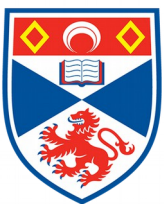
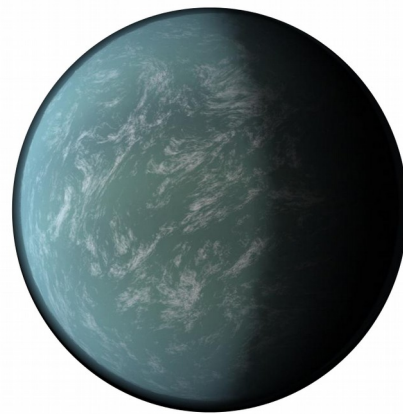
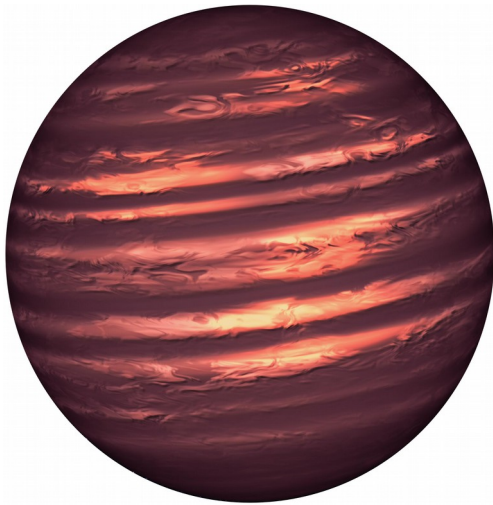




**Scottish
Exoplanet & Brown Dwarf
Community Meeting**

27th April 2015

University of St Andrews



University of
St Andrews



European Research Council
Established by the European Commission

PROGRAMME SUMMARY

10:00 Arrival and Welcome Coffee.

10:30 Welcome: Dr Ch. Helling & Dr B. Biller

Morning Session in Lecture Theatre C. Chair: Guillaume Laibe

10:35 Post-doc presentations 1

Aurora Sicilia-Aguilar, Eric Lopez, Annelies Mortier & Craig R. Stark

PhD Talks

10:50 Johanna Vos, University of Edinburgh.

The First Search for Exoplanet Weather

11:10 Kirstin Hay, University of St Andrews.

Is the eccentric WASP-118 system misaligned?

11:30 Graham Lee, University of St Andrews.

Nucleation & Cloud Formation in HD 189733b

MSc Project Presentation

11:50 Guy Brett-Robertson & Kenneth Wood, University of St Andrews.

Monte Carlo Simulations of Cosmic Ray Air Showers in the Atmospheres of Jupiter and Brown Dwarfs

12:00 Discussion.

12:30 Lunch in Physics Concord – Tables along the windows are reserved for the meeting

Afternoon session in Lecture Theatre C, Chair: Annelies Mortier

14:00 Post-doc presentations 2

Guillaume Laibe, Irena Vorgul, Raphaëlle Haywood & Paul B. Rimmer

PhD Talks

14:15 Jack Yates, University of Edinburgh.

Investigating habitability and biosignatures with models of the Earth system

14:35 Lisa T. Lehmann, University of St Andrews.

Simulation of non-potential azimuthal magnetic fields using a bipole model

14:55 Gabriella Hodosán, University of St Andrews.

Lightning on exoplanets and brown dwarfs: What can we learn from Solar System planets?

15:15 Maria Rodriguez Barrera, University of St Andrews.

A reference study of plasma and magnetic characteristics for M-dwarf, Brown Dwarfs and Giant Gas Planets

MSc Project Presentation

15:35 Patrick Sandquist & Guillaume Laibe, University of St Andrews.

