CURRICULUM VITAE

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DATE OF BIRTH	18th January 1950
CITIZENSHIP	British

CURRENT AFFILIATIONS

01.02.2016 onwards: Emeritus Professor of Ophthalmology, University College London
01.04.2016 onwards: Senior Scientific Advisor, Narayana Nethralaya, Bangalore

PREVIOUS APPOINTMENTS

01.05.2016 to 06.05.19: Distinguished Professor & Principal Investigator, Andalusian Centre for Molecular Biology and Regenerative Medicine (CABIMER)
01.08.2008 to 30.04.2016: Director of CABIMER
01.10.1992 to 31.01.2016: Sembal Professor of Experimental Ophthalmology, Head Division of Molecular Genetics, Institute of Ophthalmology, University College London, UK
01.01.2007 to 31.12.11: Chair de Excellence, Institut de la Vision, Pierre et Marie Curie University, Paris, France
From: 01.02.87 to 30.09.92. Top Grade Scientist (with special responsibilities) and Head of Molecular Genetics Unit, Department of Human Genetics, University of Newcastle upon Tyne, UK
From: 01.06.80 to 31.01.87. Scientific staff and Senior Research Fellow, MRC Human Genetics Unit, Edinburgh and University of Edinburgh, UK
From: 01.05.77 to 30.05.80. Research Associate in the University Department of Clinical Biochemistry, Royal Victoria Infirmary, Newcastle Upon Tyne, UK

QUALIFICATIONS

BSc, 1969, Upper Second Division with Honours in Chemistry, University of Bombay.
MSc, 1971, Clinical Biochemistry, University of Newcastle upon Tyne, U.K.
Awarded a tuition fee grant from the British Council.
PhD, 1977, Clinical Biochemistry, University of Newcastle upon Tyne, UK.
Awarded a studentship from the Wellcome Foundation for the PhD studies.

PERSONAL STATEMENT AND CAREER HIGHLIGHTS

My genetic research has been dedicated to the identification of the diseases genes that are involved with visual impairment and blindness. This research has facilitated understanding of the molecular mechanisms of disease and the development of novel approaches for the treatment of patients.

Inherited retinal dystrophies are a major cause of incurable blindness in the Western World. Amongst these a significant proportion is accounted for by a clinically heterogeneous group of diseases collectively known as Retinitis pigmentosa (RP). Based on pedigree analysis, all three modes of Mendelian inheritance (Autosomal dominant, Autosomal recessive and X-linked) have been observed. RP is initially characterised by night blindness and progressive loss of peripheral vision due to the loss of rod photoreceptor cells. As the disease progresses cone cells in the central retina are also involved, often leading to total blindness in later stages of the disease.

Decades of research into the biochemical basis of the disease failed to identify even a single causative factor and therefore no treatment options could be pursued. In the absence of any biochemical defect, a reverse genetic approach should facilitate chromosomal assignment and the isolation of the disease causing genes, thereby raising the prospects for understanding disease mechanisms that may eventually help in the development of gene based therapies. The foundations of Ophthalmic Genetics were laid with the help of recombinant DNA technology for the development of X-chromosome specific DNA markers **(Ref 1)** and their use in the successful mapping of the X-linked form of RP **(Ref 2)**. Linkage studies demonstrated the existence of at least two genes for XLRP (RP2 and RP3) which eventually facilitated the isolation of these genes through a positional cloning approach (1997/98). With the finding of genetic heterogeneity in XLRP, involvement of multiple genes in the causation of the dominant or recessive forms of the disease was expected. It soon became clear that the identification of these genes would depend on genetic mapping in single large families. In 1989 the first locus for autosomal dominant retinitis pigmentosa (ADRP) was mapped to chromosome 3q24, in the same interval as the gene for the rod-cell specific photopigment rhodopsin. The first European mutation identified **(Ref 3)** was a small deletion of the rhodopsin gene which may have originated as a result of replication slippage during meiosis due to a 3bp repeating motif (CAT) present at the site of the mutation. At this point it became essential to develop a rapid and simple mutation detection method **(Ref 4)** which would allow large-scale screening of ADRP patients. Our studies indicated that up to 30% of all ADRP patients carry a rhodopsin gene mutation. A positional candidate approach soon implicated peripherin/rds in ADRP however, our studies demonstrated that the same gene is also involved in macular dystrophies **(Ref 5)**, making it the first example of two distinct clinical phenotypes resulting from mutations in the same gene. This led to the re-examination of the peripherin/rds cellular localisation data which confirmed it's expression in rod as well

as cone cells, providing a possible explanation of the spectrum of retinal diseases associated with this gene.

To further elucidate the genetic basis of retinal degeneration, genealogical studies were undertaken to identify large families with ADRP and cone-rod dystrophy. A novel locus for ADRP was identified in a large 9 generation family on chromosome 7p **(Ref 6)** which was soon followed by the identification of a dominant cone-rod dystrophy (CORD2) locus **(Ref 7)** on chromosome 19q. A positional cloning approach was initiated which subsequently resulted in the identification of the CORD2 gene known as CRX **(Ref 8)**. The gene contains a homeobox sequence (typical of most transcription factors), and has been shown to be involved in the regulation of photoreceptor specific genes such as rhodopsin, IRBP and arrestin. Apart from identifying two additional loci for ADRP on chromosome 17q and 19q, linkage studies in a large Cone dystrophy family highlighted the guanylate cyclase activating protein 1 (GCAP1) as a possible candidate gene on chromosome 6p. Soon a Y99C mutation was identified and biochemical studies in-vitro indicated that even in the presence of high levels of Ca (usually a suppressor of GCAP1 activity) GCAP1 remains active **(Ref 9)** leading to a possible constitutive activation of ret GC1 and raised levels of cGMP production. In animal models, high levels of intracellular cGMP have been associated with retinal degeneration and may explain the biological basis of the disease in our Cone-dystrophy family. More recent work allowed the mapping of a further new locus for ADRP on chromosome 14 followed by the identification of a S50T mutation in a second transcription factor gene NRL **(Ref 10)**. Transient co-transfection experiments, in-vitro, demonstrated consistent over stimulation of the rhodopsin promoter as a functional impact of the mutant protein in presence of CRX. Transgenic animals over-expressing wild type rhodopsin are known to display retinal degeneration. This may account for the phenotype seen in the chromosome 14-linked ADRP family.

