

# Themis Bowcock

## CURRICULUM VITÆ

### EDUCATION

<b>New College, Oxford</b>	BA	1978	-	1981
Oxford OX1 3BN Tel: 01865 279500				
<b>Queen Mary College</b>	Ph.D	1981	-	1984
Department of Physics, University of London 327 Mile End Road, London, E1 4NS, UK (0)20 7882 6958 phone				

### EMPLOYMENT

<b>Harvard University</b>	Research Associate	1984	-	1989
High Energy Physics Laboratory (now LPPC) 17 Oxford Street, MA 02138, USA (617) 495-2872 phone (617) 495-0416 fax				
<b>Texas A&amp;M University</b>	Assistant Professor	1989	-	1991
Department of Physics and Astronomy College Station, TX 77843-4242, USA (979) 845-7717 phone (979) 845-2590 fax				
<b>University of Liverpool</b>	Lecturer	1991	-	2001
	Chair	2001	-	

### AWARDS

<b>SSC</b>	Fellow	1989	-	1991
<b>University College Dublin</b>	Visiting Professor	2008	-	2011
<b>CERN</b>	Scientific Associate	2009	-	2011

### SUMMARY PARTICLE PHYSICS RESEARCH

UA1 Experiment (CERN)	Discovery of W & Z	1981	-	1984
CLEO Experiment (Cornell)	Exotics	1984	-	1989
SSC Facility(Texas)	Detector technology	1989	-	1991
ATLAS Experiment(CERN)	Detector technology	1991	-	1994
DELPHI Experiment(CERN)	W and Heavy Flavour	1991	-	1997
LHCb Experiment(CERN)	Heavy flavour Detectors	1997	-	
g-2 Experiment (FNAL)	Muon moments Detectors	2013	-	

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## Themis Bowcock: Curriculum Vitæ

LHCb Experiment	2014-
LHCb Experiment	1998-2013
g-2 Experiment	2013-
DELPHI Experiment	1991-1997
ATLAS Experiment	1991-1994
SSC	1989-1991
CLEO Experiment	1984-1989
UA1 Experiment	1981-1984

## PARTICLE PHYSICS RESEARCH

- Leader the UK VELO upgrade. Leader on assembly of pixel upgrade of VELO detector (@Liverpool) for 2021.
- Designed, developed, built and commissioned the silicon Vertex Detector (VELO1&2). VELO Project leader 2009-2011.
- First measurement of top quark production in the forward region.
- Initiated Liverpool entry into the g-2 experiment at FNAL. Built straw tracker. Proposer of upgraded tracker to increase sensitivity for EDM and g-2.
- First precision measurement of b-quark lifetime using vertices at DELPHI at the Large Electron Positron Collider (LEP) at CERN. This changed the world average to current values
- First measurement of the Non-Abelian Trilinear Gauge Couplings
- Design, and co-proposer Silicon EndCaps
- Design of novel technology for tracking
- First high statistics measurements of the production of the Ds Searches for solution to strong CP problem in QCD – the axion
- Study on the production of other colour “anomalies” in QCD including free quarks and di-quarks
- Pioneered new technique to look for monopoles and dyons
- Demonstrated Non-Abelian nature of QCD using jet-jet measurements
- Determined method for measuring the distributions of gluons within the proton from proton-antiproton collisions
- Discovery of the W and Z Particles (Nobel Prize 1984)

## FUNDING (UK)

Since ~2000 I have directly generated as PI or Co-I over £42,000,000 in grant income. I have held over £29,000,000 as PI. Of the total £3.1M is grant income generated outside of Particle Physics

## Themis Bowcock: Curriculum Vitæ

Quantum Technology	2018-2020
Electric Dipole Mom.	2015-
HVCMOS	2015-2019
LHCb	2016-
CLFV	2015-2019
Quantum "Foam"	2016-
WHO	2020-2021
HEV/HPLV	2020-
AiMeS	2004-2007
NWGRID	2004-2007
MAP2	2001-2006
Virtual Population Lab	2001-2003
MAP	1996-1999

## NEW RESEARCH DIRECTIONS

- Co-initiator UK Quantum Sensors for Fundamental Physics initiative (funded as QFTP).
- Leading UK proponent of measuring EDMs in storage rings (muon g-2 at FNAL) and proton EDM experiment.
- Liverpool group leading design of strategically important HVCMOS sensors in UK. Applications to "compact" trackers for g-2, mu3e
- Design of future upgrades for LHCb (Inner tracker with HV\_CMOS)
- Led Liverpool to join mu2e/mu3e. Liverpool now building (not under my direction) vertex detector for mu3e.
- Designed a new "table-top" search for Quantum Foam nature of space/time. First generation experiment performed