Modern models for dust settling in discs

15:45 Discussion

16:15 Coffee and Conclusions

17:00 End of Meeting

DETAILED PROGRAMME

10:00, Arrival & Welcome Coffee (*Physics Concord*)

10:30, Welcome

Dr. Christiane Helling & Dr. Beth Biller

Morning Session (*Lecture Theatre C*)

Chair: Guillaume Laibe

10:35, Post-doc Presentations [*3 min each*]

Aurora Sicilia-Aguilar	HERSCHEL: CONNECTING PROTOSTARS, DISKS AND STAR-FORMING REGIONS
Eric Lopez	UNDERSTANDING THE COMPOSITIONS AND EVOLUTION OF SUB-NEPTUNES AND SUPER-EARTHS
Annelies Mortier	HARPS-N SPECTROSCOPY – THE HUNT FOR EARTHS
Craig R. Stark	ATMOSPHERIC NON-EQUILIBRIUM PLASMA PROCESSES

PhD Student Talks [*15+5min each*]

10:50 *Johanna Vos* THE FIRST SEARCH FOR EXOPLANET WEATHER

Abstract: *Periodic variability due to rotation and patchy cloud cover has been detected in L and T brown dwarfs, with considerably higher variability amplitudes observed at the L/T transition. Directly imaged planets occupy the same temperature regime as L and T type brown dwarfs and are likely to exhibit similar variability. We are currently conducting the first survey of weather patterns on free-floating young planetary mass objects with NTT SOFI. We aim to discover and characterise variability in these objects and to constrain the fraction that show periodic variability due to rotationally modulated patchy cloud cover. A comparison of our survey with surveys of field brown dwarfs will provide insight into the effects of surface gravity on cloud structure. Here I will present some preliminary results from this survey.*

11:10 *Kirstin Hay* IS THE ECCENTRIC WASP-118 SYSTEM MISALIGNED?

Abstract: *WASP-118b is a newly discovered hot Jupiter in a near 4 day orbit around its mid F stellar host. The high eccentricity of the orbit ($e=0.45$) suggests that it may be in the final stages of tidal circularisation following a period of eccentricity oscillations driven by the Kozai mechanism. In this talk, I will present a summary of the planetary parameter fitting techniques used, and the current evidence for a high spin-orbit misalignment. I will also discuss how the obliquity can be measured, and where this particular system sits in the hot Jupiter distribution.*

Abstract: *Context.* Recent observations of HD 189733b suggest that the exoplanet has a cloud/haze component in its atmosphere. The presence of cloud/haze has an effect on the local thermo- dynamic and chemical properties of the atmosphere. Unlike Earth, where cloud condensation nuclei are provided by the upward motion of sand or ash, in hot Jupiters these condensation seeds form from the gas phase. The rate at which these seeds form is determined by the local thermodynamic conditions and the chemical composition of the local gas phase. Since hot Jupiters have different thermodynamic conditions from their dayside to nightside faces we expect them to exhibit locally and globally different cloud structures. This has implications on interpreting observations of the atmosphere, which probe different atmospheric regions and depth.

Aims. Inspired by mineral cloud modelling efforts for Brown Dwarf atmospheres, we present spatially varying kinetic cloud model structures for HD 189733b.

Methods. We follow a 2-model approach using results from a 3D global radiation-hydrodynamic atmospheric simulation of HD 189773b (Dobbs-Dixon & Agol 2014) as input for our kinetic cloud formation model.

Results. We present cloud maps for HD 189733b based on a kinetic cloud formation model, and we demonstrate how the cloud structure changes locally and globally tracing the local thermodynamics of the atmosphere. The calculated cloud properties show variations in composition, size and number density of cloud particles which are strongest between the dayside and nightside. We show the impact of cloud on the local gas composition and C/O ratio. The cloud particles scattering properties suggest that they would sparkle/reflect a midnight blue colour at optical wavelengths.

11:50, MSc Project Presentation

MONTE CARLO SIMULATIONS OF COSMIC RAY AIR SHOWERS
IN THE ATMOSPHERES OF JUPITER AND BROWN DWARFS

Guy Brett-Robertson & Kenneth Wood

12:00, Discussion

12:30, Lunch (*Physics Concord*)

Tables along the windows are reserved for the meeting

Afternoon Session (Lecture Theatre C)

Chair: Annelies Mortier

14:00, Post-doc Presentations [3 min each]

