration grant)
- BW Kompetenznetz Funktionelle Nanostrukturen. 200 k€ (collaboration grant)
- SFB-TRR21 Sonderforschungsbereich. 200 k€ (collaboration grant)
- Humboldt research fellowship. 300 k€ Turned down for the Sofja Kovalevskaja grant
- Integrated Quantum Systems (IQST) excellence initiative grant.
- Individual Marie Curie EIF041565MoST (on a 10% success rate). 150 k€
- MagMaNet and QuEMolNa EU networks of excellence projects. 100 k€
- Italian national Ph.D. scholarship (first place with score 118/120)

NETWORK OF RELATIONSHIPS

I built a strong relationship network by working many years in several different countries, and by setting up collaborations with international partners:

- University of Oxford: I shall bring connection with the whole University of Oxford, and the associated Quantum Initiative. In particular: I am in constant contact with Prof S Benjamin (director of the UK's National Quantum Computing Centre and co-founder of the Quantum Motion startup). I personally know the leadership of the Hub in Quantum Computing and Simulation, recently endowed with £94 M. Several of the prominent scientist, to name just a few, are: Prof D Jaksch, Prof P Radaelli (director of the advanced characterization facilities), Prof A Ardavan (director of the national pulsed EPR facilities), Prof A Briggs (previous director of the UK Quantum Initiative), Prof H Anderson, Prof C Timmel (unravelling quantum effects in biological systems), Prof S Blundell (working on topological materials).
- UK: the network includes (but not limited to) University of Manchester: Prof R Winpenny, Prof. E McInnes, Prof N Chilton, Prof Irina Grigorieva, Prof A Geim, Prof K Novoselov, Prof. C Casiraghi, Dr. Ashok Keerthi, Dr Floriana Tuna; UCL Prof J Morton (who recently started the startup Quantum Motion to pioneer Si-based quantum computing); Imperial College, Prof I Walmsley (provost of Imperial College and founder of the ORCA quantum computing company); University of Lancaster: Prof E Laird. Prof. C Lambert;
- France: CEA Grenoble, Prof. S de Franceschi; ENS Paris, Prof P Roussignol, Prof T Kontos; CEA Paris and Academie de France, Prof. D Esteve;
- Germany: MPI für Mikrostrukturphysik, Prof. X Feng; MPI für Polymerforschung, Prof K Mullen; MPI fur Festkörperforschung, Prof. K Kern, Prof H Takagi, Prof B Keimer; University of Stuttgart, Prof. J Wrachtrup (founder of the Centre for Integrated Quantum Science and Technologies IQST); Helmholtz-Zentrum Berlin, Dr B Naydenov (head of the pulsed microwave unit); University

of Ulm, Prof M Plenio, Prof F Jelezko; University of Konstanz, Prof. G Burghard (theory of quantum systems, and Si Qbits).

- Austria: IST Austria, Prof G Katsaros (on superconductor-semiconductor quantum hybrids);
- Netherlands: TU Delft, Prof H van der Zant, Prof G Steele;
- Switzerland: ETH Zürich, Prof. C Degen, Prof P Gambardella, Prof G Aeppli ; PSI Prof G Aeppli; University of Basel, Prof D Loss, Prof M Poggio;
- Spain: University of Valencia, Prof E Coronado; University of Zaragoza, Prof F Luis; Nanogune Centre, Prof L Hueso; ICREA Barcellona, S Roche;
- USA: MIT, Prof Danna Freedman (Frederick George Keyes Professor); National High Magnetic Field Laboratory, Prof S Hill.
- China: Hong Kong University, Prof J Liu; Quantum Technology Institute, Dr T Pei; Chinese National Academy, Prof S Gao; University of Science and Technology of China, Prof J Mayer.
- Japan: The University of Tokyo, Prof. Shinichi Ohkoshi (vice-dean of the school of science and responsible for the quantum initiative at University of Tokyo), Prof E Nakamura, Prof. A Namae, Dr M Yoshikiyo; University of Tsukuba, Prof H Tokoro; Tohoku University, Prof M Yamashita; RIKEN-Tokyo, Prof F Nori; OIST, Prof A Narita.
- Singapore: NUS, Prof.J Wu; Centre for Advanced 2D Materials, Prof. K Novoselov; A*Star: Dr Aaron C L Siong, Kuan E J Goh.