## OTHER ACTIVITIES

- Member of WHO expert respiratory panel
- Founder member of HEV/HPLV ventilator programme
- Co-founder and technical Director of the Advanced Internet Methods Institute at Liverpool with focus on applications of Grid Technologies. Successful spin-off companies from this
- Liverpool lead and co-proposer of UK regional Grid activity
- Proposed and built 800 node cluster that entered world "top-50"
- Collaboration with WHO; co-proposed the building of an international platform for "in-silico" modelling of epidemiological events
- I proposed and built a Monte Carlo Array Processor. At the time of commissioning it was the biggest of its kind in HEP.

## LIVERPOOL PHYSICS

Department Chair	2016
Director Research & Deputy Head Dept.	2014-2016
PI Liverpool HEP	2011-2019

## LEADERSHIP

- Created and lead the Physics and Impact Research Board. The Department income became the highest in the country
- Proposed and led our external review of physics (2015) with the aim of returning Liverpool to top 10% of physics departments in the country.
- I led the Liverpool Particle Physics Experimental Group through 3 grant cycles (2012, 2015, 2019). The group is one of the leading groups in the country by funding profile. I increased openness of governance of the group and its efficiency of operation.
- Over 8 years I doubled the annual research income of the group. At the end of my term our research income was the highest (per capita) the country.
- Strategically repositioned group physics discovery and broadened physics programme with substantial emphasis on neutrinos (DUNE) and charged leptons ( $g-2$ ,  $\mu 2e$ ,  $\mu 3e$ ) and Dark Matter (LZ). This gives us a dynamic and forward looking profile.
- Increased leadership of the group. We now had 2 international spokespersons on near-term experiments, one on future colliders leader and have one Physics Coordinator of a major experiment. This was 4 fold increase in positions of leadership in four years.
- 2013-2018 worked with alumni to hold open days at CERN and FNAL. This has raised funding for studentships funding  $g-2$  and LHCb.
- I funded the creation of a unique atom interferometry experiment (DEAI) – with late Nobel Laureate Martin Perl – which will search for DE in the Lab. This led to the UKs QFTP programme (£30M) and to Liverpool cofounding MAGIS,
- I also have another “table-top” experiment to search for quantized space/time. These represent our in-house high risk/high impact experiments.

## MAIN PHYSICS PUBLICATIONS

### LHCb (187 publications)

First observation of top quark production in the forward region, Phys.Rev.Lett. **115**, 112001 (2015).  
Measurement of the forward Z boson production cross-section in pp collisions at  $\sqrt{s} = 7$  TeV, JHEP **1508**, 039 (2015).  
Measurement of forward W and Z boson production in pp collisions at  $\sqrt{s} = 8$ TeV (2015) **(101 citations)**  
Measurement of the  $B_s \rightarrow \mu\mu$  branching fraction and search for  $B^0 \rightarrow \mu\mu$  decays at the LHCb experiment, Phys.Rev.Lett. 111, 101805 (2013). **(257 citations)**

### DELPHI (316 publications)

A precision measurement of the average lifetimes of B hadrons, Z. Phys. C65:3-16, 1994.  
Lifetimes of charged and neutral B hadrons using event topology, Z.Phys. **C68**, 363-374 (1995).  
 $B^*$  production in Z decays. Z.Phys.C68:353-362,1995  
Measurement of Trilinear Gauge Couplings in  $e^+e^-$  collisions at 161 GeV and 172 GeV. Phys. Lett., B : 423 (1998) 194-206.  
Search for the standard model Higgs boson at LEP, Phys.Lett. B565, 61-75 (2003). **(2287 citations)**