- Guillaume Laibe PLANET FORMATION, DUST AND SPH
- Irena Vorgul CYCLOTRON EMISSION AND FLASH IONISATION EVENTS IN BROWN DWARF ATMOSPHERES
- Raphaëlle Haywood BREAKING THE ACTIVITY BARRIER IN EXOPLANET MASS DETERMINATIONS
- Paul B. Rimmer AMINES AMINES EVERYWHERE: PREBIOTIC SYNTHESIS IN EXOPLANET ATMOSPHERES

PhD Student Talks [15+5min each]

- 14:15 *Jack Yates* INVESTIGATING HABITABILITY AND BIOSIGNATURES WITH MODELS OF THE EARTH SYSTEM

Abstract: *The Earth system comprises the atmosphere, the seas and oceans, various geologic processes and the biosphere, each of which is mutually interacting with the others. Decades of high resolution, high cadence observations of the Earth have allowed us to model the Earth system with good accuracy and predictive power. State of the art models are highly optimised and highly modular, which makes them amenable to adaptation. In astrobiology, the gold standard for habitability is the Earth (unsurprisingly). Alternative biochemistries have been proposed, but to date there is no good evidence that anything other than carbon- and water-based life is viable. Naturally, then, if we're looking for life in the universe, we're looking for planets like the Earth. In my project I will be using and adapting Earth system models (or advances in Earth system modelling) in order to investigate the habitability of exoplanets. I will also be looking at the detectability of hypothetical life in these environments through spectral biosignatures. In this talk I'll briefly describe the approach behind my project and some of our research questions and aims.*

- 14:35 *Lisa T. Lehmann* SIMULATION OF NON-POTENTIAL AZIMUTHAL MAGNETIC FIELDS USING A BIPOLE MODEL

Abstract: *Non-potential magnetic fields are detected on many cool stars, although their origin is as yet not fully understood. They often appear as a uni-directional ring of azimuthal field. We explore the possibility that this is a resolution effect: could small spots (below the resolution limit), produce the same net line-of-sight field as a ring of azimuthal field? To do this, we simulate non-potential azimuthal magnetic field structures by covering a star with simple bipoles. By considering several bipole configurations varied by different resolutions in velocity space, we explore the effect of resolution on the recovered line of sight field.*

14:55 Gabriella Hodosán LIGHTNING ON EXOPLANETS AND BROWN DWARFS:
WHAT CAN WE LEARN FROM SOLAR SYSTEM PLANETS?

Abstract: *Large-scale electrostatic discharges (i.e. lightning) have been observed in the Solar System. Apart from Earth there are direct detections from Jupiter and Saturn and indirect (only radio) detection from Uranus and Neptune. Recent observations made by the Venus Explorer revealed radio signals that may be related to lightning. Observations indicate that clouds form on extrasolar planets and brown dwarfs (BDs). The conditions in these clouds may be good for lightning to occur, which can be a main ionization process in these atmospheres. The aim of this study is to apply the information that have been gathered from lightning observations from Earth, Jupiter and Saturn, on potential discharge characteristics on extrasolar objects. We focus on lightning climatology studies, which help us explore the global variations in lightning occurrence. Earth is a fair analogy for rocky or ocean planets while Jupiter and Saturn resemble giant planets and brown dwarfs. Using the statistical studies show the role Solar System planets in characterizing extrasolar bodies.*

15:15 Maria Rodriguez Barrera A REFERENCE STUDY OF PLASMA AND MAGNETIC
CHARACTERISTICS FOR M-DWARFS, BROWN DWARFS
AND GIANT GAS PLANETS

