Internal Review Report

Kusuma School of Biological Sciences

Indian Institute of Technology, Delhi

February, 2014

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0. Preamble

"It is reasonable to say we are entering the Age of Biology, paralleling in many ways the Age of Physics in the first half of the 20th century". The National Academies Press, Globalization, Bio-security and the Future of Life Sciences (2006), p-15. The dawn of 21st century has witnessed the announcement of the draft human genome demonstrating how biology, computer science, chemistry, physics, mathematics & engineering etc. can converge to advance human knowledge with potentially significant benefits to society. Biology for centuries has been empirical in nature. Modern Biology has departed from emphasis on species level understanding to appreciating unity and diversity at the genomic level affording new opportunities for the generation of hypothesis driven knowledge. The current revolution in Biological Sciences is driven by Genomic/Proteomic Biology which involves understanding the information encoded in DNA, RNA, and proteins, the molecules of life at the cellular level. The quest is on for developing insights from a genome in a cell to tissue to organ to organism plant or animal. The challenges are not confined to deciphering the temporal and spatial networks at a molecular / cellular level in development but anticipating influences and proposing remedies to internal fluctuations or external perturbations. Subtle electrical/ molecular/ environmental changes govern the dynamics of intelligent biologics of genomes. In short, biology poses some of the best challenges to human mind and an institute like IIT known for its strengths is well suited to undertake some of these challenges. To provide a platform to catalyze a campus-wide research and educational activities, to bring together biologists, physicists, chemists, biotechnologists, computational scientists, physicians and engineers in interdisciplinary research initiatives encompassing several emerging areas of Engineering Biomaterials, Development of personalized medicine, Cancer Biology and Cell Biology of Aging, Quantum medicine, Biologics and biofluid analysis, it has been proposed to establish a School of Biological Sciences at IIT Delhi.

Background

The proposal to establish a School of Biological Sciences at IIT Delhi was approved by the Board of Education Research & Planning (23-3-2007), the Executive Committee of the Senate (29-3-2007), the Senate (19-4-2007) and the Board of Governors (28-06-2007). Following the recommendations of the above academic bodies, a high power national advisory committee was constituted with the following composition. Prof. M. Vijayan (IISc, Co-chairperson), Prof. Surendra Prasad (Director, IITD, Co-chairperson), Prof. Vijaya Raghavan (NCBS), Prof. A. Surolia, (NII), Prof. S. K. Brahmachari (DG, CSIR), Prof. Alok Bhattacharya (JNU), Prof. Pradeep Sinha (IITK), Prof. S.C. Lakhotia (BHU), Prof. Vijayalakshmi Ravindranath (NBRC), Prof. A. K. Srivastava (Head, DBEB, IITD), Prof. Sneh Anand (Head, CBME, IITD), Prof. Saroj Mishra (DBEB, IITD), Prof. M. N. Gupta (Chemistry, IITD), Prof. S. N. Maheshwari (CSE, IITD), Prof. B. N. Jain (Deputy Director, Faculty, IITD), Prof. B. Jayaram (Head, Chemistry, IITD, Convenor). Also, an Internal Task Force was set up (6-9-2007) to steer the establishment of the School, comprising the following: Prof. B. N. Jain (Deputy Director, Faculty, Chairman), Prof. A. K. Srivastava (Head, DBEB), Prof. Sneh Anand (Head, CBME), Prof. Saroj Mishra (DBEB), Prof. M. N. Gupta (Chemistry), Prof. S. N. Maheshwari (CSE) and Prof. B. Jayaram (Head, Chemistry, Convenor). The internal Task Force met several times to draft a vision document and draw up a plan of action for setting up the School which is presented below. The document was discussed in the meeting of the Director with all interested faculty of IITD on 19-12-2007 and most of the suggestions are incorporated in the document. The National Advisory Committee set up for the School met on 27-12-2007. While applauding the initiative of IITD to set up the School of Biological Sciences, the NAC made several useful suggestions which have been integrated into the vision document (Annexure-1).

Creation of the School

A coordinator (Prof. B. Jayaram) was appointed in March, 2008 to oversee the creation of the School. A space of ~ 20,000 sq. ft. (formerly IBM building) was allocated. Faculties from across the Institute were invited to consider joining the School full time and their bodata was sought. About 30 applications were received. A special selection committee with the approval of BoG was constituted consisting of Prof. M. Vijayan, Prof. A. Surolia, Prof. Surendra Prasad, Prof. B. N. Jain & Prof. B. Jayaram who looked into the applications of all the candidates and selected (1) Dr. James Gomes, Associate Professor, DBEB, (2) Dr. Aditya Mittal, Associate Professor, CBME, (3) Dr. Tapan K. Choudhury, Associate Professor, DBEB, (4) Dr. Bishwajit Kundu , Assistant Professor, DBEB, to join the School as core faculty. These four faculty members joined the School in Dec., 2008. Faculty offices were created as well make make-shift Laboratories in the main building. A Ph.D. programme in Biological Sciences along with a few Pre Ph.D. courses was proposed by the School which was approved by BERP and the Senate. The first batch of Ph.D. students was inducted in 2009. New faculty selections were conducted in 2009 against an open advertisement and four faculty were selected. (5) Prof. C. S. Dey, (6) Dr. Archana Chugh, (7) Dr. Vivekanandan Perumal & (8) Dr. Manidipa Banerjee joined the School in 2010. The School made several presentations to attract external funding. Kusuma Trust UK founded by an Alumnus of IIT Delhi, Mr. Anurag Dikshit, agreed to donate Rs. 20 Crores, half of it as matching grant, for initiating the research work on infectious diseases and non-communicable disorders and for popularizing Biology among undergraduate students (Annexures-2 & 3). The School proposed a Minor Area Programme in Biological Sciences for Engineering Students in 2010 which included a Foundational Course in Modern Biology and this course became extremely popular with the UG students. The first series of research papers started appearing from the School in 2010. Meanwhile, the Institute made available Rs. 6 Crores for the creation of BSL-1, 2 & 3 Laboratories. After a series of bureaucratic hurdles, the order for Lab. creation was placed in 2012. (9) Prof. Seyed Hasnain, who was selected as Professor with the approval of BoG joined the School on in 2012. The Laboratories including BSL-3 in the annexe building became operational and the renovation work in the main building commenced in 2013. The senate decided in 2013 that all the UG students (850+) inducted every year to IITD would take the Foundational Course in Biology being offered by the School as a core course. Faculty selections were conducted under special drive in 2013 and (10) Dr. Ashok Kumar Patel was selected who joined the School in 2013. The School proposed an MS(R) programme. Approvals for this programme from the Institute and the Department of Biotechnology are awaited. The first Ph.D. thesis submission from the School occurred in 2013. The Ph.D. student strength rose to 50. The School faculty in this short span published ~ 90 papers with an average impact factor of 4. The School faculty generated funding worth Rs. 15 Crores (Annexure-4). Several state of the art facilities including FACS, DNA microarray, MS, were procured and installed. Cryo-EM is under installation. A high speed low light imaging system and a cell electrophysiology set up are in the process of procurement. The Advisory Board of the School met thrice and appreciated the progress being made by the School (Annexure 5 to 7). Overall, the School is on its course to take off to greater heights (School Flyer; Annexure-8).

Internal Review Report

Assessment Parameters

1. Curriculum

1.1 List of degree programmes offered - UG + PG - and enrollment.

(i) UG – Minor Area in Biological Sciences

Graduated: 1 (out of 5 initially enrolled)

Pursuing: 10 (indicated by those who have completed SBL101 and enrolled for SBP200 and SBL201)

(ii) PG – Ph. D., with enrollment of 50

(iii) PG – M. S., under administrative consideration.

1.2 Consistency of curricula with academic vision of the department.

(i) UG courses (SBL101, SBL201, SBP200, SBD301) and several 700/800 level courses are consistent with the vision of popularizing biology amongst the IIT Delhi student population.

(ii) SBL100 will be taught for the first time in July 2014 as a core course of the B. Tech. curriculum for all incoming (850+) UG students at IIT Delhi.

(iii) PG courses are consistent with the academic vision of developing a strong background for the incoming PG students in specific aspects of biological sciences.

1.3 Quality of programmes:

(a) Periodicity of curriculum review UG and PG (*relevant documents*).

A curriculum review of all UG and PG programmes is held once every 10 years by the Institute. The SBL100 was introduced for all UG students as a part of this review.

(b) Mechanism for review at UG and PG level (*relevant documents*).

The mechanism is initiated centrally by the Academic Section of the Institute. The review is carried out over a period of 2 years before a new curriculum, modified course structure and new courses are adopted. The School is less than 5 years old and has participated in the UG curriculum review leading to the creation of SBL100.

(c) Coursework for each UG, PG and PhD programme - Core / Elective.

Undergraduate programmes: Minor Area in Biological Sciences

Eligibility: As per Section 3.12 in Registration & Attendance Rules

Requirements: Minimum completion of 20 credits including:
8 credits of core courses.
Minimum of 12 credits (from any combination of 3 electives + minor project).

Core Courses:

SBL101	Modern Biology for Engineers	(3-0-0)	3 credits
SBL201	High-Dimensional Biology	(3-0-0)	3 credits
SBP200	Introduction to Practical Modern Biology	(0-0-4)	2 credits

Elective Courses: Currently available in the School, DBEB, CBME and Chemistry.