DIDACTIC AND PASTORAL ACTIVITIES

I conjugate these research activities with a strong commitment to student pastoral care and teaching, where I have matured experience in both first-year and advanced courses. I have taught both practical and theoretical courses, I have developed and taught new courses in Departments of Chemistry, Physics and Materials, interfacing with students from very different backgrounds, that span from synthetic chemistry to quantum properties of matter. I have supervised 10 DPhil and 10 Part II (Master) students from a variety of backgrounds.

My teaching experience includes the planning and teaching of theoretical and practical courses, as well as tutorials and preparation for examinations. I have experience in **teaching Chemistry, Physics, and Materials science subjects**. I have taught both **fundamental introductory courses and advanced courses** for Master students.

I take particular care of finding ways to teach concepts so that they can be grasped and handled intuitively, and not only using mathematical machinery. As an example, while teaching group theory and its applications in materials science, I have shown how it can be employed to solve Rubik's cube, providing a practical and immediate application of the concepts. The individual student tutoring system is a particular characteristic of the colleges of Oxford and Cambridge, and demands a strong teaching commitment. I have performed **single-student and group tutoring** in an official manner at Keble College, Oxford, and I consider this an evolution of the personal tutoring and care that I have always provided for the preparation of junior students for official examinations.

I also have experience in Admissions for Undergrads (and Graduate) students, and I have acted in admissions for Keble College and StAnne's College, for both Chemistry and Materials. **This expertise will be place in the service of the Chemistry, Materials Science and Physics Courses in Florence**.

I have always created personal friendly relations with my students and, in more than one occasion, I have helped them with their needs besides the teaching activities, with guidance and support. In particular I have personally provided for the needs of Master students (K. Vaklinova and I. Kahn) coming from disadvantaged backgrounds, who needed financial assistance to dedicate themselves to their studies. I have taken particular care about the scientific and professional development of female students and collaborators, as detailed below. I have always developed very good relationships with the students that I supervised, and I have often kept in touch with bachelor students who have later moved to different (and prestigious) institutions for personal reasons (e.g. A. Ummadisingu, first at EPFL and now in Cambridge; Vaklinova at NUS, etc…). I have taken particular care to **sponsor the careers of female** and minority group members, most of which have continued to academic careers, or moved into leading positions in industry, and, since 2019, I chair the Equality and Diversity Committee of the Department, for which I am currently preparing the Athena Swan award application.

- Currently: Course Superconductivity and Magnetism, third year option course, plus associated tutoring classes. Course Optics and Optoelectronic Devices, third year option course, plus associated tutoring classes.

- Assessor for Undergraduate Admissions, at Keble College and St Anne's College.
- 2019 and 2020: Internal Examiner for Preliminaries Collections, Department of Materials, University of Oxford.
- 2019: Final year Course on Nanotechnology, University of Tokyo, Tokyo, Japan. This series of lectures (12 hours in total) was aimed at the final year students of the Physics and Chemistry courses, and was followed by a series of exercises based on the course.
- 2018: Theory of Errors and practical Course, first year students at the Department of Materials, University of Oxford (86 students).
- 2015-16: Senior Research Fellow and Tutorial fellow for second and third year students at Keble College, University of Oxford (7 students per year, 1 to 1 weekly tutorials and examination mock tests).
- 2013: Italian Habilitation for academic teaching in Solid-State Physics, Inorganic Chemistry and Physical Chemistry.
- Since 2012, Every First Semester: "Nanowissenshaft" theoretical course, Universität Stuttgart (typically 20 students).
- Since 2012, Every second Semester: "Nanomagnetismus" course, Universität Stuttgart (typically 20 students).
- 2012, Spezialvorlesung: "Symmetrie und Festkörperphysik" special advanced theory course, Universität Stuttgart (12 students).
- 2012-13: Supervisor for a summer student (M.Y. Tsang) from Princeton University, USA.
- 2011: Supervisor for a RICE bachelor student (D. Dawson) from Washington State University.
- Since 2011: Supervisor for 6 PostDoc scientists in Chemistry and Physics, Universität Stuttgart.
- Since 2008: Supervisor for 5 PhD students in Chemistry and Physics, Universität Stuttgart.
- Since 2009: Supervisor for 7 German Master students in Physics, Universität Stuttgart.
- 2010-11 Second Semester: Hauptseminar "Carbon nanostructures", Universität Stuttgart (12 students, see details below).
- 2009, 2010 and 2013 First Semester: Physics Laboratory Prakticum for the "International master programme", Universität Stuttgart (10 groups of 2 students, working for 2 days on an experiment).
- 2009: Invited lecturer at the physics PhD school at Chalmers University, Gotheborg, Sweden (1 week, 13 students).
- 2008: Course responsible at the EU-School ESONN, Grenoble, France. Advanced practical course A20.
- 2007: French habilitation for academic teaching in Optics, Solid State Physics, Inorganic Chemistry, Physical Chemistry.