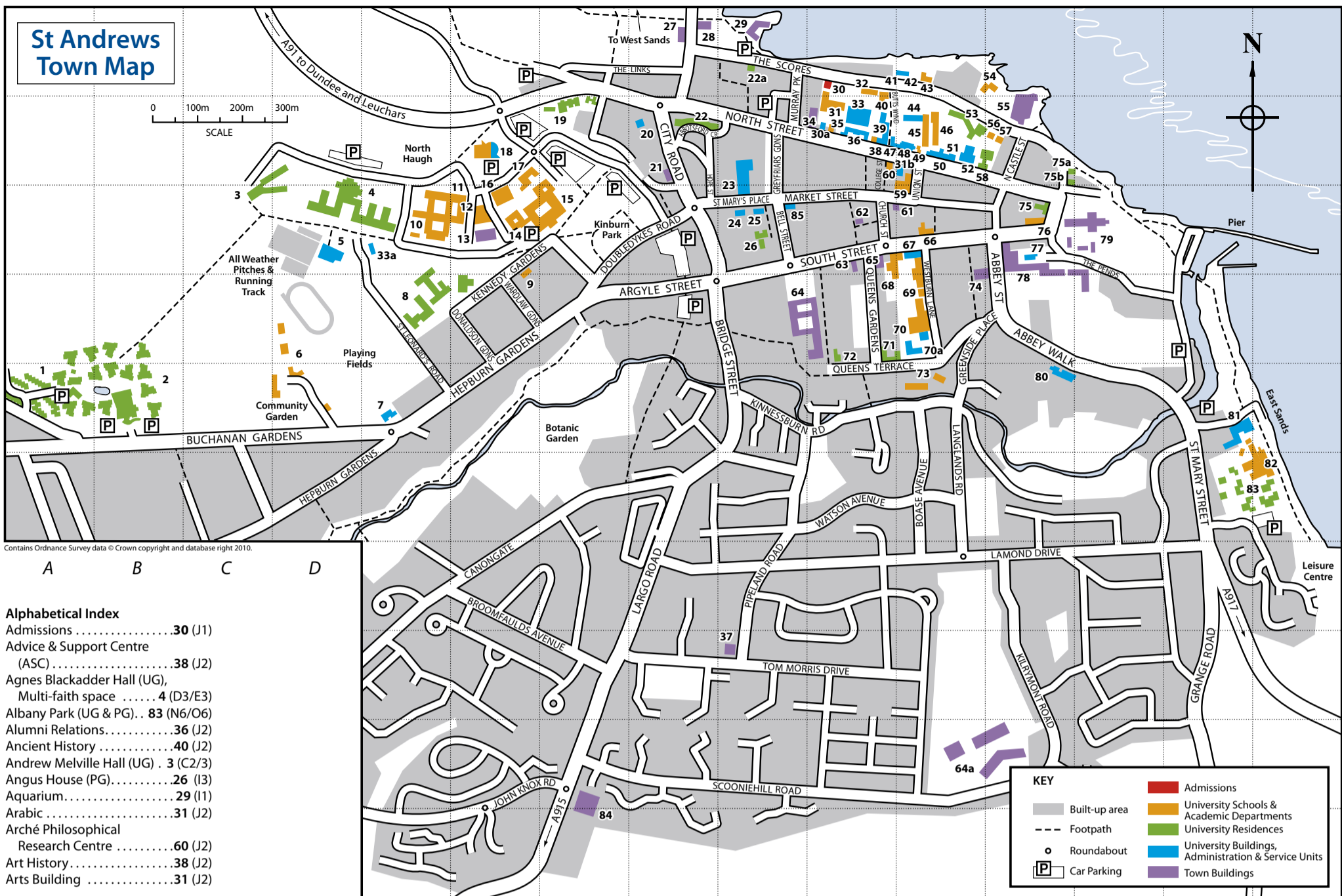
Abstract: *Radio and X-ray emission from ultra-cool objects such as brown dwarfs and extrasolar planets have been observed. Such observations suggest that a magnetised plasma is present in the atmospheres of such ultra-cool objects. The aim of this study is to identify which ultra-cool objects, M-dwarfs, brown dwarfs and planets, are most susceptible to possess a magnetised plasma by thermal processes. We study a set of fundamental plasma and magnetic coupling parameters as the theoretical framework to analyse the ionisation and magnetic coupling state of ultra-cool atmospheres.*

15:35, MSc Project Presentation
MODERN MODELS FOR DUST SETTLING IN DISKS
Patrick Sandquist & Guillaume Laibe

15:45, Discussion

16:15, Coffee and Conclusions (*Physics Concord*)