S. No.	Course No.	Course Title	L-T-P	Credits
1	SBL701	Biometry	3-0-0	3
2	SBL702	Systems Biology	3-0-0	3
3	BEL421	Metabolic Regulation and Engineering	3-0-0	3
4	CYL726	Cheminformatics and Molecular Modeling	3-0-0	3
5	BEL412	Immunology	3-0-2	4
6	SBL704	Human Virology	3-0-0	3
7	SBL707	Bacterial Pathogenesis	3-0-0	3
8	SBL 708	Epigenetics in Health and Disease	3-0-0	3
9	BEL311	Physical and Chemical Properties of Biomolecules	3-0-0	3
10	SBL705	Biology of Proteins	3-0-0	3
11	BEL714	Protein Science and Engineering	3-0-0	3
12	BEL722	Genomics and Proteomics	3-0-0	3
13	SBL703	Advanced Cell Biology	3-0-0	3
14	SBL706	Biologics	3-0-0	3
15	SBL709	Marine Bioprospecting	3-0-0	3
16	SBL710	Chemical Biology	3-0-0	3
17	BML700	Introduction to Basic Medical Sciences for Engineers	3-0-0	3
18	CHL291	Introduction to Biochemical Engineering	3-1-0	4
19	SBD301	Mini Project	0-0-6	3

Post Graduate Programme: Master of Science (Research)

Course No.	L-T-P	Course Name
Compulsory		
SBC795	0-0-1	Graduate Student Research Seminar - I
SBC796	0-0-1	Graduate Student Research Seminar - II
SBP810	0-0-4	Advanced Bioscience Techniques (*new course*)
SBD895	0-0-80	MS Research Project (*new course*)
SBL750	3-0-0	Quantitative Biology (*new course*)
SBL751	3-0-0	Chemical and Molecular Foundations of Cell (*new course*)

Other Courses (a student will select 12 credits from these or other relevant courses from the Institute (See next item))

(d) Pre PhD courses offered (*in last 5 yrs*)

Course No.	L-T-P	Course Name
SBL701	3-0-0	Biometry
SBL702	3-0-0	Systems Biology
SBL703	3-0-0	Advanced Cell Biology
SBL704	3-0-0	Human Virology
SBL705	3-0-0	Biology of Proteins
SBL706	3-0-0	Biologics
SBL707	3-0-0	Bacterial Pathogenesis
SBL708	3-0-0	Epigenetics in Human Health and Disease
SBL709	3-0-0	Marine Bioprospecting
SBL710	3-0-0	Chemical Biology
SBL711	3-0-0	Cell Signaling (*new course*)
SBL712	3-0-0	Dynamics of Infection Biology (*new course*)
SBV881	1-0-0	Advances in Chemical Biology

SBV882	1-0-0	Biological Membranes
SBV883	1-0-0	Chaperone and Protein Conformational Disorders
SBV884	1-0-0	Elements of Neuroscience
SBV885	1-0-0	Protein Aggregation and Diseases
SBV886	1-0-0	Signalling Pathway Analysis
SBV887	1-0-0	Current Topics in Computational Biology
SBV888	1-0-0	Computer-Aided Drug Discovery
SBV889	1-0-0	Diagnostic Virology
SBV890	1-0-0	Kinetoplastid Parasites and Novel Targets
SBV891	1-0-0	Virus Host Interactions

(e) New advanced Masters / Pre-PhD courses introduced in last 5 yrs
All courses listed in the previous sections were introduced in the last 5 years.

(f) Overlap between courses (c) and (d) & (e), including opening latter to UG.
There is at most a 10% overlap with other courses that have been approved by the Senate. This is an Institute policy. New courses go through a rigorous check to ensure that there is not more than 10% overlap with existing courses and that the courses reflect the need of the curriculum, in tune with trends of the international scientific community and topical trends.

(g) Seminar series (weekly/regular) held each semester.
SBC795 Graduate Student Seminar Course is floated every semester.

(h) Placement details.

Mr. Suhas Vasaikar who submitted his thesis (the first from the School), has joined as a Post Doctoral fellow in Karolinska Institute.

(i) Relevance of UG and programmes to recruiters, potential and on-campus recruiters.
The School of Biological Sciences participates in the UG programme through its Minor Area Scheme and the Foundational Course in Biology. The on-campus recruitment is conducted for all departments and the statistics are available with the "Training and Placement Cell, IIT Delhi".

(j) Benchmarking of curriculum.
See sections 3.8 – 3.11

2. Teaching environment

2.1 Student-Teacher ratio separately and total for UG, PG, PhD (based *on gross numbers and on class size basis*)

Course-work- UG/PG/PhD based on gross numbers and class size basis

Year	# Courses	Total Enrolment	Average	Stdev
2009-2010	11	108	9.82	5.67
2010-2011	21	220	10.48	6.77
2011-2013	19	248	13.05	8.78
2012-2013	30	297	9.90	11.40
2013-2014	23	559	24.30	29.13

MS (Research) Programme
3 students per faculty (Total approved strength: 30 students)
PhD Programme
5 students per faculty (Total enrolled strength: 50 students)

2.2 No. of students graduated in each programme, incl. PhD, (*data for 5 yrs*)
One (This is the first student from the programme; The Ph.D programme of the School was started in 2009)

2.3 Student-T.A. (or student-hours/T.A.) ratio: 8 hours per TA

2.4 No. of skilled technical staff:
One Junior Laboratory Assistant (Ms. Pushplata)

2.5 Gross laboratory space; break-up of lab space for core UG / PG teaching
UG: 4000 sq ft. for 850 students (SBL100 practical) with about 50 students per cycle.
PG: ~12000 sq ft. for all students in the PhD and MS programmes.

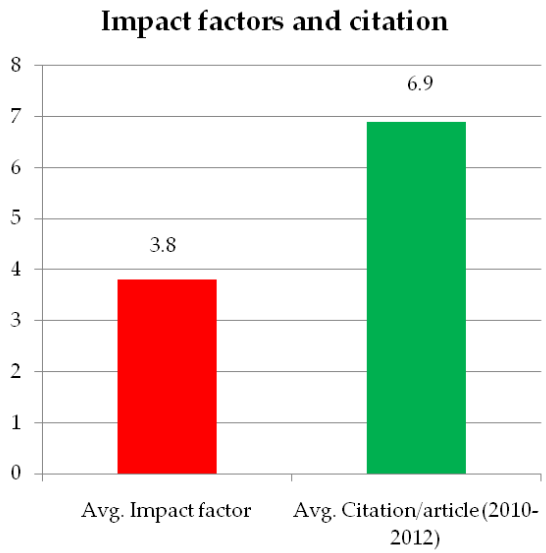
2.6 Laboratory modernization performed in last 5 years for (i) UG core, (ii) PG core, (iii) elective courses (*attach data before and after modernization)*
UG core: A new laboratory of 4000 sq ft is being constructed in the Lecture Theatre Complex of the Institute
PG core: A new laboratory of 800 sq ft is being constructed in the School for PG practical courses

2.7 Course files for each course for last 5 years
The course files for each of the courses are maintained by individual faculty members who have coordinated their respective courses.

2.8 Study materials (monographs, notes, books, videos, web-based materials, etc.) prepared, course-wise
Study material for the various courses consisting of slides, notes, web-based materials are maintained by individual faculty members. For SBL101, see http://web.iitd.ac.in/~amittal/Teaching_SBL101_SemII_2013_14.html

2.9 Research and Innovations in teaching-learning processes
Some innovations in teaching-learning process at UG/PG level courses are highlighted by (a) Open book, open notes, open web examinations in SBL101 – completely dispelling the myth of biology being a “cramming” subject, and, (b) Take home examinations in courses such as SBL701 highlighting analytical problem solving with sustained thought process on biological data.

The innovations in research are reflected by the high impact publications of the faculty of the school (See Figure below). In the last 4 years, more than 90 publications were produced by the faculty of the school.



2.10 No. of students (UG and PG separately) who have spent at least a semester at another university/institute (overseas or Indian).
One Ph.D. student. Mr. Hirdesh Kumar (DADD Fellowship): 2013

2.11 No. of students from overseas universities who have taken classes, done project work or internship, UG & PG separately, in the department.
One Ph.D. student: (Mr. Ali Khosravi)

2.12 Course feedback:

Course feedback is given by the students in the online academic system. The average teaching rating of the faculty is about 4/5. In certain courses such as SBL701: Biometry, the registration increased from about 20 to 60 (maximum allowed) over the last three years. In the flagship UG course, offered as an open elective so far, SBL101: Modern Biology for Engineers registration increased from 14 (offered first time in Semester I 2011-2012, maximum allowed = 30) to 100 (in both semesters 2013-2014, maximum allowed = 100; pre-registration >345 in semester II 2013-2014) in spite of less than 10% of students securing A grades in all semesters. Course feedback given by students has been extremely positive with average score ~ 4.5/5 consistently. Some elective modular courses such as SBV891: Virus Host Interactions are now seeing registrations >70.

2.13 Industry experts who have delivered lecture(s), seminars, discussions as part of a core/elective course – UG and PG separately.
Several visitors from the industry have expressed their desire to teach in the School (Dr. Barry Buckland, Merck).

2.14 Industry exposure to students – course-related visits
Nil. This is not practicable for PhD students.

3. Research

3.1 No. of Masters and Ph.D. students supported - (i) by Institute Assistantship, (ii) on sponsored projects/consultancies, (iii) others sources and (iv) sponsored by external organizations.

(i)Institute Assistantship: 15 PhD students
ii) Sponsored projects/consultancies: 4 PhD students from DBT/ DST/ICMR funded projects.
(iii) Others sources: 4 PhD students (includes self-sponsored and part-time candidates)
(iv) Sponsored by external organizations: 29 PhD students with fellowships from CSIR, DBT and ICMR.

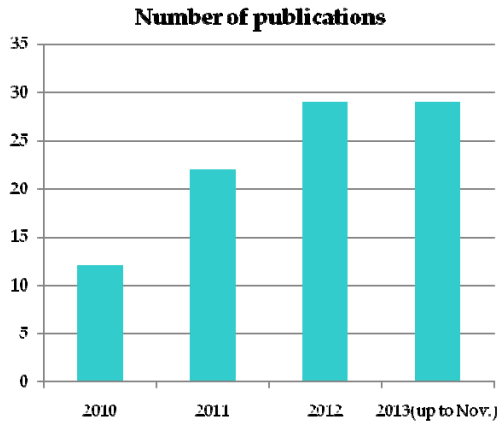
3.2 No. of Ph.D.s enrolled, graduated per faculty for last 5 years

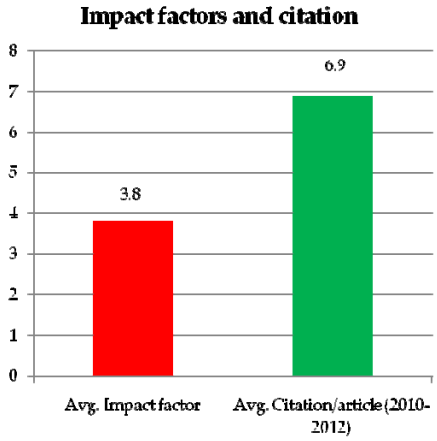
a) Average No. of Ph.D.s enrolled: 5.2 students / faculty.
b) Average No. of Ph.D.s graduated per faculty~ 1-2 (Most faculty members of the School have been associated with IITD for less than 5 years)

Details:

Name	Number of PhD students
Prof. Aditya Mittal	7 (2 graduated)
Dr.ArchanaChugh	4 (0 graduated)
Dr. Ashok Patel	0
Dr.Bishwajit Kundu	8 (1 graduated)
Prof. B. Jayaram	2.5 (0 graduated)
Prof. C. S. Dey	3 (0 graduated)
Prof. James Gomes	15 (8 graduated)
Prof. Manidipa Banerjee	6 (0 graduated)
Prof. T. K. Chaudhuri	14 (3 graduated)
Prof. Seyed Hasnain	4.5 (0 graduated)
Dr.Vivekanandan Perumal	4.5 (0 graduated)

3.3 Areas of research (e.g. areas listed in Prospectus, and others) by (i) Volume (quantifiable parameters), (ii) Breadth, and (iii) Years these have been research areas.