- 2005-06: Inorganic Chemistry course (theory and laboratory, 36 Students, 6hrs/week, summer semester).
- 2002-03: Stage responsible for a French “Diplôme d’Etudes Approfondies” (D.E.A) stage (Dr. A. Vicens).
- 2001-05: Stage responsible for 4 Italian and international students at La.M.M..
- 2005: Formation of scientific guides, illustration of a molecular-magnet-based machine; Genova National Science Festival.
- 2002-2005: Private tutoring of Italian students for examinations and exercises.

SUPERVISOR LEGACY

I have officially supervised or co-supervised:

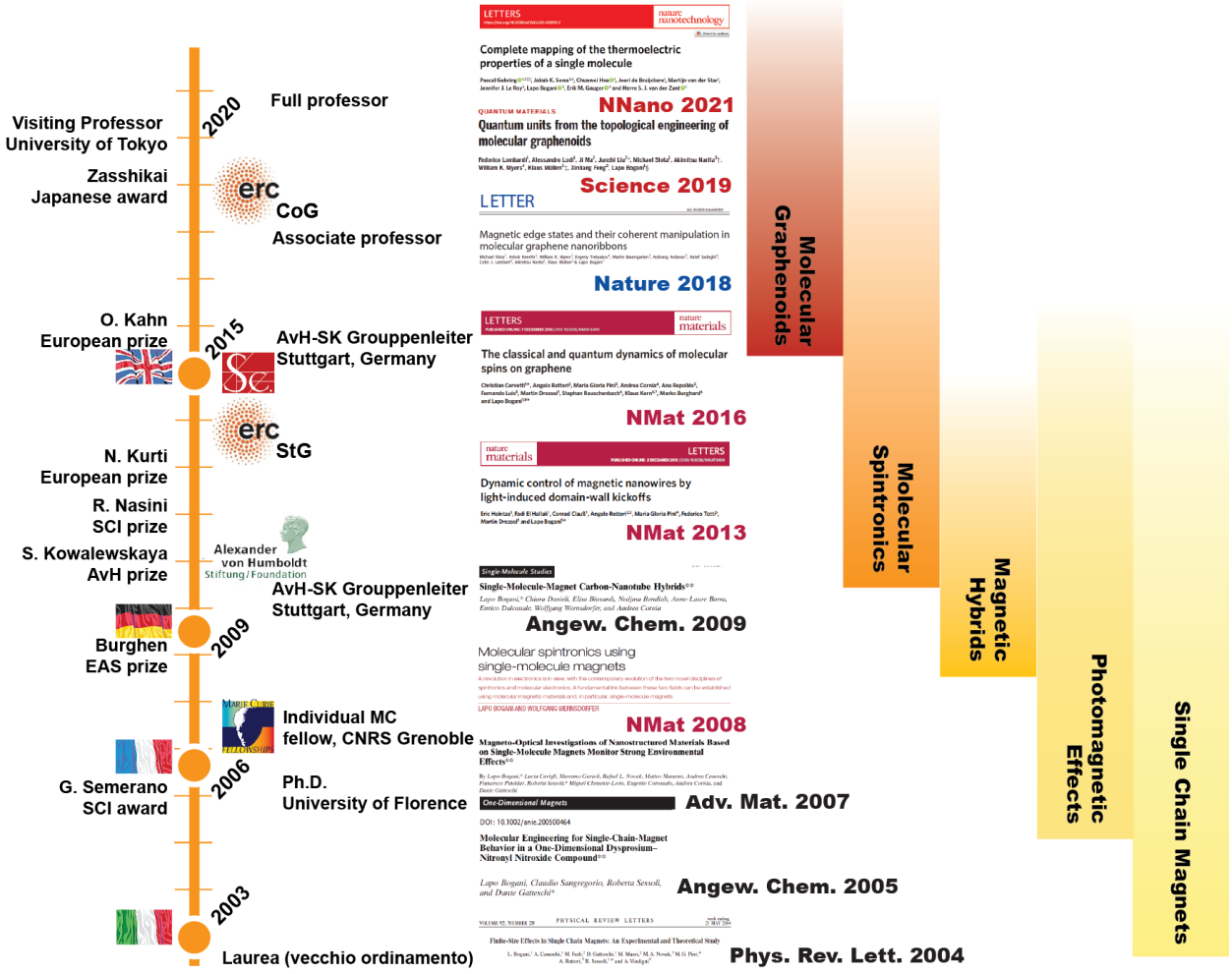
- 8 DPhil students in Oxford who completed their DPhil
- 3 Master students
- 3 PhD students in Germany
- >7 master students in Germany
- I'm currently supervising 7 DPhil students, with 3 who just joined my group in Autumn 2021.
- I've been internal and external examiner to several DPhil VIVAs (around 15).