17:00, End of Meeting



<p>(The) Barron Theatre 36 (J2)</p> <p>Biology .. 17,70,73,82 (F2,K4,K5,O6)</p> <p>Biomedical Sciences</p> <p> Research Complex 11 (E3/F3)</p> <p>Buchanan Building 59 (K2/3)</p> <p>Bus Station 21 (H2)</p> <p>Bute Annexe 70a (K4)</p> <p>Bute Building 70 (K4)</p> <p>Byre Theatre 74 (K3/4)</p> <p>CAPOD 47,70a (J2,K4)</p> <p>Careers Centre 24 (I3)</p> <p>Castle 55 (L2)</p> <p>Castlecliff 54 (L1)</p> <p>Castle House 57 (L2)</p> <p>Cathedral 79 (M3)</p> <p>Chaplaincy 25 (I3)</p> <p>Chemistry 10 (E3)</p> <p>Cinema</p> <p> (New Picture House) 34 (J2)</p> <p>Classics / Classical Studies</p> <p> (Swallowgate) 40 (J2)</p> <p>College Gate 50 (K2)</p> <p>Conference &</p> <p> Group Services 39 (J2)</p> <p>Computer Science</p> <p> (Jack Cole Building) 16 (F3)</p> <p>Computer Science</p> <p> (John Honey Building) ... 12 (F3)</p> <p>David Russell Apartments</p> <p> (UG & PG) 2 (B5)</p> <p>Deans Court (PG) 75 (L3)</p> <p>Deans' Office 50 (K2)</p> <p>Design (Print & Design) 30 (J1)</p> <p>Development 36 (J2)</p> <p>Digital Communications .. 30a (J2)</p> <p>Divinity 68,76 (J3/K3,L3)</p> <p>Economics & Finance 54 (L1)</p> <p>Eden Court 22a (I1)</p> <p>Edgecliffe 43 (K1)</p> <p>English (Kennedy Hall) 56 (L2)</p> <p>English (Castle House / Poetry House) 57 (L2)</p> <p>English Language</p> <p> Teaching 9 (F3/4)</p> <p>Environmental Health and Safety Services 70 (K4)</p> <p>Estates 81 (N5)</p> <p>Evening Language</p> <p> Teaching 70 (K4)</p> <p>Events 36 (J2)</p> <p>Fife Contemporary Art and Craft (Town Hall) 65 (J3)</p> <p>Fife Park (UG & PG) 1 (A4/5)</p> <p>Film Studies 35 (J2)</p> <p>Finance (Advice & Support) 18 (F2)</p> <p>Finance (Operations & Compliance) 80 (L5)</p> <p>French 59 (K2/3)</p> <p>Gannochy House (PG) ... 58 (K2/L2)</p> <p>(The) Gateway 18 (F2)</p> <p>Geography & Geosciences</p> <p> (Irvine Building) 46 (K2)</p> <p>German 59 (K2/3)</p> <p>Golf Museum 28 (H1)</p> <p>Greek 40 (J2)</p> <p>Gregory Place (PG) 75b (L2)</p> <p>Harold Mitchell Building</p> <p> (Biology) 73 (K5)</p> <p>Hebrew 68 (J3/K3)</p> <p>Hebdomadar's Room 47 (J2)</p> <p>Hospital 84 (G9/10)</p> <p>Human Resources 80 (L5)</p> <p>International Relations 31 (J2)</p> <p>Irvine Building 46 (K2)</p> <p>Islamic Prayer Room 25 (I3)</p> <p>Italian 59 (K2/3)</p> <p>IT Helpdesk 33 (J2)</p> <p>IT Services 39 (J2)</p> <p>Jack Cole Building 16 (F3)</p> <p>Jeeves Labs 69 (K4)</p> <p>John Burnet Hall (Atholl) (UG) 19 (G2)</p> <p>John Honey Building 12 (F3)</p> <p>Kennedy Hall 56 (L2)</p> <p>Knowledge Transfer Centre 18 (F2)</p> <p>Latin 40 (J2)</p> <p>Lean 70a (K4)</p> <p>Library (Town) 62 (J3)</p> <p>Library (University) 33 (J2)</p> <p>Library Annexe and Museum Store (University) 33a (E3)</p> <p>Lower College Hall 44 (K2)</p> <p>Madras College 64 (I4/J4)</p> <p>Madras College (Kilrymont) 64a (K9/L9)</p> <p>Mail Room 70a (K4)</p> <p>Management 18 (F2)</p> <p>Martyrs Kirk Research Library 33b (K2)</p> <p>Mathematics & Statistics (Mathematical Institute) .. 