The clinical heterogeneity seen in patients with retinal degeneration have been corroborated by the finding of extensive genetic heterogeneity. This has been borne out by the identification of more than 12 genes for the dominant form of RP with our latest finding of TOPORS mutations causing ADRP **(Ref 11)**. As more and more genes are identified, understanding the biochemical basis and functional consequences of the mutant protein may truly revolutionise the 'Post-Genome' era and ultimately lead to the development of more rationale gene or gene based therapies. Proof of principle demonstrating success of such an approach has recently been established by work carried out in our laboratory. Subretinal injection of an adeno-associated viral construct containing a functional copy of the peripherin gene allowed complete ultrastructural and functional rescue of photoreceptor cells in the retinal degeneration slow (rds) mouse **(Ref 12)**. As stated earlier, peripherin has been implicated in a variety of human retinopathies and the gene therapy based rescue of a mouse model provides a great deal of hope to patients suffering from degenerative disease of the retina. More recent work supporting further identifications of recessive RP genes (**Ref 13**), preliminary clinical trials in patients (**Ref 14**), generation of retinal progenitor cells for transplantation from ES cells (**Ref 15**) and derivation of retinal pigment epithelial cells for disease modeling using iPSC technology (**Ref 16**) are underway

In summary, for the reasons outlined above it would be critical to undertake careful genotype/phenotype correlation so that the patients who are most likely to benefit are enrolled first for clinical trials, as and when they become available.

Highlighted publications:

1. Towards a complete linkage map of the human X-chromosome: Regional assignment of 16 cloned single copy DNA sequences employing a panel of somatic cell hybrids. Wiecker, P., Davies, K.E., Cooke, H.J., Pearson, P.L., Williamson, R., **Bhattacharya, S.S**., Zimmer, J. and Ropers, H. (1984): Am.J.Hum.Genet., **36**: 265-276.
2. Close genetic linkage between X-linked retinitis pigmentosa and a restriction fragment length polymorphism identified by recombinant DNA probe L1.28. **Bhattacharya, S.S**., Wright, A.F., Clayton, J.F., Price, W.H., Phillips, C.I., McKeown, C.M.E., Jay, M.R., Bird, A.C., Pearson, P.L., Southern, E.M. and Evans, H.J. (1984): Nature, **309**: 253-255.
3. A three base pair deletion in the rhodopsin gene in a family with autosomal dominant retinitis pigmentosa. Inglehearn, C.F., Bashir, R., Lester, D.H., Jay, M.R., Bird, A.C. and **Bhattacharya, S.S**. (1991). Am. J. Hum. Genet. 48: 26-30.
4. Rapid detection of single base mismatches as heteroduplexes on hydrolink gels. Keen, J., Lester, D.H., Inglehearn, C.F., Curtis, A. and **Bhattacharya, S.S.** (1991). Trends in Genetics, **7**: 5.
5. Mutations in the human retinal degeneration slow (RDS) gene can cause either retinitis pigmentosa or macular dystrophy. Wells, J., Wroblewski, J., Keen, T.K., Inglehearn, C.F., Jubb, A., Eckstein, M., Jay, M.R., Arden, G.B., **Bhattacharya, S.S.,** Fitzke, F.W., Bird, A.C. (1993). Nature Genetics, **3**: 213-218.
6. A new locus for autosomal dominant Retinitis Pigmentosa (adRP) on chromosome 7p. Inglehearn, C.F, Carter, S.A., Keen, T.J., Lindsey, J., Stephenson, A.M., Bashir, R., Al-Maghtheh, M., Moore, A.T., Jay, M.R., Bird, A.C. and **Bhattacharya, S.S.** (1993). Nature Genetics, **4**: 51-53.
7. Genetic linkage of cone-rod dystrophy to chromosome 19q and evidence for segregation distortion. Evans, .E., Fryer, A.F., Inglehearn, C.F., Duvalloung, J., Whittaker, J., Gregory, C.Y., Ebenezer, N., Hunt, D. and **Bhattacharya, S.S.** (1994). Nature Genetics, **6**: 210-213.
8. Cone-Rod Dystrophy due to mutations in a novel photreceptor-specific homeobox gene (CRX) essential for maintenance of the photoreceptor. Freund, C.L., Gregory-Evans, C.Y., Furukawa, T., Papaioannou, M., Looser, J., Ploder, L., Bellingham, J., Ng, D., Herbrick, J.S., Duncan, A., Scherer, S.W., Tsui, L., Loutradis-Anagnostou, A., Jacobson, S.G., Cepko, C.L., **Bhattacharya, S.S.** and McInnes, R.R. (1997). Cell, **91**: 543-553.
9. GCAP1(Y99C) Mutant is constitutively active in autosomal dominant cone dystrophy. Sokal, I., Li, N., Surgucheva, I., Warren, M.J., Payne, A.M., **Bhattacharya, S.S**., Baehr, W. and Palczewski, K. (1998). Molecular Cell, **2**: 129-133.
10. Mutation in *NRL* is associated with autosomal dominant retinitis pigmentosa. Bessant, D.A.R., Payne, A.M., Mitton, K.P., Wang, Q-L., Swain, P.K., Plant, C., Bird, A.C., Zack, D.J., Swaroop, A. and **Bhattacharya, S.S.** (1999). Nature Genetics, **21**: 355-356.
11. Mutations in *TOPORS* Cause Autosomal Dominant Retinitis Pigmentosa with Perivascular RPE Atrophy. Chakarova, C.F., Papaioannou, M.G., Khanna, H., Lopez, I., Waseem, N., Shah, A., Theis, T., Friedman, J., Maubaret, C., Bujakowska, K., Veraitch, B., Abd El-Aziz, M.M., Prescott, Q., Parapuram, S., Bickmore, W.A., Munro, P.M/G/, Gal. A/, Hamel, C.P., Marigo, V., Ponting, C.P., Wissinger, B., Zrenner, E., Matter, K., Swaroop, A., Koenekoop, R.K. and **Bhattacharya, S.S.** (2007). Am J Hum Genet, **81**: 1098-1103.