I care that my female students and group members go on to have successful career, and I have actively supported several female group members:

- Amita Ummadisingu, currently a researcher in Cambridge.
- Kristina Vaklinova, who was a master student and started her PhD with me. Had a troubled fall out with the head of the institute in Stuttgart, and I supported her towards completion. She is currently Research scientist at National University Singapore.
- Karin Goß, now research directing manager at DENSO gmbh, a global Fortune 500 company.
- Jennifer Le Roy, whom I supported for several fellowships, received an offer for a lectureship in Vancouver but turned it down to become CTO of NovoLop, and attend Harvard Business School.
- Wenjing Yan, who was a postdoc in Oxford and is now building up her research group at the University of Nottingham.

RESEARCH STATEMENT

My research focuses on quantum molecular materials and devices at the nanoscale, with attention to the effects produced by **the classical and quantum spin dynamics**. I see this as a strongly **multidisciplinary** effort, and my group is covering the whole range of opportunities offered by these systems: the **chemical synthesis** synthesis of novel molecular systems based on **organic and inorganic blocks** such as molecular graphenoids and their inorganic coordination compounds; the **fabrication of nanoscale quantum devices** and their integration with molecular materials; the development of **novel measurement techniques** reaching the limits of single-molecule sensitivity; the investigation of **quantum electronic transport** at the single-molecule level and **molecular spintronics**; the use of **photons for quantum processing**, with both optical and microwave frequencies in the weak and strong coupling limits; the **numerical and analytical modelling** of the properties.



In the **upcoming years**, my plan is to lead this area to bloom, along three axes:

1▪ Investigate the quantum properties of a new wave of carbon nanomaterials, combining them with inorganic centres so as to see the emergence of topological states.

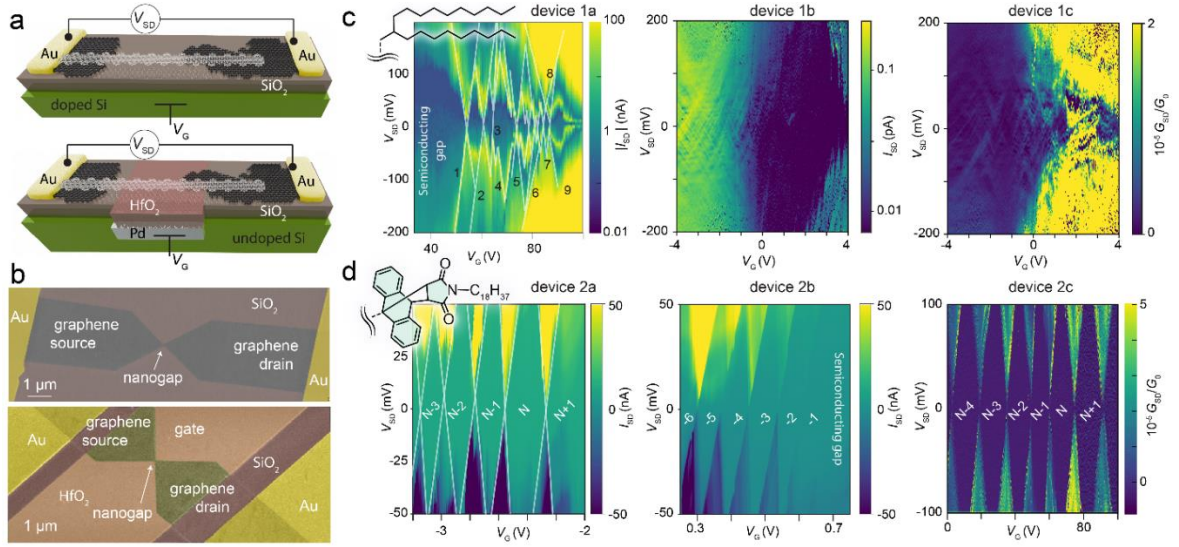
2▪ Develop an interface to quantum devices, using electrons (transport) and photons (strong coupling), and time resolved techniques, with attention to system active in the visible, GHz and THz regions.