3.4 Publications per faculty (average per year for last five years) in academic journals.

Name	Avg./year (5 year avg.)
Prof. Aditya Mittal	4
Dr. Archana Chugh	1
Dr. Ashok Patel	2.2
Dr. Bishwajit Kundu	1.2
Prof. B. Jayaram	6.4
Prof. C. S. Dey	2.4
Prof. James Gomes	7
Prof. Manidipa Banerjee	1.2
Prof. T. K. Chaudhuri	2
Prof. Seyed Hasnain	7
Dr.Vivekanandan Perumal	3

3.5 Publications (journal and conference) total and per (a) Ph.D. student, (b) Masters student, (c) UG student.

3.6 Best papers in last 5 years: (i) Individual best 3, (ii) department/centre best 10; and brief justifications.

(i) Individual Best 3

Name	**Best 3 publications and a one line justifications**
Prof. Aditya Mittal	**Mittal, A.***, B. Jayaram*, S. R. Shenoy and T. S. Bawa. A stoichiometry driven universal spatial organization of backbones of folded proteins: Are there Chargaff's rules for protein folding? ***J. Biomol. Struct. Dyn.*** **2010;** 28: 133-142. (***Cover Article***). **Impact factor (2010) = 4.99** **Provides a new perspective on protein folding, citations > 55** Naresh, M., S. Das, P. Mishra and **A. Mittal***. The Chemical Formula of a Magnetotactic Bacterium. ***Biotechnol. Bioeng.*** **2012;** 109: 1205-1216. **Impact factor (2012) = 3.65** **A step towards unraveling chemical logic of life** Naresh, M., M. Sharma and **A. Mittal***. Intracellular Magneto-spatial Organization of Magnetic Organelles inside Intact Bacterial Cells. ***J. Biomed. Nanotechnol.*****2011;** 7: 572-577. **Impact factor (2012) = 5.26** **One of the first reports on quantitative intracellular organelle distributions using**

	NSOM on intact cells
Dr. Archana Chugh	1. Jain A, Bhatia P, Chugh A. Microbial synthetic biology for human therapeutics. Syst Synth Biol. 2012 Jun;6(1-2):9-22. doi: 10.1007/s11693-012-9092-0. Epub 2012 Jun 2. 2. Eudes F, Chugh A. Translocation of cell-penetrating peptides and delivery of their cargoes in triticale microspores.Plant Signal Behav. 2008 Aug;3(8):549-50. (Impact factor 3.0) 3. Chugh A, Amundsen E, Eudes F.Plant Cell Rep. 2009 May;28(5):801-10. (Impact factor 2.8)
Dr. Ashok Patel	Torigoe, Sharon E.; **Ashok Kumar Patel**; Mai T Khuong, Bowman, Gregory D.; Kadonaga, James T. " ATP-dependent chromatin assembly is functionally distinct from chromatin remodeling ATP-dependent Chromatin Assembly Is Distinct from Chromatin Remodeling." **eLife 2013; 2:** **Ashok Kumar Patel,**SrinivasChakravarthy, Seamus Morrone, Ilana M. Nodelman, Jeffrey N. McKnight and Gregory D. Bowman. "Decoupling nucleosome recognition from DNA binding dramatically alters the properties of the Chd1 chromatin remodeler". **Nucleic Acid Research December 2012, 41, 1637-1648.** (Journal impact factor 8.28). **Ashok Kumar Patel,** Jeffrey N. McKnight, PavolGenzor, and Gregory D. Bowman, "Identification Of Residues In Chromo-Helicase-DNA-Binding Protein 1 (Chd1) Required For Coupling ATP Hydrolysis To Nucleosome Sliding "**Journal of Biological Chemistry.(JBC) December 2011***, VOL. 286(51), pp 43984-43993* (Journal impact factor 4.65).
Dr.Bishwajit Kundu	Bansal S, Srivastava A, Mukherjee G, Pandey R, Verma AK, Mishra P, **Kundu B***. Hyperthermophilicasparaginase mutants with enhanced substrate affinity and antineoplastic activity: structural insights on their mechanism of action. FASEB J.;26(3):1161-71. 2012. **Impact factor 5.7.** **- A report giving insights about the structural and functional stability of thermophilic asparaginases, with potential for therapeutic and industrial applications** **2.** Tomar R, Garg DK, Mishra R, Thakur AK, Kundu B*. N-terminal domain of Pyrococcus furiosus l-asparaginase functions as a non-specific, stable, molecular chaperone. FEBS J.; 280(11):2688-99. 2013. **Impact Factor 4.25** **First time report of an isolated domain of a protein working as a chaperone** **3.** Rana A, Gnaneswari D, Bansal S and Kundu B*. Prion Metal Interaction: Is prion pathogenesis a cause or a consequence of metal imbalance? Chemico - Biological Interaction ,Vol. 181 (3) 282-291 , 2009**. Impact Factor 3.0** **A novel mechanism is proposed for the initiation of protein aggregation inside the cell.**
Prof. B. Jayaram	G. Khandelwal, and B. Jayaram, "DNA-water interactions distinguish messenger RNA genes from transfer RNA genes", J. Am. Chem. Soc., 2012, 134, 8814-8816. DOI:10.1021/ja3020956. **Physico-chemical properties of DNA sequences convey their functional destiny.** A. Soni, K. Menaria, P. Ray, B. Jayaram, "Genomes to Hits *in Silico*: A Country Path Today, A Highway Tomorrow: A case study of chikungunya", *Current Pharmaceutical Design*, **2013**, 19, 4687-4700, DOI**:** 10.2174/1381612811319990379. **A "Genome to Hits In Silico" assembly line is proposed and illustrated on Chikungunya virus. The pathway envisages automated gene prediction, protein tertiary structure determination and hit molecule generation based on in-house software.** Goutam Mukherjee and B. Jayaram, "A Rapid Identification of Hit Molecules for Target Proteins via Physico-Chemical Descriptors", Phys. Chem. Chem. Phys., 2013 **A freely accessible rapid physico-chemical method/software for identifying hit molecules against any protein target from a million compound database.**
Prof. C. S. Dey	Bisht B, Srinivasan K and **Dey CS.** *In vivo* inhibition of Focal Adhesion Kinase

	causes insulin resistance. **J. Physiology, 2008, 586/16:** 3825. Identification of Focal adhesion kinase as a possible drug in vivo against insulin resistant diabetes. (Impact factor: 4.6) Gupta, A; Bisht, B and **Dey CS**: Peripheral insulin-sensitizer drug Metformin ameliorates neuronal insulin resistance and Alzheimer's-like changes **Neuropharmacology** 2011, 60:910. Identification that insulin resistant diabetes may cause Alzheimer's disease and metformin may be used as a therapeutic drug. **Recently cited and presented by the Nobel Laureate Dr. James Watson in his lecture on the occasion of 60 years of DNA, at UCLA during March, 2013** (the link for the video: http://www.imedseminar.com/seminars/ oxidants-antioxidants-and-the-curing-of/video**).** (Impact factor: 4.7) Gupta A and **Dey CS**: PTEN, a widely known negative regulator of insulin/PI3K signaling, positively regulates neuronal insulin resistance. **Mol. Biol. Cell** 2012:23(19):3882-98. Identification of a phosphatase, PTEN, as a regulator of neuronal insulin resistance. (Impact factor: 6)
Prof. James Gomes	A. Padhi, H. Kumar, S. V. Vasaikar, B. Jayaram and J. Gomes*, (2012) Mechanisms of Loss of Functions of Human Angiogenin Variants Implicated in Amyotrophic Lateral Sclerosis, PLoS ONE 7(2), e32479 (**IF=4.34**) **Elucidation of the molecular mechanisms for loss of ANG function** Aditya K. Padhi, Bhyravabhotla Jayaram, James Gomes* (2013) Prediction of Functional Loss of Human Angiogenin Mutants Associated with ALS by Molecular Dynamics Simulations, Scientific Reports 3, Article number: 1225, doi:10.1038/srep01225 Nature Publishing Group (**IF=2.927**). **Prediction if a mutation will cause ALS for all known mutations of ANG** Padhi, A.K., Suhas V.V, B Jayaram , Gomes J*, Fast prediction of deleterious angiogenin mutations causing amyotrophic lateral sclerosis. FEBS Lett. (2013),http://dx.doi.org/10.1016 /j.febslet.2013.04.022 (**IF=3.478**) **Development of a web tool for clinicians that determines if a new mutation will cause ALS**
Dr. Manidipa Banerjee	Bajaj S and Banerjee M*. Engineering virus capsids into biomedical delivery vehicles: Structural engineering problems in nanoscale. J Biomed Nanotechnol. 2013. Accepted for publication. (*corresponding author) Banerjee M, Speir JA, Kwan MH, Huang R, Aryanpur PP, Bothner BB, Johnson JE. Structure and function of a genetically engineered mimic of a non-enveloped virus entry intermediate. J Virol. 2010. May; 84(9): 4737-46 Banerjee M, Khayat R, Odegard AL, Walukiewicz HE, Schneemann A and Johnson JE. Dissecting the functional domains of a non-enveloped virus membrane penetration peptide. J Virol. 2009 Jul; 83(13):6929-33
Prof. T. K. Chaudhuri	1. Vinay Dahiya and **Tapan K. Chaudhri*** "GroEL/ES acccelerates the refolding of a multi-domain protein through modulating on pathway intermediates". **J Biol Chem. 2014 Jan 3;289(1):286-98.** 2. Madhuri Suragani, Varma D. Aadinarayana, Aleem B. Pinjari, Karunakar Tanneeru, Lalitha Gururprasad, Sharmishtha Banerjee, Saurabh Pandey, **Tapan K. Chaudhuri** and Nasreen Z. Ehtesham "Human Resistin, a Pro-inflammatory cytokine, shows chaperone like activity". **PNAS(USA)**, 2013