12. Restoration of photoreceptor ultrastructure and function in retinal degeneration slow mice by gene therapy. Ali, R.R., Sarra, G.M., Stephens, C., Alwis, M.D., Bainbridge, J.W., Munro, P.M., Fauser, S., Reichel, M.B., Kinnon, C., Hunt, D.M., **Bhattacharya, S.S.** and Thrasher, A.J. (2000). Nature Genetics, **25**: 306-310.
13. EYS, encoding an ortholog of Drosophila spacemaker, is mutated in autosomal recessive retinitis pigmentosa. Abd El-Aziz MM, Barragan I, O'Driscoll CA, Goodstadt L, Prigmore E, Borrego S, Mena M, Pieras JI, El-Ashry MF, Safieh LA, Shah A, Cheetham ME, Carter NP, Chakarova C, Ponting CP, **Bhattacharya SS,** Antinolo G. (2008) Nat Genet.**40**: 1285-1287. PMID: 18836446
14. Effect of gene therapy on visual function in Leber's congenital amaurosis. Bainbridge JW, Smith AJ, Barker SS, Robbie S, Henderson R, Balaggan K, Viswanathan A, Holder GE, Stockman A, Tyler N, Petersen-Jones S, **Bhattacharya SS**, Thrasher AJ, Fitzke FW, Carter BJ, Rubin GS, Moore AT, Ali RR. (2008) N Engl J Med.**358**: 2231-2239. PMID: 18441371
15. Hypoxia increases the yield of photoreceptors differentiating from mouse embryonic stem cells and improves the modeling of retinogenesis in vitro. Garita-Hernández M, Diaz-Corrales F, Lukovic D, González-Guede I, Diez-Lloret A, Valdés-Sánchez ML, Massalini S, Erceg S, **Bhattacharya SS**. Stem Cells. 2013 May; 31(5): 966-978. PMID: 23362204
16. Human iPSC derived disease model of MERTK-associated retinitis pigmentosa. Lukovic D, Artero Castro A, Delgado AB, Bernal Mde L, Luna Pelaez N, Díez Lloret A, Perez Espejo R, Kamenarova K, Fernández Sánchez L, Cuenca N, Cortón M, Avila Fernandez A, Sorkio A, Skottman H, Ayuso C, Erceg S, **Bhattacharya SS**. (2015). Sci Rep. **5**:12910. doi: 10.1038/srep12910. PMID: 26263531.

RESEARCH EXPERIENCE AND RESEARCH ACTIVITIES

Newcastle upon Tyne
January 1972 to May 1980

The research work in Newcastle involved investigations into cell membrane permeability and Na-pump activity in heart and skeletal muscle. Net accumulation of cell sodium was taken as an index of membrane permeability and net extrusion from Na-enriched tissues as for Na-pump activity. Total tissue and cellular sodium, potassium chloride and water content were measured. Kinetics of sodium and potassium exchanges in heart and skeletal muscle cells were compared and the mode of action of certain cardioactive drugs (cardiac glycoside, diuretics and beta blockers etc) on membrane permeability and Na-pump activity were investigated.

Edinburgh
June 1980 to January 1987

I have been involved in collaboration with members of Edwin Southern's Mammalian Genome Unit in the construction of a flow sorted human X-chromosome specific genomic library. Extensive screening of this library resulted in the isolation and characterisation of a large number of unique X-chromosome specific DNA probes. A number of restriction fragment length polymorphisms (RFLP) were identified using these probes that can facilitate disease gene mapping as well as construction of a genetic linkage map of the X-chromosome. In collaboration with Dr. Alan Wright of the clinical section of the MRC

Human Genetics Unit, Edinburgh, a locus for the X-linked form of retinitis pigmentosa (XLRP) was mapped to the proximal short arm of the chromosome (Bhattacharya et al Nature, 1984, Vol 309; 253). Two loci for XLRP were identified on the short arm of the X-chromosome and work continued on the identification of the X-linked RP genes.

Newcastle upon Tyne
February 1987 to September 1992

I have been responsible for organising and establishing a Molecular Genetics Laboratory for research and diagnostic work in the Department of Human Genetics, University of Newcastle upon Tyne. The laboratory was mainly equipped from my research grants and is fully operational. The Newcastle Area Health Authority provided me with permanent funding to employ a principal scientist, three senior grade scientists and 4 medical laboratory techicians for the diagnostic service. We provided DNA diagnostic tests for the Duchenne Muscular Dystrophy, Becker Muscular Dystrophy, Cystic Fibrosis and Huntington's Disease registers in the region. With the availability of new resources, molecular diagnostic tests were offered for most inherited genetic diseases in the region for which closely linked DNA markers were identified.

My research group was involved with the isolation and characterisation of retinal genes, studying its developmental and cellular expression patterns and molecular genetic localisation of inherited eye diseases such as Norrie's Disease, Ushers syndrome and autosomal dominant or recessive or X-linked forms of Retinitis Pigmentosa. A spectrum of mutations in candidate genes, such as Rhodopsin and Peripherin in patients with ADRP were identified. We also investigated deletion patterns and phenotypic expression of X-chromosome linked muscular dystrophies, the possibility of genetic heterogeneity in polycystic kidney disease, confirming and extending linkage results in polyposis coli, undertaking novel linkages in incontinentia pigmenti, Retts syndrome and Aarskog syndrome, polymorphisms of mitrochondrial DNA and racial variations in the allele frequencies of DNA polymorphisms. The overall aim of this research was to understand the nature and biology of genetic diseases and to provide an efficient diagnostic service for carrier detection and prenatal diagnosis. My laboratory was a participating group in UK and EU Human Genome Mapping Initiative and developed rapid and novel ways of mutation detection and genome analysis. In recognition of significant expansion in my research activity, Wellcome Trust provided substantial refurbishment funds to create state-of-the-art research facilities.

London
October 1992 to January 2016

I was appointed to the Sembal Chair in Experimental Ophthalmology to establish a strong research division dedicated to Ophthalmic Genetics, working in close association with colleagues from Moorfields Eye Hospital. The establishment of the division included complete design and planning of the laboratories and offices and the research facilities. The division is well equiped for biochemical and molecular biological techniques and much of the instrumentation was bought from my research grants. The facilities include automated DNA sequencing (obtained equipment grant funding from the Wellcome Trust for an ABI automated sequencer), high speed and ultracentrifuges, a tissue culture and class 2 containment laboratory, and a radio-isotope laboratory. The techniques of gene mapping,

positional cloning, DNA sequencing, mutation analysis, and structure/function studies of normal and mutant proteins are extensively used in current research projects.

The long-term aim of my research group is to locate, identify and characterise the genes responsible for inherited eye diseases. Development of PCR based microsatellite markers has revolutionised mapping of human genetic diseases. Rapid progress in Human Genome Sequencing projects have resulted in the generation of extensive databases of human genes. Detailed clinical examination and accurate pedigree information recorded over the last twenty five years at Moorfields Eye Hospital has allowed the establishment of an extensive genetic register of inherited eye diseases. Information on over 3000 families are recorded in this register and it is a unique world resource. Many of the eye disease genes identified in my laboratory benefited from the availability of this database. Characterisation and functional analysis of the genes involved in the pathophysiology of these diseases should eventually lead to better clinical management as well as formulating protocols for treatment.