14 (F3)</p> <p>McIntosh Hall (Chattan) (UG) 22 (H2)</p> <p>Mediaeval History 66 (K3)</p> <p>Medical & Biological Sciences 17 (F2)</p> <p>Middle Eastern Studies 31 (J2)</p> <p>Modern History 32 (J1)</p> <p>Modern Languages 59 (K2/3)</p> <p>Museum of the University of St Andrews (MUSA) ... 42 (K1)</p> <p>Music Centre 52 (K2)</p> <p>New Technology Centre 13 (F3)</p> <p>Observatory 6 (D4/5)</p> <p>Officer Training Corps 20 (H2)</p> <p>(The) Old Burgh School 80 (L5)</p> <p>Old Union Café 38 (J2)</p> <p>Old Union Diner 39 (J2)</p> <p>Open Association 30 (J1)</p> <p>Parliament Hall 67 (K3)</p> <p>Part-time Study 30 (J1)</p> <p>Philosophy (Logic & Metaphysics, Moral Philosophy) .. 43,60 (K1,J2)</p> <p>Physics & Astronomy 15 (F3/G3)</p> <p>Police Station 37 (I8)</p> <p>Porter's Lodge 47 (J2)</p> <p>Post Office 63 (J3)</p> <p>Press Office 30a (J2)</p> <p>Principal's Office 50 (K2)</p> <p>Print & Design 30,51 (J1,K2)</p> <p>Print Unit (Print & Design) .. 51 (K2)</p> <p>Proctor's Office 50 (K2)</p> <p>Procurement 80 (L5)</p> <p>Psychology & Neuroscience 69 (K4)</p> <p>Publications</p> <p> (Print & Design) 30 (J1)</p> <p>Purdie Building 10 (E3)</p> <p>Rector's Café 23 (I2/3)</p> <p>Registry 80 (L5)</p> <p>Research Business Development & Contracts 18 (F2)</p> <p>Residential & Business Services 39 (J2)</p> <p>Royal & Ancient Golf Club .. 27 (H1)</p> <p>(The) Roundel (Divinity) 76 (L3)</p> <p>Russian 45 (K2)</p> <p>St Gregory's (PG) 75a (L2)</p> <p>St Katharine's Lodge 32 (J1)</p> <p>St Katharine's West 30 (J1)</p> <p>St Leonard's Chapel 77 (L3)</p> <p>St Leonards School 78 (L3/M3,4)</p> <p>St Mary's College</p> <p> (Divinity) 68 (J3/K3)</p> <p>St Regulus Hall (UG) 71 (J4)</p> <p>St Regulus Hall Annexe (UG) 72 (J4)</p> <p>St Salvator's Chapel 48 (K2)</p> <p>St Salvator's Hall (UG) 53 (K2)</p> <p>Schools 1-6 45 (K2)</p> <p>Scottish History 32 (J1)</p> <p>Scottish Oceans Institute (SOI) 82 (O6)</p> <p>Senate Room 67 (K3)</p> <p>SMRU Ltd 13 (F3)</p> <p>Social Anthropology 45,49 (K2)</p> <p>Spanish 45 (K2)</p> <p>Special Collections 33a (E3)</p> <p>Sports Centre 5 (D3)</p> <p>Sports Pavilion 7 (E5)</p> <p>Stanley Smith House (PG) ... 26 (I3)</p> <p>Student Accommodation</p> <p> Services 39 (J2)</p> <p>Students' Association</p> <p> (Union) 23 (I2/3)</p> <p>Student Services 23,22a (J2,I1)</p> <p>Sustainable Development .. 46 (K2)</p> <p>Swallowgate 40 (J2)</p> <p>Tourist Information 61 (J3/K3)</p> <p>Town Hall 65 (J3)</p> <p>United College 47 (J2)</p> <p>University Hall (UG) 8 (E4/F4)</p> <p>University House 41 (K1)</p> <p>University Retail Store 85 (I3)</p> <p>Upper College Hall 44 (K2)</p> <p>Younger Hall 52 (K2)</p> <p>25 Chaplaincy, Islamic Prayer Room</p> <p>26 Angus House (PG), Stanley Smith House (PG)</p> <p>27 Royal & Ancient Golf Club</p> <p>28 Golf Museum</p> <p>29 Aquarium</p> <p>30 Admissions, Open Association, Part-time Study, Print & Design (Design & Publications), St