	Dec 17;110(51):20467-72. 3. Vinay Dahiya and **Tapan K. Chaudhuri*** "Functional intermediate in the refolding of a large and multidomain protein Malate Synthase G". **Biochemistry (ACS Publications)** ,**2013**,52,4517-4530
Prof. Seyed Hasnain	1. Saini V, Raghuvanshi S, Khurana JP, Ahmed N, Hasnain SE, Tyagi AK, Tyagi AK. Massive gene acquisitions in Mycobacterium indicus pranii provide a perspective on mycobacterial evolution. ***Nucleic Acids Res***. 2012; 40: 10832-10850 **Provides a comprehensive genomic analyses of an Indian vaccine strain against leprosy and Tuberculosis.** 2. Kohli S, Singh Y, Sharma K, Mittal A, Ehtesham NZ, Hasnain SE. Comparative genomic and proteomic analyses of PE/PPE multigene family of *Mycobacterium tuberculosis* H37Rv and H37Ra reveal novel and interesting differences with implications in virulence. ***Nucleic Acids Res***. 2012;40(15):7113-22. **Highlights the importance of PE/PPE family in virulence of *Mycobacterium tuberculosis.*** 3. Nair, S., Ramaswamy, P.A., Ghosh, S., Joshi, D.C., Pathak, N., Siddiqui, I., Sharma, P., Hasnain SE., Mande, S.C., Mukhopadhyay, S. (2009) The PPE18 of *Mycobacterium tuberculosis* interacts with TLR2 and activates IL-10 induction in macrophage. ***Journal of Immunology*** 183:6269-81. **Elucidating the pro-pathogen mechanism of PE/PPE family**
Dr.Vivekanandan Perumal	1. Upadhyay M, Samal J, Kandpal M, Vasaikar S, Biswas B, Gomes J, **Vivekanandan P***. CpG dinucleotide frequencies reveal the role of host methylation capabilities in parvovirus evolution. *J Virol.* 2013 Dec; 87(24):13816-13824. (* corresponding author). **Impact factor 5.0** **Provides a new perspective to virus evolution** 2. Upadhyay M, Samal J, Kandpal M, Singh OV, **Vivekanandan P** * .The Warburg effect: insights from the past decade. *PharmacolTher.* 2013 Mar;137(3):318-330. (*corresponding author). **Impact factor 7.5** **Insights into epigenetics of Warburg effect / Among the 25 most downloaded articles from the journal in 2013** 3. Samal J, Kandpal M, **Vivekanandan P ***.Molecular mechanisms underlying occult hepatitis B virus infection.*ClinMicrobiol Rev*. 2012; 25(1):142-163. (*corresponding author). **Impact factor 17.1** **Novel mechanistic perspective in occult HBV infections**

(ii) School's 10 best: In random order (not ranked)

Mittal, A.*, B. Jayaram*, S. R. Shenoy and T. S. Bawa. A stoichiometry driven universal spatial organization of backbones of folded proteins: Are there Chargaff's rules for protein folding? J. Biomol. Struct. Dyn. 2010; 28: 133-142. (Cover Article). Impact factor (2010) = 4.99

- Provides a new perspective on protein folding, citations > 60

2. Bansal S, Srivastava A, Mukherjee G, Pandey R, Verma AK, Mishra P, Kundu B*. Hyperthermophilicasparaginase mutants with enhanced substrate affinity and antineoplastic

activity: structural insights on their mechanism of action. FASEB J.;26(3):1161-71. 2012. Impact factor 5.7.

- A report giving insights about the structural and functional stability of thermophilic asparaginases, with potential for therapeutic and industrial applications

3. G. Khandelwal, and B. Jayaram, "DNA-water interactions distinguish messenger RNA genes from transfer RNA genes", J. Am. Chem. Soc., 2012, 134, 8814-8816. DOI:10.1021/ja3020956.

4. Gupta A and Dey CS: PTEN, a widely known negative regulator of insulin/PI3K signaling, positively regulates neuronal insulin resistance. Mol. Biol. Cell 2012:23(19):3882-98.

- Identification of a phosphatase, PTEN, as a regulator of neuronal insulin resistance. (Impact factor: 6)

5. A. Padhi, H. Kumar, S. V. Vasaikar, B. Jayaram and J. Gomes*, (2012) Mechanisms of Loss of Functions of Human Angiogenin Variants Implicated in Amyotrophic Lateral Sclerosis, PLoS ONE 7(2), e32479 (IF=4.34)

- Elucidation of the molecular mechanisms for loss of ANG function

6. Kohli S, Singh Y, Sharma K, Mittal A, Ehtesham NZ, Hasnain SE. Comparative genomic and proteomic analyses of PE/PPE multigene family of Mycobacterium tuberculosis H37Rv and H37Ra reveal novel and interesting differences with implications in virulence. Nucleic Acids Res. 2012;40(15):7113-22.

- Highlights the importance of PE/PPE family in virulence of Mycobacterium tuberculosis.

7. Vinay Dahiya and Tapan K. Chaudhri* "GroEL/ES acccelerates the refolding of a multi-domain protein through modulating on pathway intermediates". J Biol Chem. 2014 Jan 3;289(1):286-98.

8. Bajaj S and Banerjee M*. Engineering virus capsids into biomedical delivery vehicles: Structural engineering problems in nanoscale. J Biomed Nanotechnol. 2013. Accepted for publication. (*corresponding author).

9. Vinay Dahiya and Tapan K. Chaudhuri* "Functional intermediate in the refolding of a large and multidomain protein Malate Synthase G". Biochemistry (ACS Publications),2013,52,4517-4530.

10. Upadhyay M, Samal J, Kandpal M, Vasaikar S, Biswas B, Gomes J, Vivekanandan P*. CpG dinucleotide frequencies reveal the role of host methylation capabilities in parvovirus evolution. J Virol. 2013 Dec; 87(24):13816-13824. (* corresponding author). Impact factor 5.0

- Provides a new perspective to virus evolution

3.7 Average citation per department/center.

Average citation for publications from KSBS in from 2010-2013 - ~7 citations/ article.

3.8 Changes, modifications, etc. done to improve the quality of (i) M.Tech., and (ii) Ph.D. graduates.

The school currently has only a PhD programme running. The MS (R) programmes has been approved in principle and will begin soon. The School also has a Minor Area programme, through which UG students can obtain a minor area degree in Biological Sciences if they fulfill the required credits. Therefore, the improvement of quality of Ph.D. students is relevant. Since the School is only 5 years old, modification/changes do not apply - the PhD programme was designed to ensure that the quality of students enrolled was the best.
Improvement of quality of PhD Students:
The short listing criteria for PhD students is not too stringent to enable students from various backgrounds to apply.

(i) The School conducts a PhD screening test every semester. The multiple choice questions are designed to test the students analytical ability based on a general knowledge of biology, mathematics and engineering science.

(ii) The School's PhD course requirement includes a compulsory Graduate Student Seminar floated for two semesters in which they are inculcated with ideas of ethics, citizenship in science and the value of creativity.

(iii) The School offers a bouquet of PG 700 level courses in the areas of expertise of the faculty; As long as a student fulfills the minimum credit requirement of the Institute, there is no restriction on the number of courses a student wishes to take. In fact, students are encouraged to take as many courses as they wish to build a strong foundation in Biological Engineering.

3.9 Sponsored projects - (i) individually, (ii) with another faculty of the group/section of the department, (iii) with another faculty of the department but from another group/section of the department (iv) with another faculty of another dept/center.

i) Individually - 15
(ii) With another faculty of the group/section of the department -13
(iii) With another faculty of the department but from another group/section of the department – Not applicable (since no groups exist within the School)
(iv) With another faculty of another dept/center -15

3.10 Industry consultancies

(i) A project on the mechanism and performance of anti-scaling technology – for the HIRA group, Raipur. PIs – Prof. T.S. Sreekrishnan (DBEB) and Prof. A. Mittal (KSBS).

(ii) A project entitled "Anti-hepatitis B virus activity of CFT in cell culture model – a pilot study". PI- VivekanandanPerumal.

3.11 New areas of research which are different from the faculty's PhD thesis area

Almost all the faculty are working in areas of research different from their respective PhD areas.

3.12 Methodology for
(i) identifying obsolescence in research areas

Feedback from students during class committee meetings
Anonymous response sheets about various areas of research

(ii) Identification of new areas for future research.

The School will consolidate the on-going research in the area of “Infectious Diseases & Non-Communicable Disorders” over the next 3-5 years. The School will also start research in the broad area of “Neuro/Cognitive Computational Sciences” as mandated by the National Advisory Committee.

3.13 Number of large interdisciplinary projects (within department's areas, and across the Institute).

Total of 6 projects*. Please see the Table below for details:

Name of PI/ CO-I	Number of large interdisciplinary projects
Prof. Aditya Mittal	2 (PI/Co-Is from other departments across the institute)
Dr. Archana Chugh	1
Dr. Bishwajit Kundu	1 (PI is from other department across the institute)
Prof. B. Jayaram	2
Prof. James Gomes	1 (As Co-PI)
Dr. Vivekanandan Perumal	1 (As Co-I) PI/ Co-Is from 3 departments in IITD

* Some of these projects have been included in section 3.9 (iv).

4. Innovation, Design and Development

4.1 No. of students who have been funded for innovating (TePP, PRISM, etc.). NIL

4.2 Technology developed (*give list and brief information*). NIL

4.3 Technology transferred (*give list and brief information*). NIL

4.4 Number of patent granted as a fraction of patents filed. NIL granted/5 filed

4.5 Innovations of products, processes, designs, etc. in the department: One start-up company – Novoinformatics (Under incubation at IITD since 2011); Faculty Mentor – B. Jayaram, Scientific Advisors – Aditya Mittal and C. S. Dey, CEO: Mr. Avinash Mishra (PhD student under joint supervision of B. Jayaram and Aditya Mittal). The company has already garnered several National awards.

4.6 Availability and access to students' workshops, "tinkering laboratories" so that they may pursue their own ideas. NIL

4.7 No. of students/teams who have competed in national / international competitions, and outcome; Association of Biotechnology Lead Enterprises, Biotechnology Enterprises Student Teams ABLE BEST, organized and sponsored by DBT 10-13 August 2012, our School’s team ranked in the top 20 teams who participated in the final round

5. R & D Environment

5.1 No. of post-doctoral scholars hired in the department/centre and their durations, from

(i) Abroad NIL
(ii) On project NIL
(iii) Others, and outcomes One (1 month)

5.2 No. of foreign students enrolled in
(i) Masters NIL
(ii) PhD programmes One

5.3 No. of Indian and foreign faculty/researchers who have spent a sabbatical in the department. NIL

5.4 Sabbatical taken by faculty and where spent
Two
(i) Queens University, Northern Ireland
(ii) Institute of Molecular Science, Japan (2011).
(iii) Kansas Univ Medical School, USA (2012).

5.5 Number of seminars (education and research separately) given by the faculty
(i) In the department - Three (03)
(ii) In other departments - Nineteen (19)
(iii) At other institutions. - One hundred twenty six (126)

5.6 No. of faculty/researchers/scholars invited by the department for
(i) Seminars - Eight (08)
(ii) Spending at least a week in the department - Nil

5.7 No. of faculty/researchers who visited the department on their initiative for giving (i) seminars, (ii) spending at least a week in the department
(i) Seminars - twenty five (25)
(ii) Spending at least a week in the department - NIL

5.8 Adequacy of research infrastructure.
No, There was a delay in the renovation/ reconstruction of labs in the premises of the school, which resulted in inadequacy of lab infrastructure at present. We are likely to get the working labs within six months.