AWARDS AND HONOURS

--Paul Kayser International Award of Merit in Retina Research, Presented at the 7th Bi-Annual Congress of International Society of Eye Research, September 1986, Nagoya, Japan.
--Alcon Research Institute Award for Molecular Genetic Investigations into Inherited Retinal Degenerations, 1991.
--Aida Mann medal, Oxford Eye Infirmary and University of Oxford, awarded 1993.
--Elected Fellow of the Academy of Medical Sciences(UK) 2001-**FMedSci**
--Elected Fellow of the Royal Society of Edinburgh 2006 – **FRSE**
--Awarded Chair of Excellence 2006, France. Full professor appointment held at Pierre et Marie Curie University, Paris from January 2007 to December 2011.
--Scientific recognition from ONCE, Spain, for research on retinal degeneration, 2015
--Board of Directors Special Award for Genetic research, Foundation Fighting Blindness (USA), 2016

MEMBERSHIP OF LEARNED SOCIETIES

--Genetical Society of UK.
--The Galton Institute.
--British Society of Human Genetics.
--American Society of Human Genetics.
--Association for Research in Vision and Ophthalmology (ARVO).

INVITED TALKS

I have given a large number of invited talks at international conferences such as the Am Soc Hum Genet (ASHG), Eu Soc Hum Genet (ESHG) and Association for Vision & Ophthalmology (ARVO) and as external speakers for universities both in the UK and abroad. I have given Keynote lectures at Retinal Degeneration Symposium at the International Congress of Eye Research (ICER) meeting in Nagoya, Japan 1986, New Delhi, India 1994; New Therapeutic Approaches in Inherited Eye Disease (sponsored by EU): Madrid 1996, Athens 1998; Novartis Foundation sponsored meeting in Baltimore 2002; Indian Society of Human Genetics, Kolkata 2006; Andalucian Ministry of Health organized symposium on Genetics and New Treatments, Seville 2007; College de France & INSERM sponsored joint meeting on Vision and Hearing, Paris 2007. Invited speaker at School of Biosciences,

University of Kent, UK, November 2012. Invited speaker at the Chinese University of Hong Kong, University Eye Hospital, Shantou, China and Department of Ophthalmology, University of Chengdu, China, January 2014, October 2015, January 2017. Invited talks at Narayan Nethralaya, Bangalore India (January 2016); University of Newcastle upon Tyne (March 2016) and Vision Conference, Baltimore June 2016 organised by Foundation Fighting Blindness, USA

Regular research presentations (on average two per year since 1985) to branch members of the British Retinits Pigmentosa Society, to explain the genetic basis of retinal degeneration, research progress and new developments in treatment. I have also given lectures to RP Societies of Italy, Germany, Finland, France, South Africa, Canada, Ireland, Australia and USA.

TEACHING

Along with Dr. Papiha, I have been responsible for establishing a new course in October 1989 in Medical Genetics at the University of Newcastle-upon-Tyne. The course was approved by the Medical Research Council and an MRC studentship was awarded on a yearly basis. I covered the disease gene mapping and gene identification aspect of the course. Since taking up my current appointment in London I have been giving periodic lectures to undergraduate students in Genetics at UCL.

Ph.D. THESIS SUPERVISION

Supervised a total of 40 students

Paula Monaghan	1989	Douglas Lester	1990
Ivan Still	1991	Alison Hardcastle	1992
Smaro Kamakari	1994	Peter Clements	1994
Mai Al-Maghetheh	1995	Nick Occleston	1996
Dawn Thiselton	1997	Sujeewa Wijesuriya	1997
Francesca Cordeiro	1998	Reshma Patel	1998
Eranga Vithana	1998	Donna MaKay	1998
Marcela Votruba	2000	Sana Kermani	2000
Peter Francis	2000	Mohamed El-Ashry(MD)	2001
Marc Botcherby	2002	Ordan Lehmann	2003
David Bessant(MD)	2003	Leen Abu-Saif	2003
Neil Ebenezer	2003	Aung Tin*	2003
Ashwin Reddy(MD)	2003	Peter Addison(MD)	2006
Mai Abd El-Aziz	2007	Kinga Bujakowska	2008
Brotati Ghosh	2008	Petra Liskova	2008
Amna Shah	2009	Ciara O'Driscoll	2009
Abhay Krishna	2010	Francesca Fiocco	2010
Anna Rose	2012	Margarita Romero	2012
Marcela Garita	2013	Barbara Czub	2015
Przemyslaw Kruczek	2015	Ana Belen	2019

Several of my former Ph.D. students have become senior academics both in UK and abroad including two students who are now full professors of UCL (Alison Hardcastle, 1992 and Francesca Cordeiro, 1998). Several Clinical Fellows who completed their MD/Ph.D. under my supervision have become Consultant/Professor (Alex Ionedes, Kevin

Gregory-Evans, David Bessant, Marcela Votruba, Ashwin Reddy, Aung Tin, Ordan Lehman and Peter Addison). Seven of my former postdoctoral fellows have become full professors (Susan Lindsay, Chris Inglehearn, Alan Shiels, Cheryl Gregory-Evans, Andrew Webster, Robin Ali and Jane Sowden) and Robin Ali was elected to the prestigious Academy of Medical Sciences, UK in 2007 and as a senior investigator of National Institute of Health Research, UK in 2008.

Examined over 40 Ph.D. students from top UK & European Universities including Oxford, Cambridge, London, Edinburgh, Dublin, Ghent, Nijmegen and University of Seville.

UNIVERSITY ENABLING ACTIVITIES

--Academic Appointments Committee member at University of Newcastle
--Founder member of Centre for Human Genetics at UCL
--Executive board member of the UCL Institute of Human Genetics
--Academic Appointments Committee member at Institute of Ophthalmology and Institute of Child Health, University College London
--Senior member of Strategy Committee, Institute of Ophthalmology, UCL

PROFESSIONAL ACTIVITIES

--On the examiners panel of the Royal College of Pathologists for the Degree in Clinical Cytogenetics and Molecular Genetics. Course tutor in Molecular Genetics for the MRC Path. examination.
--Past Committee member of Clinical Molecular Genetic Society.
--Scientific Advisory Panel of the British Retinitis Pigmentosa Society.
--Assessor for British Council sponsored European joint research programmes.
--Member of the Genetics Committee of the Foundation Fighting Blindness (USA).
--Editorial Board member of Annals of Human Genetics and Disease Markers
-- Editorial Board member of Molecular Vision
--Grant review panel member of the Irish Health Research Board, Deutsche Forschungsgemeinschaft (DFG) and INSERM (France)
--Member of the visiting sub-committee for the Management and Scientific reviews of the following research centres:

- Telethon Institute of Genetic Medicine, Naples (September 2003)
- MRC Human Genetics Unit, Edinburgh (May 2005).
- GSF(Munich)-Institutes of Bioinformatics, Developmental Genetics, Experimental Genetics, Human Genetics and Department of Comparative Medicine (March 2005).
- Institut de la Vision, Pierre et Marie Curie University (UPMC), Paris (January 2017)

--International Advisor to National Eye Institute of NIH for EyeGENE Programme (Jan 2006)
-- Inauguration of the Medical Genome Centre in Seville (March 2011)
--Grant review panel member of the Irish Health Research Board (May 2011)
--Panel member of European Union review committee for Translational Research March 2012
--Grant review panel member of the Irish Health Research Board and MRCG (September 2013)
--ARVO Foundation Awards Committee member (since 2012)
--Grant review panel member of Fondazione Roma (February 2014)

Refereed grant applications for:
--Medical Research Council
--BBSRC
--The Wellcome Trust
--British Retinitis Pigmentosa Society
--German Medical Research Council
--Irish Retinitis Pigmentosa Society
--Foundation Fighting Blindness of USA
--Irish Department of Health
--March of Dimes Birth Defects Foundation
--Health Research Board of Australia
--New Zealand Medical Research Council
--Guide Dogs for the Blind
--Action Research

Refereed manuscripts

Refereed papers for all top journals in the field including Nature, Science, Cell, Nature Genetics, Nature Medicine, NEJM, EMBO, American Journal of Human Genetics, European Journal of Human Genetics, Human Genetics, Human Molecular Genetics, Journal of Medical Genetics, Human Mutation and Investigative Ophthalmology & Visual Science.

INTERNATIONAL CONFERENCES / SESSIONS ORGANISED

--Retinal Degeneration Symposium at International Congress Eye Research Meeting (ICER) - New Delhi, India 1994.
--Genetics section at the British Society for Eye Research - Cardiff 1994.
--Inherited Retinal Dystrophies Symposium at Association for Research in Vision and Ophthalmology (ARVO) - Fort Lauderdale, Florida 1996.
--New therapeutic approaches in inherited eye disease (sponsored by EU):
1st Meeting 1996 - Madrid, Spain
2nd Meeting 1997 - Athens, Greece
3rd Meeting 1999 - Tubingen, Germany
4th Meeting 2001 – Prague, Czech Republic
--Retinal Degeneration Symposium at International Congress Eye Research Meeting (ICER) - Paris, France 1998.
--Mutations Associated with Retinal Disease at Association for Research in Vision and Ophthalmology (ARVO) - Fort Lauderdale, Florida 1999.
--Molecular Characteristics of Cataractogenesis at Association for Research in Vision and Ophthalmology (ARVO) - Fort Lauderdale, Florida 2001.
--Mutations, Modifiers and Complex Genetics at Association for Research in Vision and Ophthalmology (ARVO) - Fort Lauderdale, Florida 2003.
--Mutations, Modifiers and Complex Genetics at Association for Research in Vision and Ophthalmology (ARVO) - Fort Lauderdale, Florida 2008.
--Disease Mechanisms at Association for Research in Vision and Ophthalmology (ARVO) - Fort Lauderdale, Florida 2012

--Proposer and Chair of The Novartis Foundation and Foundation Fighting Blindness (USA) sponsored symposium on "Retinal Dystrophies: Functional Genomics to Gene Therapy" 2002. Symposium volume published (John Wiley & Sons) Jan. 04.
--Course in Eye Genetics. 23-25 September 2010. Bologna (Italy).

--8th International Meeting on Retinal Dystrophies.19-22 May 2010 (Dublín, Reino Unido).

-- 4th Genome Sequencer FLX User Conference, 15-17Jun, 2010, Athens (Greece)
--Course in Rare Diseases, June 2010, organized by the UNIA (International University of Andalusia) Seville (Spain)

--The American Society of Human Genetics, 31Oct-7 Nov, 2010, Washington (USA)

-- Jornadas Salud Investiga 21-23 October 2010. (Cádiz, España).

--ARVO Traslational research: seeing the possibilities. 6-10 May 2010 (Fort-Lauderdale, Florida (USA)

--ARVO Traslational research: seeing possibilities.7-11 May 2012 (Fort- Lauderdale, Florida (USA)

-- International Symposium on cell therapy and gene-based therapies.28-29 June 2012 (Granada-Spain)
-- ARVO AMD poster session moderator May 2014
-- ARVO Retinal dystrophy genetics 2015
-- Invited talks, Hong Kong Eye Hospital and Chineese University of Hong Kong, 17-18th October 2015
-- Invited talks, Guandong Ophthalmological Society International Conference, China 29th Oct -1st Nov 2015

-- Invited talk Narayana Nethralaya, Bangalore, 29th January 2016

--Seminar presentation, University of Newcastle upon Tyne, March 2016

International Program Committee member of Asia-ARVO January 2009, 2011, 2013, 2015 and 2016
International Program Committee member of World Ophthalmology Congress (WOC) 2018, Barcelona, Spain

BOOK PUBLICATIONS

Degenerative Retinopathies: Advances in Clinical and Genetic Research by Peter Humphries, Shomi Bhattacharya, Alan Bird, CRC Press, Florida, 1991.

Retinal Dystrophies: Functional Genomics to Gene Therapy. Novartis Foundation Symposium 255, Chaired by Shomi Bhattacharya, John Wiley & Sons Ltd, UK, 2004.

LIST OF PUBLICATIONS
Published 384 peer reviewed papers and 13 book chapters

1. Effects of ouabain on sodium uptake by frog heart and skeletal muscle. Flear, C.T., Greener, J.S. and Bhattacharya, S.S. (1975). Recent Adv. Stud. Cardiac Struct. Metab. **5**: 343-349.

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BOOK CHAPTERS:

1. Cellular exchanges and happenings after injury and in the critically ill. Flear, C.T.G., Bhattacharya, S.S. and Nandra, G.S. (1977): in Nutritional aspects of care in the critically ill, edited by Richards, J.R. and Kinney, J.M. Published by Churchill Livingstone (Edinburgh, London and N.Y.) p195-224.

2. Transmembrane sodium exchanges in health and heart disease: actions of beta-blockers. Flear, C.T.G., Bhattacharya, S.S. and Jackson, A. (1981): on Current themes in cardiology, edited by G.F.B. Birdwood and J.G. Russel, published by Geigy Pharmaceuticals, Horsham, England, p29-32.