3▪ Expand towards novel platforms for quantum, e.g. investigating the quantum coherence of the topological states of Haldane chains, and towards novel approaches, e.g. the use of ultrafast techniques to investigate correlations and edge states in graphenoids and hybrid nanostructures (e.g. comprising superconductors and graphene systems).

These axes will be developed along the following areas of research.

▪ **Novel Measurement Techniques.** My group actively engages in the development of novel instrumentation that works at extreme conditions, and allows probing quantum effects at the nanoscale. We are contributing to the developments of a novel transient-microwave setup that allows interfacing laser excitation and microwave spectroscopy with ns time resolution; a mK torque magnetometer with extreme sensitivity, operating in vector magnetic fields; Hall bar gradiometers, also operating at mK temperatures and in vector fields. We are currently developing a novel setup to interface pulsed microwaves with transport at mK temperatures, so as to measure single-molecule electron paramagnetic resonance. The instrumentation created allows **the time-resolved characterization of the quantum properties of spin systems, with GHz pulses and single-electron transport.**

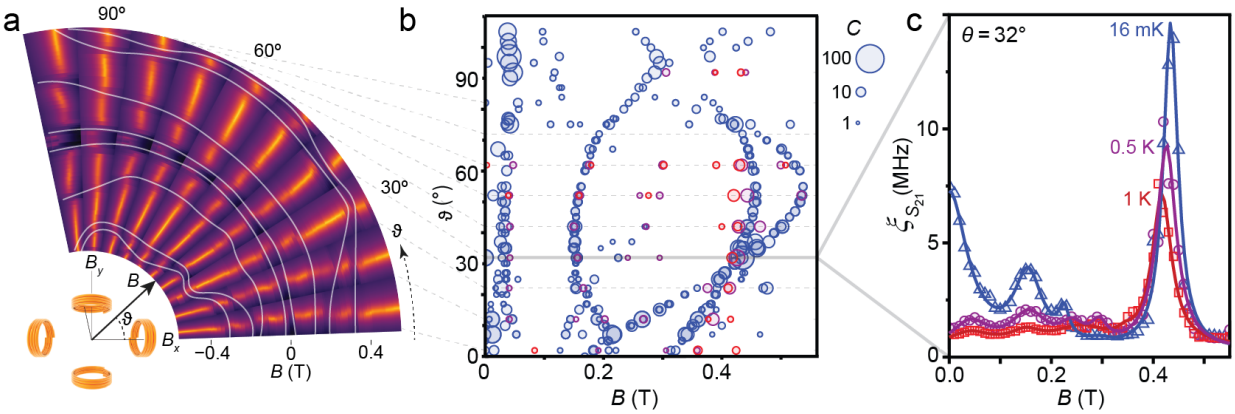
▪ **Single Molecule Electron Transport.** My laboratory produces and characterizes transport devices where single-electron transport can be measured at mK temperatures and in magnetic fields (we run 3 dilution refrigerators and 2 cryostats, all cryo-free). Our investigations cover the spin and vibrational coupling of graphene nanoribbons to the electronic bath, and the integration of these graphene nanostructures into single-electron transistors that work at room temperature (Nature Materials in press 2023). Moreover, we use the spin properties of metal centres to observe quantum spintronic effects in single-molecule devices (Nature Materials 2009, Nature Communications 2022,). These activities have also allowed probing the limits of thermodynamics at the quantum limit, and we are actively engaging in understanding thermal and electronic effects arising in quantum transport, e.g. via the Peltier effect at the single-molecule level (Nature Nanoechnology 2021).



Examples of single-electron quantum transport devices based on molecular graphene nanoribbons, fabricated and measured in my labs, showing the geometry of the fabrication (a), the actual devices (b), non-optimized transport (c), ultra-clean Coulomb blockade transport features optimized for quantum experiments (d).

These activities introduce novel techniques that produce a strong synergy with all areas of synthetic activity in Florence, including organic and inorganic chemistry, and allow bridging the activities with those of the Physics Department .