5.9 Adequacy of technical staff – existing numbers and competency areas; competency areas in which there is a shortage.
(i) Technical staff – existing numbers: 1
(ii) Competency areas in which there is a shortage-
Following technical staff are required:
a. Mass spec. Facility
b. Cryo EM
c. FACS and microarray facility
d. Technical staff for maintenance of all other laboratory equipment

5.10 Work space available for (a) Masters students, (b) Ph.D. students, (c) project staff, (d) post doctoral scholars.
(i) Master students: NIL
(ii) Ph.D. student: Twenty Five (25). Currently 50 Ph.D students are enrolled. However, the space available is less than what is desirable resulting in crowding.
(iii) Project staff: Five (5)
(iv) Post doctoral scholars: NIL

5.11 No. of national conference/workshops/seminars attended by PhD students (*total and per student for 5 years*). More than fifty (50) (at least one per student)

5.12 No. of international overseas conference/workshops/seminars attended by PhD students (*total and per student for 5 years*). Fifteen (15) total

5.13 No. of students who have continued to Ph.D. (i) in same dept., (ii) other departments of IITD, (iii) in India, and (iv) abroad (separately for M.Tech. and B.Tech. students).
Not applicable since the School offers only PhD programme.

5.14 No. of projects with co-guide from industry NIL

5.15 No. of students who have spent time in industry as part of thesis/project work (give number and duration). NIL

5.16 Self assessment reports of the department/centers/schools if any. NIL
Advisory Board Meetings of the School are held annually (minutes attached).

5.17 Placement of M.Tech. and PhD graduates in technical careers

Prog. Type	Prog. Name	No. of graduating students	Nature of job for first 2-3 years after graduation	Nature of job5 years after graduation	% of graduates in technical line of work	% of graduates started in technical line and are managers/administrators
PhD	Biological Sciences	01	Post Doctoral Research	-	-	-

5.18 Inter-disciplinary work -: (i) joint thesis guidance by faculty across groups within a department, or across departments/centres, (ii) Proposals submitted and funded – PI-CoPI and their group/department affiliations…(List of Projects attached; Annexure-4).

6. Outreach / External stakeholder engagement

6.1 Educational

(a) Workshops/Short term courses – topical research for disseminating research of IITD.
Four - Three annual conferences of the School + One organized by James Gomes and Anurag Rathore (Dept. of Chemical Engineering).

(b) Workshops/Short term courses – educational methods (teaching, learning resources, pedagogy).
Ten workshops – Organized by SCFBio with faculty resources from the School.

(c) Learning, research material on the website.
Apart from tools available from SCFBio, Two - NeuroDNet + AngDelMut tools

(d) Science & technology for public information – on website. NIL

(e) Courses taught to students of other IITs/NITs/Other institutions. NIL

(f) Courses taught via NKN. NIL

(g) Courses developed for NPTEL. NIL

(h) Books, monographs, study material made available outside IITD. NIL

(i) Experiments developed and made available to other institutions. NIL

(j) Seminars live/via NKN, web to other institutions in India/abroad NIL

(k) Reach out to schools, NCERT, KVs, etc. (e.g. K-12 programmes). Yes; during open house

(l) Mentoring of other institutions, e.g. new IITs, NITs, universities, etc. including faculty mentoring, curriculum development, laboratory development, etc. NIL

6.2 Industry collaboration

(a) No. of students (Ph.D./Masters) directly linked to industry funded projects. NIL

(b) No. of industry staff/engineers who have taken a regular course(s) for entire semester. NIL

(c) Technology transfer to companies, entrepreneurs, local and other governments/government agencies, NGOs (separately). NIL

(d) Continuing education/courses for industry. NIL

(e) Faculty secondment to industry. NIL

(f) Research projects undertaken with industry as partner. NIL

(g) Laboratories, equipment, etc. provided by industry for use in UG / PG teaching laboratories and student projects. NIL

(h) Seminars/workshops held with industry by the department. NIL

6.3 Professional

(a) Service as Board, Senate, selection committee member at other IITs, NITs, and Universities.

(i) Member, Scientific Advisory Council to the Prime Minister of India (SAC-PM), the highest decision and policy making body for Science & Technology for the country (2005-2009, 2009-2014)

(ii) Member, Scientific Advisory Committee to the Union Cabinet, Government of India (2008-2012)

(iii) Chairman, High Powered Committee of “Global Environment Change and Health” of Indian Council of Medical Research (ICMR), Ministry of Health & Family Welfare, India

(iv) Chairman, Academic Committee, PGI, Chandigarh

(v) Member, Institute Body and Governing Council, Postgraduate Institute of Medical Education & Research (PGI), Chandigarh

(vi) Member, Search cum Selection Committee, Director, PGI, Chandigarh

(vii) Member, Selection Committee, Faculty Selections, PGI, Chandigarh

(viii) Member, Selection Committee, Faculty Selections, AIIMS, New Delhi

(ix) Member, Selection Committee, Faculty Selections, Institute of Liver and Biliary Sciences (ILBS), New Delhi

(x) Member, Selection Committee, Selection of Directors of ICMR Institutes, ICMR

(xi) Member, Selection Committee, Promotion of Scientists (F&G) of ICMR Institutes, ICMR

(xii) Chairman, Selection Committee, Selection of Scientist, DST, GoI

(xiii) Chairman, National Bio Science Award Selection Committee, DBT, GoI, New Delhi

(xiv) Member, ICMR Awards Selection Committee, ICMR, GoI, New Delhi

(xv) Member, Executive Council, Aligarh Muslim University, Aligarh

(xvi) Member, Academic Council, IGNOU, New Delhi

(xvii) Chairman, Vice Chancellors Search Committee, Three Universities in Bihar

(xviii) Member, Vice Chancellor Search Committee, Agra University

(xix) Chairman, Vice Chancellor Search Committee, University of Rajasthan, Jaipur

(xx) Member, Vice Chancellor Search Committee, University of Kashmir, Srinagar

(xxi) Member, Board of Management, IIM, Khozikhode

(xxii) Member, High Power Committee to Review ICMR

(xxiii) Member, DRDO High Power Committee for Promotion/Extension of Scientist G/H

(xxiv) Member, University Grants Commission (UGC), India

(xxv) Former Member, National Agriculture Commission, India
(xxvi) Former Member, National Police Mission, Ministry of Home Affairs, Govt. of India
(xxvii) Former Member, Board of Trustees, Indian Institute of Advanced Study, Shimla
(xxviii) Former Member, Advisory Council, National Police Academy, Hyderabad
(xxix) Member Executive Council, Jamia Hamdard, New Delhi (2000-2012)
(xxx) Member, Court, English & Foreign Languages University, Hyderabad (2010 –2012)
(xxxi) Former Member, Advisory Committee, Indian Council for Cultural Relations, Delhi
(xxxii) Former Member, Board of National Police Academy, Ministry of Home Affairs, GoI
(xxxiii) Member, Life Sciences Research Development Board, Department of Biotechnology, GoI
(xxxiv) Former Member, EC, Jawaharlal Nehru University, New Delhi
(xxxv) Former Member, National Assessment and Accreditation Council (NAAC), Bangalore
(xxxvi) Member, SAC, National JALMA Research Institute, ICMR, Agra Member, Talwar Research Foundation
(xxxvii) Member, Zaheer Science Foundation
(xxxviii) Member, Academic Council, Central University of Bihar, Bihar
(xxxix) Member, Search Committee for the selection of Vice-Chancellor, Khwaja Muinuddin Chishti Urdu, Arbi Farsi Vishwavidyalaya, Lucknow
(xl) Member, Senate, IISER, Bhopal

(b) Service as Ph.D. thesis examiner at other institutions.

The faculty of the School have been examiners for theses for various institutions across India and one from Malaysia.

Birla Institute of Technology & Science, Pilani
Jamia Hamdard University, Hamdard Nagar, New Delhi
Maharaja Syajirao University of Baroda
University of Delhi, Delhi
University of Hyderabad, Hyderabad
JNU, New Delhi
University of Malaya, Kuala Lumpur
Indian Institute of Technology Bombay
Indian Institute of Technology Chennai
JNCASR, Bengaluru
Delhi University

(c) Service as technical expert on committees – MHRD, DST, DSIR, DRDO, Pan-IIT initiatives, other ministries, state and local governments.

(i) Member, Expert Committee of Ministry of Food Processing & Technology, Ministry of Agriculture, GoI
(ii) Chairman, DRDO Committee on Biothreat Mitigation and Biological weapons
(iii) Chairman, DST Standing Committee for the Special Package to Bihar for augmentation of S&T Infrastructure, Research, Education and Training in the State, DST, GoI
(iv) Former Chairman, Government of Andhra Pradesh, Biotech Advisory Committee, Hyderabad
(v) Member, Government of Gujarat, Biotech Advisory Council

(vi) Member, Government of Kerala, Biotech Advisory Council
(vii) Member, Government of Goa, Core Committee, Biotech Policy Review
(viii) Member, Government of Jharkhand, Biotech Advisory Council
(ix) Member, Expert Committee to examine and recommend organizations to receive grants-in-aid under Drugs and Pharmaceuticals Research Programme of DST
(x) Member, Advisory Council, Ministry of Chemicals & Fertilizers, for developing Human Resource for Pharma Industry including Medical Device & Clinical Research
(xi) Member, Management Committee of the Southern Regional Centre of Council for Social Development, Hyderabad
(xii) AIU Representative in the Court and Council of the Indian Institute of Science, Bangalore
(xiii) Member, Advisory Committee of UGC-Academic Staff College, University of Kasmir (August 2013 – August 2015)
(xiv) Member, Advisory Board, MGM Institute of Health Sciences, Mumbai (June 2013 – Contng)
(xv) Member, Academic Planning and Development Committee, NIPER, Punjab
(xvi) Member, Empowered Committee, MHRD, New Delhi
(xvii) Member, Review Committee, Tata Institute of Social Sciences, Mumbai
(xviii) Member, NBFSFARA, ICAR
(xix) Member of the National Task Force on Bioinformatics of Department of Biotechnology (DBT) (till 2009 & from 2013-2015)
(xx) Member of Physical Chemistry Programme Advisory Committee of the Department of Science & Technology (DST) (2004 -2007)
(xxi) Member of Organic Chemistry Programme Advisory Committee of the DST (2007-2011)
(xxii) Member of the Working Group on Bioinformatics of Department of Information Technology (2007-2011)
(xxiii) Vice President of Indian Biophysical Society (2006-2008)
(xxiv) Member of FIST Committee of DST for Chemical Sciences (2009-2011)
(xxv) Member of National Committee of IUPAB (2008-2011)
(xxvi) Member of the Bioinformatics Task Force of Indian Council of Medical Research (2012-2014)
(xxvii) Chairman, DBT's committee on promotion and popularization of Biotechnology (2009-2012)
(xxviii) Member of Biophysics, Biochemistry & Molecular Biology Programme Advisory Committee of the DST (2012-2014)

(d) Technical expert on policy, regulatory, laws, standards committees.