3. DNA probes in the diagnosis of X-linked retinitis pigmentosa. Wright, A.F., Dempster, D., Clayton, J.F., Jay, M.R., Bird, A.C. and Bhattacharya, S.S. (1985). In Biotechnology in Diagnostics, Koprowski, H., Ferrone, S., Altertini, A. (eds), Esevier Science Publishers, p261-268.

4. The detection of X-linked retinitis pigmentosa by DNA hybridization. Wright, A.F., Dempster, M., Jay, M.R., Clayton, J.F., Bhattacharya, S.S. and Bird, A.C. (1985): In "Retinal Degeneration: Experimental and Clinical Studies, Hollyfield, J.G., La Vail, M.M. (eds) Alan R. Liss Inc., New York.

5. Recombinant DNA mapping of retinitis pigmentosa genes. Wright, A.F., Bhattacharya, S.S., Craig, I.W., Jay, M.R., Dempster, M., Fraser, N., Meitinger, T., Jay, B., Bird, A.C. and Evans, H.J. (1988): Molecular Biology of the Eye: Genes, Vision and Ocular Diseases (Eds Paitagorsky, Shinohara and Zelinka), Alan R. Liss (Pub), p293-303.

6. X-linked retinitis pigmentosa: A molecular genetic approach to isolating the defective genes. Lindsay, S., Jay, M.R., Bower, D.J., Adam, G., Inglehearn, C.F., Sealey, P.G., Papiha, S.S. and Bhattacharya, S.S. (1989): In "Inherited and environmentally induced retinal degenerations. Published by Alan R. Liss Inc., New York, p83-97.

7. Molecular genetic studies of inherited eye diseases. Inglehearn, C.F., Bashir, R., Curtis, A., Lindsay, S.J. and Bhattacharya, S.S. (1990): In: Application of molecular genetics to the diagnosis of inherited disease, K. Davies (ed), Royal College of Physicians, London (Pub.), p17-27.

8. Molecular genetic studies in autosomal dominant retinitis pigmentosa. Bashir, R., Inglehearn, C.F., Lester, D., Lauffart, B., Keen, T.J., Papiha, S.S., Jay, M.R., Bird, A.C. and Bhattacharya, S.S. (1991). In "Degenerative Retinopathies: Advances in Clinical and Genetic Research", Humphries, Bhattacharya and Bird (eds) CRC Press/ Boston p13-19.

9. Linkage studies and rhodopsin mutation detection in autosomal dominant retinitis pigmentosa: an update. Bhattacharya, S.S., Bashir, R., Keen, T.J., Lester, D.H., Lauffart, B., Jay, M.R., Bird, A.C. and Inglehearn, C.F. (1991). Retinal Degenerations, Anderson, Hollyfield and LaVail (eds), CRC Press publication, p375-382.

10. Extensive genetic heterogeneity in autosomal dominant retinitis pigmentosa. Farrar, G.J., Siobhan, A., Jordan, Kumar-Singh, R., Inglehearn, C.F., Gal, A., Gregory, C., Al-Maghtheh, A., Kenna, P.F., Kenna, Humphries, M.M., Sharp, E.M., Sheils, D.M., Bunge, S., Hargrave, P.A., Denton, M.J., Schwinger, E., Bhattacharya, S.S. and Humphries P. (1993) In Retinal Degeneration: Clinical and Laboratory Applications, edited by Hollyfield, J.G., Anderson, R.E., LaVail, M.M. Plenum Press, p63-77.

11. Molecular Genetic Studies of retinal dystrophies principally affecting the macula. Evans, K., Gregory, C.Y., Wijesuriya, S., Jay, M., Chopdar, A. and Bhattacharya, S.S. (1995). In "Retinal Degenerations" eds Anderson, R.E., LaVail, M.M. and Hollyfield, J.C. Plenum Press, London, p323-330.

12. Rhodopsin mutations in photoreceptor degeneration: implications for protein dysfunction. Bhattacharya, S.S., Al-Maghtheh,M. and Inglehearn, C. (1997) in Protein Dysfunction in Human Genetic Disease, Swallow, D.M. and Edwards,Y.H. (eds.), Bios Scientific Publ. U.K., pp 187-202.

13. Francis PJ, Berry V, Kaushal S, Moore AT, Bhattacharya SS. Len aquaporin mutations**.** Molecular Biology and Physiology of Water and Solute Transport, Kluwer Academic/Plenum, New York 2000, Eds. Hohmann and Nielsen, p 205-207.

RESEARCH GRANT SUPPORT OBTAINED (1986 to present):

I have obtained grant income in excess of £18 million based on 70 successful grant applications over the last 31 years. I have also sponsored 11 Fellowship applicants.

Genetic Mapping in X-Linked RP, National RP Foundation of USA, July 1986-June 1989, SS Bhattacharya and AF Wright, £31,400

Molecular Genetic Analysis of Retinal Specific Genes, British RP Society, October 1986-September 1989, SS Bhattacharya, £26,250

Gene Mapping in Autosomal Dominant RP, National RP Foundation of USA, October 1987-September 1993, SS Bhattacharya, £334,000

Gene Mapping in Usher's Syndrome, British RP Society, October 1987 - September 1989, SS Bhattacharya and SS Papiha, £14,500

Isolation and Identification of Candidate Genes for XLRP and other X-Linked Eye Diseases, The Wellcome Trust, November 1987-October 1991, SS Bhattacharya £123,300

Isolation of Retinal Genes, Fight for Sight, October 1988 - September 1991, SS Bhattacharya, £24,000

Deletions in DNA and Phenotypic Expression of Muscular Dystrophy, Medical Research Council, October 1988-September 1989, J Harris and SS Bhattacharya, £19,088

Isolation of Retinal Genes Using Antibody Probes to Retinal Proteins, British RP Society, October 1988 - September 1991, SS Bhattacharya, £12,000

Molecular Genetic Studies of X-Linked Hypohidrotic Ectodermal Dysplasia. The Wellcome Trust, January 1989 - December 1991, SS Bhattacharya and P. Harper, £82,247

Incontinentia Pigmenti and Retts Syndrome: Two X-linked Dominant, Male-Lethal Causes of Mental Retardation in Females, The Sir Jules Thorn Trust, January 1989 - December 1990, SS Bhattacharya, £83,533

The Molecular Biology of a Feline Model for Retinitis Pigmentosa, The Wellcome Trust, February 1989 to January 1992, SS Bhattacharya and G. Arden, £89,918

Identification of the Genes in X-Linked Retinitis Pigmentosa and Norrie's Disease, The British RP Society, May 1989 - April 1992, SS Bhattacharya, £54,244