- **Ligh-matter interactions: bringing molecules to the quantum limit.** We have developed the apparatus necessary to measure strong coupling effects in 3D resonators and superconducting coplanar waveguides at mK temperatures in the 1-20 GHz range (PRL 2017). We pay particular attention to the quantum effects that can be introduced by coupling to magnetic quantum materials, such as organic radicals (Phys Rev Letters, 2017), graphenoids and inorganic compounds such as Gd(III) molecular clusters and molecular chains. There are very strong contact points here between these activities and the research on quantum states of matter, and the use of GHz frequencies together with visible light can lead to novel concepts for quantum processes. Moreover, these research activities see a connection with the theoreticians and experimentalists in the Department of Physics and LENS.

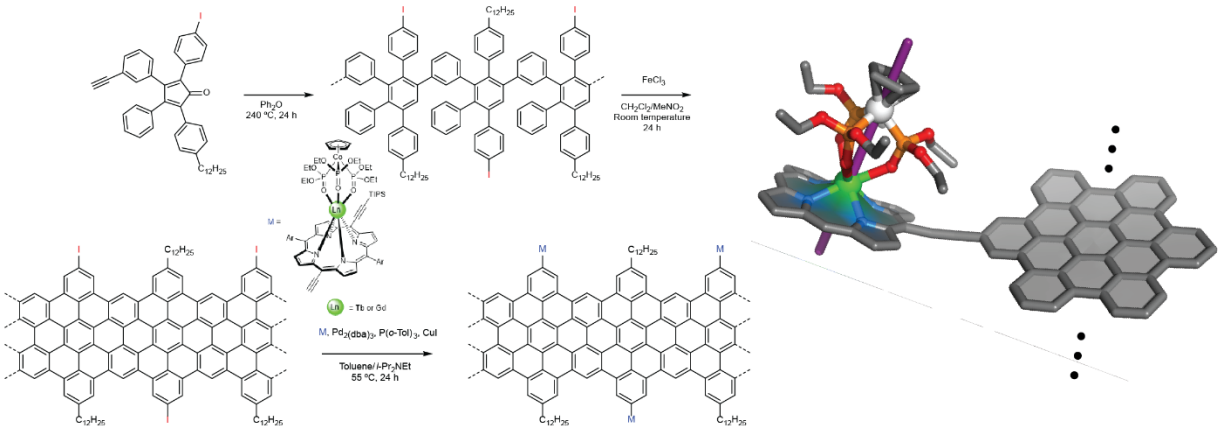


Examples of strong coupling of a high quality resonator with a Gd(III)-based metal complex, at mK temperatures, showing the angular evolution of the avoided level

crossings produced by light-matter strong coupling (a), the angular evolution of the resonator-spin quantum cooperativity C (b), and the magnetic field dependence of the quantum cooperativity between the compound and the resonator states together with simulations using second quantization (c).

- **Numerical and analytical modelling.** We eventually provide feedback and modelling support for the characterization, and produce feedback to the synthetic activities, via numerical and analytical analysis of the systems. We have developed numerical tools for the calculation of the Berry phases at the edge of carbon nanosystems for the reliable identification of the topology of graphenoids, and we are currently conjugating them with the modelling of magnetic metal centres, so as to explore the effect of functionalization and spin orbit coupling on the topological properties of compounds that can be realized synthetically. There is a clear and direct connection between this line of activities, which includes low-dimensional materials, and the research themes by several groups in the Department of Chemistry.
- **Creation of Nanomaterials.** I have a background in inorganic synthesis of coordination complexes, especially on rare-earth ions (e.g. Angew Chem 2005, JACS 2022, etc…). I have later expanded my synthetic efforts to mix coordination chemistry together with the advanced organic synthesis of polycyclic aromatic hydrocarbons (Nature 2018, Chem 2021, AngewChemie 2022, JACS 2022). These days, my group is leading, within an international research effort, the development of a new wave of molecular carbon materials that display appealing quantum properties. We pay particular attention to long coherence times even at room temperature, and to feedback from experimental results so as to optimize the quantum transport and spin coherence properties. The synthetic effort can also receive strong feedback from the numerical modelling activities, so that it is possible to guide the synthesis towards the rational design of topological states in molecular compounds, e.g. via the side-functionalization of molecular graphene nanoribbons with transition metal ions that have high spin-orbit coupling, or via the tailoring of the terminal states of the nanoribbons. Moreover, we are actively developing novel graphenoids that are highly luminescent (we recently reached 9% quantum yield) in order to produce an optical interface for these materials.

This research line sees strong synergy with the research activities in the areas of inorganic and organic chemistry.



Example of Chemical Synthesis undergone in my labs, with complex organic and inorganic tuning of quantum graphenoid materials, showing the synthetic path (left) and the resulting compound (right).