(i) Chairman, DBT Task Force on Infectious Disease Biology, DBT (2012- Contng)
(ii) Member, Research Advisory Committee, AIIMS, New Delhi (2012- Contng)
(iii) Chairman, Ethics Committee, Stem Cell research, Apollo Hospital, Delhi
(iv) Member, Society, IISER, Bhopal (2011-2013)
(v) Member, Elsevier's International Academic Executive Advisory Board, Amsterdam, 2012-2014
(vi) Member, Selection Committee to elect new members of the German National Science Academy, Leopoldina
(vii) Member, Scientific Advisory Board, Indian Council of Medical Research (ICMR), Ministry of Health & Family Welfare
(viii) Member, SAC, National Institute of Tuberculosis Research (TRC), Chennai
(ix) Member, Ministry of Human Resource Development, Govt. of India, Working Group on University and Higher Education – XII Five Year Plan
(x) Member, Science Advisory Committee to the J&K Chief Minister
(xi) Member, Higher Education Advisory Committee to the J&K Chief Minister
(xii) Member, Planning Commission Consultative Group on Higher and Technical Education
(xiii) Member, Council of Scientific & Industrial Research XII Plan Committee
(xiv) Former Member, Society, Indian Institute of Science Education & Research, Pune
(xv) Former Member, Society, Indian Institute of Science Education & Research, Kolkata
(xvi) Member, Advisory Committee, Bhopal Memorial Hospital & Research Centre, Bhopal
(xvii) Member, Biotechnology Vision Group for UP, Council of Science & Technology, Uttar Pradesh (August 2013 – Contng)
(xviii) Special Invitee, Vision Group Committee, University of Rajasthan

(e) Member of Board/Advisory Board of public and private sector corporations.

(i) Member, Board of Directors, Indian Immunologicals Ltd., Hyderabad
(ii) Member, Audit Committee, Indian Immunologicals Ltd., Hyderabad
(iii) Chairman, Executive Research Committee, Indian Immunologicals Ltd., Hyderabad
(iv) Member, Board of Directors, Suven Life Sciences, Hyderabad
(v) Member, Board of Directors, IKP Knowledge Park, Hyderabad
(vi) Member, Board of Directors, Dr Reddy's Institute of Life Sciences, Hyderabad
(vii) Member, Current Science Association, Indian Academy of Sciences, Bangalore
(viii) Member, SAC, Yashraj Biotechnology, Mumbai
(ix) Member Hyderabad Eye Research Foundation, Hyderabad (2002-2005, 2005-Contng)
(x) National Immunology Foundation, New Delhi
(xi) Member, Advisory Board, Foundation for Liberal and Management Education (FLAME), Pune
(xii) Former Member, National Book Trust, India, GoI
(xiii) Member, Board of Trustees, India First Foundation, Mumbai, Member,
(xiv) Sectional Committee, Microbiology and Immunology, Indian National Science Academy, INSA
(xv) Member, Research Advisory Committee, SHARE, India, Hyderabad

(xvi) Member, Governing Council, CBMR
(xvii) Member, Editorial Boards of Peer Reviewed journals:
- ✧ GENOME INTEGRITY (BMC JOURNAL)
- ✧ JOURNAL OF BIOINFORMATICS (2003-)
- ✧ JOURNAL OF BIOSCIENCES (1998-2000; 2001-2004, 2010-Contng)
- ✧ CURRENT SCIENCE (2001- 2012)
- ✧ JOURNAL OF FORENSIC MEDICINE & TOXICOLOGY (1995-1998)
- ✧ GUT PATHOGENS (ISOGEM) (2008 –Contng)
- ✧ JOURNAL OF COMPUTER SCIENCE & SYSTEMS BIOLOGY (JCSB) (2009 -)
- ✧ MEDICAL PRINCIPLES AND PRACTICE, (International Advisory Board)
- ✧ TUBERCULOSIS RESEARCH AND TREATMENT
- ✧ INTERNATIONAL JOURNAL OF GENOMICS AND PROTEOMICS

(f) Positions (e.g. Director, Vice Chancellor, etc.) held by faculty on lien.

(i) Vice-Chancellor, University of Hyderabad, Hyderabad (Dec 05-Mar 11)
(ii) Visiting Professor, King Saud University, Riyadh, KSA (2011-2012)
(iii) Honorary Distinguished Research Professor, Institute of Life Sciences, HCU Campus, Hyderabad (April 2007 – Continuing)
(iv) Honorary Professor, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) Bangalore (2005-10)
(v) Visiting Professor, ILBS, New Delhi (2012-Contng)
(vi) Visiting Professor, IISER, Bhopal (2011-2014

6.4 Contribution to national development goals

(a) Projects undertaken and their outcome - SCFBio has been declared as a National Center of Excellence by DBT.
(b) Policy inputs – implications, visible impact on society – Biology has been incorporated as a core part of the UG curriculum, giving it the same importance as Mathematics, Physics and Chemistry.
(c) Entrepreneurship development – One start-up company already came out of the School.

6.5 Alumni engagement

(a) Regular interactions / engagement with alumni and outcomes – Not applicable to the School yet; Existing faculty continue to interact with IIT Delhi alumni (especially who have been ex-students from their own courses). The interactions have resulted in initiation of collaborative projects.
(b) Contributions from alumni – Not applicable to the School yet; Kusuma Trust UK, opened by an IIT Delhi alumnus Anurag Dikshit contributed ~INR 20 Crores to establish the School (MoU in Annexures 2 &3).

6.6 Recognitions and Awards

(a) Awards to faculty

Prof. Aditya Mittal:
Outstanding Young Faculty Fellow, from IIT-Delhi (2008-2013)
Associate, Indian Academy of Sciences (2005-2009)

Dr. AshokKumar Patel:
Ramalingaswami Fellowship, from Department of Biotechnology, Govt of India (2014-2019)

Dr. ArchanaChugh:
Microsoft Outstanding Young Faculty Award, from IIT Kharagpur (2009)
iESF-Grantee for the conference on Marine Biotechnology: Future challenges, held in Italy (2010)
iDBT-CTEP travel grant for participation in the World Conference on Marine Biodiversity, UK (2011)

Dr. Bishwajit Kundu:
Protein Science Young Investigator Travel Grant 2013, Protein Society, USA (2013)

Prof. B. Jayaram (Coordinator, KSBS)
Chemical Research Society of India Medal (2000)

Prof. C. S. Dey:
Shanti Swarup Bhatnagar award, from CSIR, Govt. of India (2003)
National Bioscience Award, from the Department of Biotechnology, Govt. of India (2003)
Organization of Pharmaceutical Producers of India Scientist award in Pharmaceutical Biotechnology (2005)
CDRI Award in Excellence in Drug Research in Life Sciences2008, from Central Drug Research Institute, Lucknow (2008)
J. C. Bose Fellowship, from the Department of Science and Technology, Govt. of India (2008)
MDRF Honorary Lecture Award, from the Madras Diabetes Research Foundation (2011)

Dr. Manidipa Banerjee:
Ramalingaswami Fellowship, from Department of Biotechnology, Govt of India (2010-2015)

Prof. Syed E. Hasnain:
The Wood-Whelan Fellowship Award, from the International Union of Biochemistry and Molecular Biology, USA (1988)
YMSA-88 Young Scientist award for Biological Sciences, from the MAAS and TWAS (1990)
Professor Uma Kant Sinha Memorial award, from the Indian Science Congress Association (1992)
Shanti SwarupBhatnagar Prize in Biological Sciences, from CSIR, Govt of India (1995)
Golden Jubilee Biotechnology Fellowship Award, from the Department of Biotechnology, Govt of India (1997)
Ranbaxy Research Award, from the Ranbaxy Research Foundation (1997)
Platinum Jubilee Lecture Award, from The Indian Science Congress Association (1999)
RustomRanji Oration Award from the Hyderabad Eye Foundation (2001)
G D Birla Award for Scientific Research from the KK Birla Foundation (2001)
Dr K V Rao Scientific Society Endowment Oration Award, from Dr K V Rao Scientific Society (2002)
Shri Om Prakash Bhasin Award, from the Shri Om Prakash Bhasin Foundation for Science and Technology (2004)

Goyal Award, from Kurukshetra University (2004)
Dr. Nitya Anand Endowment Lecture, from INSA (2005)
J.C. Bose Fellowship, from DST, Govt of India (2006)
Padma Shri, from the President of India (2006)
Dr. Yellapragada Subba Row Memorial Award, from INSA (2008)
Humboldt Research Prize, from the Alexander von Humboldt Foundation, Germany (2008)
Robert Koch Fellowship, from Robert Koch Institute, Berlin, Germany (2009)
FICCI Award, from the Prime Minister of India (2010)
Sivananda Eminent Citizen Award, from Sanathan Dharma Charitable Trust, Hyderabad (2010)
Lions International Fellow of Excellence (LIFE) award, from the Lions Club International (2010)

Dr. Vivekanandan Perumal:
Outstanding Young Faculty Fellow, from IIT-Delhi (2011-2013)

(b) Fellows of academies, INAE, etc.

Prof. C. S. Dey:

Fellow of the National Academy, (FNA), Indian National Science Academy (INSA)
Fellow of the National Academy of Sciences (FNASc), India

Prof. Syed E. Hasnain

Fellow of the National Academy, (FNA), Indian National Science Academy (INSA)
Member, Scientific Advisory Council to the Union Cabinet
Member, Prime Minister's Scientific Advisory Council
Fellow, Third World Academy of Sciences (TWAS)
Elected Fellow, German National Academy of Sciences, Leopoldina
Member, university Grant Commission (UGC), MHRD
Elected Fellow of the American Academy of Microbiology

7. Governance

7.1 Governance

(a) Organization structure – their autonomy/ terms of reference: Faculty members operate with complete autonomy in their research programmes. So far the School has also provided complete autonomy in teaching also, however, now faculty will have to collectively contribute towards the mandatory foundation course in Biology for all freshmen. The organizational structure and terms of reference are as per IIT Delhi statutes. Faculty members of the School are actively engaged in several Institute level governance activities also (e.g. Former and Present faculty In-charges of several UG/PG extra- and co-curricular activities, hostel wardenship, staff and institutional development etc.).

(b) Planning documents developed by the department – space, faculty, staff related: From time to time, the School has submitted documentation to the offices of the Deputy Director (Operations, formerly "Administration"), the Planning Unit, and, the

Dean Infrastructure (formerly Chairman Estate & Works) regarding space, faculty and staff requirements of the School.

(c) Records of discussions within the department – internal documents (meeting minutes, position papers, discussion papers, concept papers, etc.) – The School has had fifty five faculty board meetings since its formal existence in late December 2008 along with some special faculty board meetings. Minutes of these meetings, with annexures on position papers, discussion papers, concept papers and various other issues are available – relevant portions have been provided to concerned administrative units at IIT Delhi in a timely manner.