Katharine's West</p> <p>30a Digital Communications, Press Office</p> <p>31 Arabic, Arts Building, International Relations, Middle Eastern Studies</p> <p>32 Modern History, Scottish History, St Katharine's Lodge</p> <p>33 IT Helpdesk, University Library</p> <p>33a University Library Annexe and Museum Store, Special Collections</p> <p>33b Martyrs Kirk Research Library</p> <p>34 Cinema (New Picture House)</p> <p>35 Film Studies</p> <p>36 Alumni Relations, Development, Events, (The) Barron Theatre</p> <p>37 Police Station</p> <p>38 Advice & Support Centre (ASC), Art History, Old Union Café</p> <p>39 Conference & Group Services, IT Services, Old Union Diner, Residential & Business Services, Student Accommodation Services</p> <p>40 Ancient History, Classics / Classical Studies, Greek, Latin, Swallowgate</p> <p>41 University House</p> <p>42 Museum of the University of St Andrews (MUSA)</p> <p>43 Edgecliffe, Philosophy (Logic & Metaphysics, Moral Philosophy)</p> <p>44 Lower College Hall, Upper College Hall</p> <p>45 Russian, Schools 1-6, Social Anthropology, Spanish</p> <p>46 Geography & Geosciences, Irvine Building, Sustainable Development</p> <p>47 CAPOD, Hebdomadar's Room, Porter's Lodge, United College</p> <p>48 St Salvator's Chapel</p> <p>49 Social Anthropology</p> <p>50 College Gate, Deans' Office, Principal's Office, Proctor's Office</p> <p>51 Print & Design (Print Unit)</p> <p>52 Music Centre, Younger Hall</p> <p>53 St Salvator's Hall (UG)</p> <p>54 Castlecliff, Economics & Finance</p> <p>55 Castle</p> <p>56 English, Kennedy Hall</p> <p>57 English, Castle House / Poetry House</p> <p>58 Gannochy House (PG)</p> <p>59 Buchanan Building, French, German, Italian, Modern Languages</p> <p>60 Arché Philosophical Research Centre, Philosophy</p> <p>61 Tourist Information</p> <p>62 Town Library</p> <p>63 Post Office</p> <p>64 Madras College</p> <p>64a Madras College (Kilrymont)</p> <p>65 Fife Contemporary Art and Craft, Town Hall</p> <p>66 Mediaeval History</p> <p>67 Parliament Hall, Senate Room</p> <p>68 Divinity, Hebrew, St Mary's College</p> <p>69 Jeeves Labs, Psychology & Neuroscience</p> <p>70 Biology, Bute Building, Environmental Health and Safety Services, Evening Language Teaching, IT Services</p> <p>70a Bute Annexe, CAPOD Training Room, Lean, Mail Room</p> <p>71 St Regulus Hall (UG)</p> <p>72 St Regulus Hall Annexe (UG)</p> <p>73 Biology, Harold Mitchell Building</p> <p>74 Byre Theatre</p> <p>75 Deans Court (PG)</p> <p>75a St Gregory's (PG)</p> <p>75b Gregory Place (PG)</p> <p>76 Divinity, The Roundel</p> <p>77 St Leonard's Chapel</p> <p>78 St Leonards School</p> <p>79 Cathedral</p> <p>80 Finance (Operations & Compliance), Human Resources, Procurement, Registry, The Old Burgh School</p> <p>81 Estates</p> <p>82 Biology, Scottish Oceans Institute (SOI)</p> <p>83 Albany Park (UG & PG)</p> <p>84 Hospital</p> <p>85 University Retail Store</p>
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