### CLEO (65 publications)

Observation of the Decay  $B \rightarrow FX$ , Phys Rev. Lett. 56: 1893-1899, 1986.  
Upper Limits on the Production of Short Lived Neutral Particles in Radiative Upsilon Decay, Phys. Rev. Lett 56: 2676-2682, 1986.  
Search for Magnetically Charged Particles produced in  $e^+e^-$  Annihilations at  $\sqrt{s} = 10.6$  GeV, Phys. Rev. D35. 1081-1084, 1987.  
Investigation of the Total Charm pair Cross-Section in Non-Resonant  $e^+e^-$  Annihilations at  $\sqrt{s} = 10.5$  GeV, Phys. Rev. D38: 2679-2689, 1988.  
Charm from Non-Resonant  $e^+e^-$  Annihilations at  $\sqrt{s} = 10.6$  GeV, Phys. Rev. D37: 1719-1725, 1988.  
Search for Fractionally Charged Particles in  $e^+e^-$  Annihilations at  $\sqrt{s} = 10.5$  GeV, Phys. Rev. D40: 263-267, 1989.  
Exclusive Decays and Masses of the B Mesons, Phys.Rev. **D36**, 1289 (1987).**(118 citations)**  
Observation of B Meson Semileptonic Decays to Noncharmed Final States, Phys.Rev.Lett. **64**, 16-20 (1990).**(406 citations)**  
 $B^0$  anti- $B^0$  Mixing at the Upsilon (4S), Phys.Rev.Lett. **62**, 2233 (1989).**(353 citations)**

### UA1 (26 publications)

Experimental Observation of Isolated Large Transverse Energy Electrons with Associated Missing Energy at  $\sqrt{s} = 540$ -GeV, Phys.Lett. **B122**, 103-116 (1983).**(2094 citations)**  
Experimental Observation of Lepton Pairs of Invariant Mass Around 95-GeV/ $c^2$  at the CERN SPS Collider, Phys.Lett. **B126**, 398-410 (1983) **(1860 citations)**  
Observation of Jets in High Transverse Energy Events at the CERN Proton Anti-Proton Collider, Phys. Lett. 123B: 115-122, 1983. **(410 Citations)**  
Hadronic Jets from the CERN Proton Anti-Proton Collider, Phys. Lett. 132B: 214-222, 1983. **(329 Citations)**  
Angular Distributions and Structure Functions from Two Jet Events at the CERN SPS Collider, Phys. Lett. 136B: 294-300, 1984.  
Comparison of Three Jet and Two Jet Cross-Sections in pp Collisions at the CERN SPS Collider, Phys. Lett. 158B: 494-504, 1985. **(172 citations)**

**See full list of publications**

## Themis Bowcock: Curriculum Vitæ

g-2 and EDMs

LHCb (27 articles)

ATLAS

SSC

CLEO

## KEY TECHNICAL PUBLICATIONS

Muon (g-2) Technical Design Report, (2015).

The Measurement of the Anomalous Magnetic Moment of the Muon at Fermilab, J.Phys.Chem.Ref.Data **44**, 031211 (2015).

A Storage Ring Experiment to Detect a Proton Electric Dipole Moment, (2015).

The LHCb Detector at the LHC, JINST **3**, S08005 (2008). **(1512 citations)**

LHCb VELO Technical Design Report LHC CERN/LHCC 2001-011

Report on a silicon backup to the MSGC detectors of ATLAS, Part B 068, (1994).

The Microstrip Chambers: Ultraprecise Tracking for SSC, SDC-90-114, 1992.

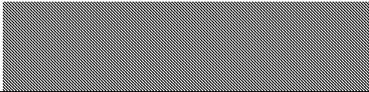
The CLEO-II detector, Nucl.Instrum.Meth. **A320**, 66-113 (1992).

Name	Body	Role	Year	Value
<b>Consolidated Grant</b>	STFC	PI	2017	£16M *
<b>Capital Bids</b>	STFC	PI	2018	£0.5M
<b>Capital (Bonding etc)</b>	STFC	PI		£0.145M\$
<b>MUSE</b>	EC	PI	2015	€229,500
<b>Consolidated Grant</b>	STFC	PI	2015	£92,227
<b>Equipment Bid</b>				
<b>Consolidated Grant</b>	STFC	PI	2015	£8,289,649
<b>SRF Funding for LHCb Upgrade</b>	STFC	PI	2015	£32,000
<b>PPGP Experiment</b>	STFC	PI	2012	£28,101
<b>LHCb Capital Equipment</b>	STFC	PI	2014	£52,000
<b>LHCb Upgrade</b>	STFC	Co-I	2015	£320,887
<b>Capital Funding</b>	STFC	PI	2013	£230,951
<b>Development of HV-CMOS sensor</b>	STFC	Co-I	2014	£200,298
<b>A measurement of the anomalous magnetic moment of the muon to 0.14 ppm using the FNAL g-2 experiment</b>	STFC	PI*	2014	£694,908
<b>STFC Capital Funding</b>	STFC	PI	2013	£30,000
<b>PPGP Experiment</b>	STFC	PI	2012	£30,701
<b>Common development of pixel tiles for the LHC upgrade</b>	STFC	PI	2012	£174,870
<b>Particle Physics Consolidated Grant</b>	STFC	PI	2012	£9,024,453
<b>42 VELO Modules for delivery in 2010</b>	CERN	PI	2010	£233,314
<b>PP Rolling Grant</b>	STFC	PI*	2016	£8,649,680
<b>Web as Corpus</b>	EPSRC	Co-I	2003	£303,016
<b>PP Rolling Grant</b>	PPARC	Co-I	2000	£2,874,261
<b>LHCb e-science</b>	STFC	PI	2005	£177,547
<b>GRIDPP: Tier-2 system management.</b>	STFC	PI	2005	£155,342
<b>AiMeS</b>	NWDA	Co-I	2003	£803,000
<b>PP Rolling Grant</b>	STFC	Co-I	2004	£3,320,768
<b>NW Science Grid</b>	NWDA	PI	2003	£1,027,447
<b>Design and Prototyping of LHCb HLT</b>	RS	PI	2003	£9,550