(d) Physical resources – percentage utilization for UG PG core and electives teaching separately, UG and PG student projects, Ph.D. student research, and Projections for future: Since the School is still in the process of creation of laboratories and six faculty members of the School are new to the IIT system, the current teaching loads are quite heterogeneous. While average teaching load is ~ 5 credits per semester, some faculty members have over 10 credits per semester while others have NIL. This scenario is expected to become more homogenous from Semester I 2014-2015 with SBL100 requiring involvement of all faculty members in teaching of courses. The expected teaching load of all faculty members is 6-8 credits per semester, with 3-4 credit hour investment in core UG courses and 3-4 credit hour investment in UG/PG electives. All faculty members are currently guiding 4-6 PhD students.

(e) Financial resources –

(i) funds provided to the department – IIT Delhi has been providing ~INR 30 Lakhs in NPN05 and ~INR 40 Lakhs in PLN03 budget heads in the last two academic years.

(ii) processes of distribution – For PLN03, the School has a priority list of equipment developed by the faculty board and funds are utilized for the same. For NPN05, utilization is done for teaching requirements, AMCs of various equipment, office supplies (including miscellaneous recurring expenditures) and by allocating an amount of Rs. 1.5 Lakh per faculty for their recurring expenditures/PhD guidance.

(iii) funding for focus areas – So far, funding of focus areas has been either generated via extramural grants or through the Kusuma Trust grant., (iv) funding for UG and PG core teaching laboratories, Outcomes of funds utilization. Changes in funding pattern and funds utilization, and effects on departmental strategy.– The real assessment for this would only be possible from Semester I 2014-2015 onwards when the core SBL100, including a laboratory component, will start. Commencement of the MS program will also require additional funds.

(f) Delegation of decision making within department/centre. List the processes and structures for financial and academic management, and the methodology for their review: The Coordinator is assisted by Faculty In-charge Stores. All decision making is done after detailed deliberations in the faculty board. Any decision related to financial and academic management is implemented only after confirmation of the minutes by all members of the faculty board. In case of even a single dissent, a consensus solution is evolved by the faculty board before implementing a decision

7.2 Department management and operations

(a) Organization structure - mandates, flexibility, etc.
(b) Processes for curriculum planning.
(c) Processes and methods for teaching resources management.
(d) Guest faculty, affiliation for teaching core, elective UG & PG courses.
(e) Faculty short-listing criteria.
(f) How collectiveness of the faculty has enhanced academic output and enhanced quality, etc.
(g) Nature, quantum and quality of support from of secretarial staff, stores and inventory management, purchases, ambience, etc.

7.3 Faculty

(a) Faculty profile, and a critique of the same.
(b) Diversity in faculty profile by: (i) gender, (ii)category, (iii) region, (iv) Ph.D. institution, (v) post-doctoral institutions worked in, (v) organizations/industry worked in, (vi) employment prior to joining the department.
(c) Procedure for faculty searches.
(d) Result of faculty searches – area-wise (as in Annexure IV), number of applicants, short-listed and offered a position, their educational qualifications & experience.
(e) Success in recruitment (data for last 5 years), and offers that the persons had from other IITs/IISc/TIFR.
(f) Faculty lost to other institutions post selection.
(g) Faculty time utilization – in class, in meetings, project management, Ph.D. guidance, Masters project guidance, UG project guidance.
(h) Level of harmony amongst department faculty.

Faculty Selections

2014

About 1118+ applications for the post of Assistant Professor have been received. Short-listing is in progress.

2013

Selections under special drive
Number of applications received: 105
Number short-listed: 1
Number selected: 1
Dr. Ashok Kumar Patel, who was selected joined the School on 30-12-2013.

2012

Post(s)	No. of Applicants	No. of Short-listed applicants at Stage I	No. of Short-listed applicants at Stage II	Selected
Professor	**12**	**2**	**2**	**2**
Associate Professor	**74**	**0**	**0**	**Kept pending**
Assistant Professor	**769**	**0**	**0**	**Kept Pending**

Dr. Aditya Mittal & Dr. Tapan K Choudhury were selected as Professors

2012

Prof. Seyed Hasnain, who was selected as Professor with the approval of BoG joined the School on 1-4-2012.

2010

Post(s)	No. of Applicants	No. of Short-listed applicants at Stage I	No. of Short-listed applicants at Stage II
Professor	**11**	**2**	**1**
Associate Professor	**33**	**1**	**1**
Assistant Professor	**283**	**Deferred**	

Dr. James Gomes and Dr. Bishwajit Kundu were selected as Professor & Associate Professor respectively

2009

Post(s)	No. of Applicants	No. Short-listed
Professor	**15**	**3 + 2 (kept pending; internal)**
Associate Professor	**46**	**0 + 2 (kept pending; internal)**
Assistant Professor	**330**	**6 + 7 (kept pending)**

Prof. C.S Dey was selected as Professor; Dr. Archana Chugh, Dr. Manidipa Banerjee & Dr Vivekanand Perumal were selected as Assistant Professors. Dr. Pawan Dhar who was selected as Associate Professor and Dr. Amit Dutt selected as Assistant Professor could not join.

2008

Faculty from across the Institute were invited to consider joining the School full time and their bodata was sought. About 30 applications were received. A special selection committee with the approval of BoG was constituted consisting of Prof. M. Vijayan, Prof. A. Surolia, Prof. Surendra Prasad, Prof. B. N. Jain & Prof. B. Jayaram who looked into the applications of all the candidates and selected (1) Dr. James Gomes, Associate Professor, DBEB, (2) Dr. Aditya Mittal, Associate professor, DBEB, (3) Dr. Tapan Choudhury, Associate Professor, DBEB, (4) Dr. Bishwajit Kundu , Assistant Professor, DBEB, (5) Dr. V. Haridas, Assistant professor, Chemistry, to join the School. These five faculty members joined the School as core faculty in Dec., 2008. Dr. V. Haridas subsequently went back to Chemistry.

2008

Prof. B. Jayaram was appointed as coordinator of the School in March, 2008.

7.4 Students

(a) Criteria for short-listing and selecting students for admission to Master's and Ph.D. programmes of past 5 years.

The shortlisting criteria for PhD students has evolved over the paat five years. The most recent one held in December 2013 is given below:

Short listing Criteria for GEN/OBC (Non-Creamy Layer) category students

Qualifying degree requirements	Qualifications	
	Qualifying score	National level examination requirements
B.E./B.Tech. or equivalent	75% marks or 8.5 CGPA on a 10-point scale	GATE score ≥ 550 * OR

		Valid JRF from CSIR/UGC/DBT/ICMR/ DST or equivalent
M.Sc./MBA/M.A./ MBBS or equivalent	65% marks or 7.0 CGPA on a 10-point scale	GATE score ≥ 550 * OR Valid JRF from CSIR/UGC/DBT/ICMR/DST of equivalent
M.Tech./M.E./ M.D. or equivalent	65% marks or 7.0 CGPA on a 10-point scale	Nil

***** The requirement for GATE score / national examination may be waived for students from centrally funded technical institutions (CFTIs) to enter PhD programmes and to avail assistantships /fellowships provided the student has a CPI of 7.0 or more (at a 10.0 point scale) at the end of their third year as per the circular dated 22-03-2013 (IITD/A&E (PGS)/2013/933).

1. In addition to the above, the applicant must have first division/class throughout their academic career from Class XII onwards

2. Relaxation for SC/ST/PH:
   a. 5% marks or 0.5 CGPA relaxation (at all levels except for CFTIs waiver**)
   b. GATE score relaxed to ≥ 450

3. Part-time and sponsored candidates: Minimum total work experience of two years as on December 1, 2013 after fulfilling the qualifying degree requirements. They must produce NOC/Sponsorship certificate at the time of interview. National level examination requirements will be waived.

****** Relaxation is not applicable for the GATE score / national examination waiver for students from centrally funded technical institutions (CFTIs).

(b) Facilities provided to students and their maintenance/management system.

The students are provided facilities by the office of the Dean of Students through the board of hostel management. The separate recreational area in the Student Activity Centre , which includes gymnasium, Open Air Theatre and indoor badminton court. There are two boards to promote the students extracurricular activities “The Board of Recreation and Creative Activities and “Board of Sports Activities”. Students from represent their hostels and participate in competitive events throughout the year and the winning Hostel is given a trophy. There are tennis courts and Playing fields.

The School encourages the students to take an active part in these events for an all round development of their personality

(c) Mentoring seminars/sessions held for Ph.D. students for prospective faculty careers.

Students enrolling for PhD must compulsorily enroll in the course “Graduate Research Seminar (part 1 and 2) during the first two semesters. Through this course, students are prepared mentally for the challenges in their PhD project and advised about the prospects of pursuing a career in Science. So far, one PhD student has submitted his thesis and is presently working as Postdoc in Karolinska Institute, Sweden.

8. Benchmarking

Mandate given to the founding faculty members of the School were – Popularize Biology amongst the UG student population at IIT Delhi and carry out high impact research. The following points are addressed in view of this mandate:

8.1 Identify departments/centres within IITD as peers: Peers of the School are spread out across various departments and centres within IIT Delhi. All faculty who are conducting research in areas related to biological sciences while teaching UG courses may be considered as peers. For example, faculty members in Dept. of Mechanical Engineering or Applied Mechanics working on strength and motility aspects of cells while teaching UG electives/core courses are the peers of the School. Similarly, specific faculty members in departments/centres such as Biochemical Engineering & Biotechnology, Chemical Engineering, Chemistry, Textile Technology etc. are peers of the School. This also reflects the true multi- and inter-disciplinary nature of setting up of School of Biological Sciences at IIT Delhi.

8.2 Identify departments/centres/schools/divisions from other IITs, IISc, NITs, private universities as peers, and reasons/criteria there for.
Utilizing the criteria of the mandate (please see above), all faculty members working in biological sciences at IITs (e.g. Bombay, Kanpur) and IISERs would be considered as peers of the School. In specific areas (e.g. structural biology) some academic units at IISc Bangalore (with their recent UG curriculum) would also be considered as peers.

8.3 Identify departments/centres from institutions in other countries as peers.
Utilizing the criteria of the mandate (please see above), the School of Biological Sciences would have nearly all top ranked academic institutions (e.g. in top 100 for North American Universities, especially with whom all current faculty members of the School have a past/current affiliation/association) would be considered as international peers. It would not be stretching it too far if the School was to consider the Dept. of Biology/Chemical Biology at Harvard/Stanford etc. as peers. However, assistance in teaching (e.g. solid framework of teaching assistants) and research (e.g. solid framework of postdoctoral scientists) to the faculty are parameters that are very limited within the IIT system in general.

8.4 Define parameters for benchmarking (i) research – Number of papers, impact factor of journals, number of citations, h-indices of faculty, invited lectures delivered (especially within the country but also abroad), (ii) curriculum - separately for UG: introduction to biology as an inter-disciplinary subject to non-biology majors/engineers can be compared to the latest courses offered abroad with similar purposes (e.g. Chemical and Biological Foundations for Engineers at Drexel University and University of Pennsylvania) , and Ph.D. programmes: coursework and research, (iii) teaching-learning processes – student feedbacks, innovative methodology (e.g. currently biology is taught with open book, open notes and open web examinations).