Molecular Genetic Studies of inherited eye disease, University Research Committee - Newcastle upon Tyne, December 1989 - November 1992, SS Bhattacharya, £39,750

Development and application of Molecular techniques for the study of inherited eye diseases, Special Trustees of Royal Victoria Infirmary, Newcastle upon Tyne, September 1990 to August 1992, S S Bhattacharya and A L Crombie, £36,000

Autosomal dominant hereditary haemorrhagic telangiectasia (HHT): A genomic search for the locus, Medical Research Council, June 1991 - May 1993, M Porteous, J Burn and SS Bhattacharya, £46, 520

Towards identifying the causative genetic defects in autosomal dominant retinitis pigmentosa, The British RP Society, September 1991 to August 1994, SS Bhattacharya, £151,156

Cornelia de Lange Syndrome: A molecular genetic Study, Medical Research Council, October 1991 to September 1994, M Ireland and SS Bhattacharya, £88,659

Molecular Genetic studies of inherited retinal Degeneration, The Wellcome Trust, October 1991 to September 1996, S Lindsay and SS Bhattacharya, £211,193

Isolation and characterisation of the genes encoding canine phospho-diesteras and their role in progressive atrophy, The Wellcome Trust, October 1991 to September 1994, SS Bhattacharya, £43,036

Molecular and biochemical studies on the etiology of retinal degeneration in the Royal College of Surgeons rat, The Wellcome Trust, December 1991 to November 1994, C Gregory and SS Bhattacharya, £92,263

Characterisation of functional loss in the outer retinal dystrophies with known genetic mutations, Medical Research Council, October 1993 to September 1998, A.C. Bird, SS Bhattacharya and F Fitzke, £680,000

Development for a delivery system for gene therapy of inherited retinal degenerations, Medical Research Council, September 1994 to August 1997, SS Bhattacharya, DM Hunt and AC Bird, £287,393

Positional Cloning of the X-linked Retinitis Pigmentosa gene (RP2) in proximal Xp, The Wellcome Trust, October 1994 to September 1997, SS Bhattacharya, £134,889

Mapping and identification of genes for autosomal dominant cataracts in humans, The Wellcome Trust, January 1995 to December 1997, A Shiels and SS Bhattacharya, £260,120

The isolation of genes expressed in the retina from defined regions of the X chromosome, Guide Dogs for the Blind, April 1996 to March 1999, SS Bhattacharya, £103,437

Autosomal dominant retinitis pigmentosa, cloning and characterisation of a novel gene on chromosome 7p, Foundation Fighting Blindness, September 1996 to August 1999, SS Bhattacharya, £105,000

Preservation of vision by the preservation of apoptosis in the retina, Guide Dogs for the Blind, December 1996 to November 1999, SS Bhattacharya and CY Gregory, £122,923

Expression and characterisation of proteins involved in eye development and disease, The WellcomeTrust, July 1997 to June 1998, MJ Warren, SS Bhattacharya and DM Hunt, £86,758

Positional cloning of the X-linked retinitis pigmentosa-2 (RP2) gene, The WellcomeTrust, October 1997 to February 2001, SS Bhattacharya, £160,054

Mapped cataract loci and candidate genes, The WellcomeTrust, March 1998 to May 2001, SS Bhattacharya and AT Moore, £299,055

Identification, cloning and characterisation of a dominant RP gene on chromosome 19q, The WellcomeTrust, April 1998 to March 1999, SS Bhattacharya, £48,808

Expression and characterisation of proteins involved in retinal disease, The WellcomeTrust, Jan 1999 to Dec 2003, M Warren, DM Hunt and SS Bhattacharya, £985,000

Cloning and characterisation of the chromosome 3q28 autosomal dominant optic atrophy gene, The WellcomeTrust, April 1999 to March 2002, M Votruba, SS Bhattacharya and AT Moore, £158,255

Autosomal dominant retinitis pigmentosa: Identification of new loci by genetic linkage studies and positional cloning of RP genes from chromosomes 19q(RP11), 17p(RP13) and1q(RP18), Foundation Fighting Blindness, September 1999 to August 2002, SS Bhattacharya, £130,980

Functional genomics and retinal degenerations, The European Union, September 2000 to August 2004, SS Bhattacharya, 200,000 EURO

Co-ordinator for a successful MRC Co-operative group application entitled: "Retinal degenerative diseases: An integrated approach from functional genomics to therapies". Grant ref: G9900417, tenure 60 months from September 2000.

Autosomal dominant retinitis pigmentosa; identification and functional analysis of the RP11 disease gene, Medical Research Council, October 2000 to June 2004 SS Bhattacharya and DM Hunt, £231,504

Human DNA sample collection and phenotypic characterisation of AMD: A key national resource to determine predisposing genetic factors, Medical Research Council, February 2001 to January 2004, AC Bird, SS Bhattacharya, P Luthert, A Webster and B Clarke, £394,336

Development of animal models for retinal disease, The Wellcome Trust, March 2001 to February 2004, DM Hunt, D Wells and S S Bhattacharya, £340,450

Identification of genes responsible for inherited cataract in man, The Wellcome Trust, June 2001 to Feb 2005, SS Bhattacharya and AT Moore £362,997

X-linked Progressive Cone-Dystrophies: Identification of the genes causing COD1 and COD2, The Wellcome Trust, April 2002 to March 2005, A Hardcastle, SS Bhattacharya, AT Moore, DM Hunt and M Cheetham, £172,685

Development of an inducible photoreceptor specific system for use in gene therapy for retinal degenerations, Foundation Fighting Blindness, July 2002 to June 2005 RR Ali and S S Bhattacharya, $195,102

Autosomal dominant retinitis pigmentosa: Identification of new loci by genetic linkage studies and positional cloning of RP genes from chromosomes 19q(RP11), 17p(RP13) and1q(RP18), Foundation Fighting Blindness, July 2003 to June 2005, SS Bhattacharya, $136,500

An investigation into the genetic basis of keratoconus, Special Trustees of Moorfields Eye Hospita, January 2004 to December 2005, S Tuft and SS Bhattacharya, £46,000

Cloning of retinal dystrophy genes from chr 1q, 6cen, 4q, British Retinitis Pigmentosa Society, July 2003 to June 2006 SS Bhattacharya, £136,257

Genotyping in ophthalmic diseases, Special Trustees of Moorfields Eye Hospital, June 2002 to December 2006, SS Bhattacharya and AC Bird , £840,000

Scientific co-ordinator of a Euro 3.68 million grant for a retinal research training network (RETNET) involving 10 European laboratories (January 2004-December 2007). Grant ref: MRTN-CT-2003-504003
Identification of novel retinal disease genes, The European Union, January 2004 to December 2007, SS Bhattacharya, Euro 375,474