<b>PP Rolling Grant</b>	STFC	Co-I	2002	£5,417,876
<b>EU Data Grid</b>	PPARC	PI*	2001	£142,792
<b>Simple Array Processor</b>	HEFCE	PI*	1999	£275,000

Current Support for PP group including grants where I am not PI

GRIDPP4+Liverpool Staff	STFC		ST/M004791/1	£100043
GridPP4+NorthGrid Liverpool h/w	STFC		ST/L006146/1	£62000
GridPP5 Liverpool Staff	STFC		ST/N00129X/1	£412149
GridPP5 Liverpool site tranche 1 h/w	STFC		ST/P006663/1	£80500
Modelling tumours	NHS			£66117
Si Strip Detectors for Spectroscopy	STFC		ST/M007243/1	£61242
3D Phantom for proton therapy	PPI Ltd		contract	£753730
Monitoring nuclear reactors	STFC		ST/M000168/1	£150495
Fissile Material Monitoring	Innovate UK		48490-346190	£390567
Atom Interferometry Applications	NPL		contract	£41253
Rb Fountain Gravity Gradiometer	NPL		contract	£41253
Remote reactor monitoring	HEFCE		lcure contract	£40885
Quantum Sensors in Navigation	EPSRC			£127427
STFC Impact Acceleration (Dept.)	STFC		Dept.	£50000
STFC Impact Acceleration (Dept.)	STFC		Dept.	£50000
PP Consolidated Award	STFC		ST/N000331/1	£8289650
Capital equipment round 2016	STFC			£168016
Wire bonder in LSDC	STFC		ST/R001316/1	£145000
Royal Society URF renewal	RS		UF/130578	£506569
Royal Commission Fellowship	1851		RF/2013/449	£125096
RSE/STFC Enterprise Fellowship	RSE/STFC			£102000
CDT, liv.dat	STFC		ST/P0006752/1	£1005532
AIDA-2020	EU			£89072
ARIADNE	EU		ERC 677927	£1482396
INFIERI	EU		EU 317446	£380271
PRAVDA	Wellcome			£472983
Development of HV-CMOS sensors	STFC		ST/L002361/1	£200298
Magis-100 (meter) Quantum Sensor	URA (USA)			£9074
LZ	STFC		ST/M003639/1	£292257
NA62 Fellow	STFC		ST/M005798/1	£597243
UniversaLepto	EU		EU 268062	£1205451
CTA pre-production phase	STFC		STM0075961	£445923
CTA Hot-Slumped Glass Mirrors	STFC		ST/N003616/1	£64258
MUSE	EU		EU 690835	£167191
Hyper-Kamiokande	STFC		ST/M002810/1	£224948
Hyper-Kamiokande Preconstruction	STFC		ST/R000239/1	£237151
protoDUNE-SP	STFC		ST/P003524/1	£84462
DUNE Preconstruction	STFC		ST/R000107/1	£372841
Mu3E	STFC		ST/P00282X/1	£180702
ATLAS upgrade 2014-16	STFC		ST/M007103/1	£860041
LHCb Upgrade	STFC		ST/L003430/1	£445950
Mu2E	STFC		ST/P002757/1	£264744
ATLAS Upgrade	STFC		ST/P002404/1	£540222
LBNE	STFC		ST/M002799/1	£200233
g-2	STFC		ST/L001896/1	£694908
Desires – Deep Sub-Micron sensors	EU Synergy			€3721326

ATLAS Production Grant	STFC	£1669040
Total (non-pending)		£22.3M