Genetic basis of partial penetrance in adRP, Fight for Sight, September 2004 to August 2007, SS Bhattacharya, £65,800

An investigation of the genetic basis of myopia in the 1958 British birth cohort,
Medical Research Council, June 2005 to July 2008, Dr J. Rahi, SS Bhattacharya, A Webster and C Peckham, £272,350

Component leader of the Mechanisms of Disease module of EU funded EURO 10 Million integrated project (IP) on Functional Genomics of the Retina in Health and Disease (GENORET) Grant ref: LSHG-CT-2005-512036
Genetic mapping and gene identification of a novel monogenic retinal dystrophy, The European Union, April 2005 to March 2009, SS Bhattacharya, Euro 440,000

A genomewide association study for refractive error in the 1958 British Birth Cohort, The Wellcome Trust, May 2008 to April 2009, Dr J. Rahi, C Hammond, A Webster, SS Bhattacharya and P Sham, £591,024

Gene therapy for childhood diseases, Department of Health, August 2004 to July 2009, R Ali, SS Bhattacharya, L Da Cruz, AT Moore and AJ Thrasher, £915,552

Genetic Studies, Functional Genomics and Animal Models of Retinal Disease, The Foundation Fighting Blindness, July 2005 to June 2010, SS Bhattacharya and DM Hunt, £345,000

Scientific co-ordinator of a Euro 1.8 million grant for an Early Stage Training (EST) in Neurodegeneration research (NEUROTRAIN) involving 10 EU partners (January 2006-December 2009). Grant ref: MEST-CT-2005-020235
Genetics and Functional Genomics of Retinal Degeneration, The European Union, January 2006 to December 2009, SS Bhattacharya, Euro 105,000

Genotyping in ophthalmic diseases, National Institute of Health Research, Biomedical Research Centre at Moorfields Eye Hospital, April 2007 to March 2012, SS Bhattacharya , £285,000

Identification of a major gene (RP25) on chromosome 6q for autosomal recessive RP, British Retinitis Pigmentosa Society, April 2007 to March 2010 SS Bhattacharya and A Webster, £159,257

Monolithically integrated interferometric biochips for label-free early detection of human diseases (PYTHIA), European Union funded consortium of 8 laboratories, May 2008 to December 2011, SS Bhattacharya, UCL share Euro 216,000

Molecular mechanisms of disease associated with a major gene (PRPF31) for ADRP, British RP Society, December 2008 to February 2012, SS Bhattacharya, £176,000

To investigate the molecular basis of partial penetrance associated with PRPF31 gene in RP, Fight For Sight, October 2008 to March 2012, SS Bhattacharya £149,928

Identification of interacting partners for TOPORS. Fight For Sight, October 2010 to September 2013, SS Bhattacharya, £92,500

Molecular mechanisms associated with PRPF31 for autosomal dominant retinitis pigmentosa. Shom Shanker Bhattacharya.P09-CTS-04967, January 2011 -December 2013 Consejería de Economía, Innovación y Ciencia de la Junta de Andalucía (Excellence Project).255.774 €

Functional studies of retina expressed genes. Rosetrees Trust with Special Trustees of MEH, July 2012 to June 2013, SS Bhattacharya, £ 45,000

Y2H technology for identification of interacting partners for EYS. Fight For Sight, January 2012 to December 2014, SS Bhattacharya, £96,500

Functional analysis and characterization of a novel gene for autosomal recessive retinitis pigmentosa, British Retinitis Pigmentosa Society, April 2011 to March 2015, SS Bhattacharya, £156,545

Identification and functional characterization of retinal genes. Rosetrees and Butterfield Trust, August 2012 to November 2015, SS Bhattacharya, £206,350

Gene identification, Functional Characterisation and Animal Models of Retinal Degeneration, The Foundation Fighting Blindness, (USA), July 2010 to July 2016, SS Bhattacharya, £467,460

Genotyping in ophthalmic diseases, National Institute of Health Research, Biomedical Research Centre at Moorfields Eye Hospital, April 2012 to June 2017, SS Bhattacharya, £420,000

Functional studies and characterization of retinal genes. Rosetrees and Butterfield Trust, July 2013 to June 2017, SS Bhattacharya, £219,250

Convenio de colaboración para el desarrollo del Programa de Captación del Conocimiento C2A **(#)** SS Bhattacharya**.** Expediente: P09-CTS-04967 €259,169 per year

EYERISK-Genetic and Functional Characterisation of Age related macular degeneration, European Union H2020, June 2015-May 2019, SS Bhattacharya, €196,750

FELLOWSHIPS SPONSORED

Molecular genetic analysis of retinitis pigmentosa, The Wellcome Trust, October 1992 to September 1997, CF Inglehearn and SS Bhattacharya, £468,530

Molecular genetic approaches to macular disease, The Wellcome Trust, May 1995 to April 1999, CY Gregory and SS Bhattacharya, £312,903

Autosomal dominat optic atrophy: positional cloning of OPA 1 gene on chromosome 3q, The Wellcome Trust, December 1996 to November 1998
M Votruba and SS Bhattacharya, £111,675

The effects of TGF-β on conjunctival fibroblasts, extracellular matrix interactions and wound healing, The Wellcome Trust, September 1996 to August 1998, F Cordeiro and SS Bhattacharya, £97,217

Molecular genetics of autosomal dominant retinitis pigmentosa, The Wellcome Trust, October 1997 to September 2000, CF Inglehearn and SS Bhattacharya, £482,749

Identification of the human homologue of theDrosophila optomotor-blind gene and investigation of its role in development of the visual system, Medical Research Council, November 1996 to October 2000, JC Sowden and SS Bhattacharya, £213,722

A search for quantitative trait that influence the development of myopia in humans, The Wellcome Trust, October 1999 to September 2002, AR Webster and SS Bhattacharya, £221,563

Identification and characterisation of novel retina-enriched cDNAs as candidategenes for retinal degenerations, The European Union, Dec 2000 to November 2002, M Papaioannou and SS Bhattacharya, €114,572

Gene editing and iPSC technology for the generation of neural progenitor cells, Miguel-Servet Fellowship, September 2012 to August 2017, Slaven Erceg, €320,000

Therapeutic approaches for inherited retinal dystrophies, Miguel-Servet Fellowship, September 2016 to August 2021, Francisco Diaz Correlas, €350,000

DNA damage and repair in retinal photoreceptor cells, Juan de la Cierva Fellowship, January 2016 to December 2017, Vaibhav Bhatia, €75,000