8.5 Perform benchmarking and report the analysis/findings for the last 5 (or 10) years – The School was conceived only 5 years ago, and is still in the process of building infrastructure. Research laboratories are yet to be completed and teaching programme is in its infancy. Thus, this benchmarking can be done after the first 5 years subsequent to completion.

9. Feedback systems and results

9.1 System for feedback from UG students and its results.
The feedback system has been made online and the information can obtained from the office of Dean Academics

9.2 System for feedback from PG, Master's and Ph.D., students, and their outcome.
The feedback system has been made online and the information can obtained from the office of Dean Academics. In addition, the Class Committee of the PhD students of the School meets once a semester with faculty through the DRC. Their concerns are noted and action taken to address them. The PhD students hold annual elections to elect their representative who coordinates all activities such as meetings with faculty, teacher-student interaction events, welcoming new students etc., seminar notifications etc. and acts as the liaison person with the faculty.

9.3 System for feedback from recruiters (i) on-campus, and (b) off-campus - separately for UG and PG graduates; and the results.
UG recruitment does not apply to the School. PhD recruitment is mediated by the supervisor who advises the student and write letters of recommendation to prospective institutes /companies to help the student in defining a career path.

9.4 Mechanism of obtaining industry feedback and the findings.

9.5 Alumni feedback mechanism and its outcome.

9.6 Placement records – Ph.D., M.Tech. and B.Tech..

10. Vision for next 5-10 years

10.1 Goals and benchmarking for future in relation to (i) curricula, (ii) research, (iii) outreach, and (iv) processes for regular internal assessment.

(i) Curricula: The curriculum of the School will be reviewed and upgraded biannually by the faculty so that the courses are in tune with new and emerging knowledge in interdisciplinary areas of biology and engineering sciences. New academic programmes will be introduced by consensus according to the needs of the School. The School will establish an Academic Biology Society to disseminate biological sciences within and outside the Institute, nationally and internationally, bringing in other relevant national and international societies to create a forum to discuss and raise issues on the future of biological sciences, and, publish, create lecture series, honor eminent biologists, organize thematic and time-relevant conferences. This is expected to facilitate the career growth of students and allow provisions to fund travel for conferences and retreats. To recognize the efforts of extraordinary individuals, the School will give outstanding student awards.

(ii) Research: Publish at least 10 research articles per faculty in reputed international journals with an average impact factor higher than 3.5. To recognize the efforts of extraordinary individuals, the School will give outstanding faculty research awards and incentives.

(iii) Outreach: The School will create a professionally designed website to communicate with the scientific community and society. The School will develop videos of lecture and laboratory courses, and of specialized experimental techniques. It will offer its high-end, state-of-the-art instrumentation and facilities (e.g. Cryo-electron microscopy, proteomics, genomics) to the scientific community through a commercial service as approved by the Central Research Facilities Committee of the Institute.

The School will also establish International collaborations with reputed institutes for research in emerging areas of Biological Sciences and facilitate the exchange of faculty and students through joint academic programmes.

(iv) Processes for regular internal assessment: The faculty of the school are regularly evaluated by online surveys by students. The internal assessments are carried out periodically before promotion of the faculty. Advisory Board meetings are held annually and feedback/suggestions taken and implemented.

10.2 Vision of curricula and teaching-learning processes - UG, PG and Ph.D.; innovations proposed.

10.3 Areas identified for improvement in (i) curriculum, (ii) teaching-learning processes.

10.4 New areas for research and Masters programme, and industry participation in these.
Research: Generate one lead molecule in any disease or disorder (Diabetes/Tuberculosis/Viral infections/Malaria/ Neurodegeneration). The laboratory space and research will be categorized into clusters such as:

(a) Microscopy and imaging cluster
(b) Analysis cluster
(c) Flow cytometry and cell sorting cluster
(d) Genomics and proteomics cluster
(e) Sequencing cluster
(f) Computational cluster

10.5 Projections for

(i) Funded projects
Acquire at least Rs. 5 crore extra-mural funding as an academic unit.

(ii) Journal publications.
Publish at least 10 research articles per faculty in reputed international journals with an average impact factor higher than 3.5. in the next 5 years

10.6 Projected graduation numbers - Ph.D., M.Tech. and B.Tech.
Graduate 2 PhD and 15 MS(R) students every year.

10.7 Projected faculty profile, and areas for recruitment of faculty.
Expand the faculty strength to 25 followed by an additional 25 (over 10 years) distributed over the research areas of the School (Diabetes/Tuberculosis/Viral infections/Malaria/ Neurodegeneration)

10.8 Projections for future benchmarking (for comparison after 5 years) – institutions in India and abroad, and parameters for future comparison.

10.9 Infrastructure and governance - limiting factors that affect achievement of benchmarks and methods to overcome these.

Although the infrastructure of IIT Delhi is one of the best in India, it is still far from the international standards achieved by MIT, Harvard, and Cambridge Universities for example.

The limiting factors are the lack of simple infrastructure such as adequate laboratory, office space per faculty, and the provision of water, electricity, air-conditioning and heating, which go a long way to improve productivity.

Governance is below par. Although many points have been raised by well-meaning faculty, the institute administration needs to gear up to bring about administrative reforms that would ensure that purchases (which may be implemented as per GOI) are not controlled by an individual position (such as the Store Keeper), that the accounts delays are removed, that interpretation of rules of renovation/construction/works is not based on individuals.

10.10 Working with other departments/centers and institutions in teaching and research.
Faculty members of the School are involved in collaborative research with various national and international institutions. Many faculty members also contribute regularly to invited lectures in courses being taught at other institutions (e.g. M. Biotech. Course at AIIMS).

10.11 New initiatives that the department/centre will undertake.
To recognize the efforts of extraordinary individuals, the School will give awards and incentives in the following categories:

- ✧ Outstanding faculty research award
- ✧ Outstanding student award
- ✧ Outstanding staff award

10.12 Outreach goals and anticipated limitations in the attainment of these.
Faculty time and effort spent on (i) administration, accounts/audit paperwork, (ii) filling, re-filling of forms pertaining to regular daily requirements etc., (iii) working within or overcoming limitations of infrastructure and utilities (e.g. electricity, water supply), must be reduced. Governance should include an evaluation section on the infrastructure support system such as Building and Works section, utility services including water, electricity and safety and waste disposal services, Maintenance sections both civil and electrical, Accounts section, Stores and Purchases Section, Administration support of department, centres and schools that included store keeper staff/PA etc..

10.13 Mechanisms for effective changes based on feedback received and development and implementation of corrective measures.
The institute should seek professional help in carrying out space audit for reallocating valuable space to growing/productive departments/centres/Schools. Further, the institute should seek professional help to determine standard operation procedures and workflow for various accounting, purchasing, and academic related matters. The professional group must then modify the administrative procedures that should be implemented top down.

10.14 Questions to which the department seeks answers from the Review Committee.

11. Information in public domain

11.1 Minutes of all meetings.

Minutes of all meetings are with the conveners of those meetings and can be made available if such a policy decision is taken by the Senate.

11.2 All reports archived in the central/department/centre libraries.

All reports of sponsored and consultancy projects are with the PI's of those projects and submitted to IRD. This information is in the public domain and often published in part by the funding agency

11.3 Past vision documents, review documents, Standing Review Committee documents.

(Pl. see Annexures 1, 5 to 7)

11.4 Any other documents developed by the department, a group/section of the department/centre.

Documents on the foundation of the School is available with the Senate.

11.5 Feedback documentation and action taken on the same, and its outcome.

Not Applicable. In general, all the information about the School is posted on the website www.iitd.ac.in/~bioschool and updated regularly.

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Annexure-1

19-2-2008

School of Biological Sciences at IIT Delhi

Preamble

"It is reasonable to say we are entering the Age of Biology, paralleling in many ways the Age of Physics in the first half of the 20th century". The National Academies Press, Globalization, Bio-security and the Future of Life Sciences (2006), p-15. The dawn of 21st century has witnessed the announcement of the draft human genome demonstrating how biology, computer science, chemistry, physics, mathematics & engineering etc. can converge to advance human knowledge with potentially significant benefits to society. Biology for centuries has been empirical in nature. Modern Biology has departed from emphasis on species level understanding to appreciating unity and diversity at the genomic level affording new opportunities for the generation of hypothesis driven knowledge. The current revolution in Biological Sciences is driven by Genomic/Proteomic Biology which involves understanding the information encoded in DNA, RNA, and proteins, the molecules of life at the cellular level. The quest is on for developing insights from a genome in a cell to tissue to organ to organism plant or animal. The challenges are not confined to deciphering the temporal and spatial networks at a molecular / cellular level in development but anticipating influences and proposing remedies to internal fluctuations or external perturbations. Subtle electrical/molecular/ environmental changes govern the dynamics of intelligent biologics of genomes. In short, biology poses some of the best challenges to human mind and an institute like IIT known for its strengths is well suited to undertake some of these challenges. To provide a platform to catalyze a campus-wide research and educational activities, to bring together biologists, physicists, chemists, biotechnologists, computational scientists, physicians and engineers in interdisciplinary research initiatives encompassing several emerging areas of Engineering Biomaterials, Development of personalized medicine, Cancer Biology and Cell Biology of Aging, Quantum medicine, Biologics and biofluid analysis, it has been proposed to establish a School of Biological Sciences at IIT Delhi.

Background

The proposal to establish a School of Biological Sciences at IIT Delhi was approved by the Board of Education Research & Planning (23-3-2007), the Executive Committee of the Senate (29-3-2007), the Senate (19-4-2007) and the Board of Governors (28-06-2007). Following the recommendations of the above academic bodies, a high power national advisory committee was constituted with the following composition. Prof. M. Vijayan (IISc, Co-chairperson), Prof. Surendra Prasad (Director, IITD, Co-chairperson), Prof. Vijaya Raghavan (NCBS), Prof. A. Surolia, (NII), Prof. S. K. Brahmachari (DG, CSIR), Prof. Alok Bhattacharya (JNU), Prof. Pradeep Sinha (IITK), Prof. S.C. Lakhotia (BHU), Prof. Vijayalakshmi Ravindranath (NBRC), Prof. A. K. Srivastava (Head, DBEB, IITD), Prof. Sneh Anand (Head, CBME, IITD), Prof. Saroj Mishra (DBEB, IITD), Prof. M. N. Gupta (Chemistry, IITD), Prof. S. N. Maheshwari (CSE, IITD), Prof. B. N. Jain (Deputy Director, Faculty, IITD), Prof. B. Jayaram (Head, Chemistry, IITD, Convenor). Also, an Internal Task Force was set up (6-9-2007) to steer the establishment of the School, comprising the following: Prof. B. N. Jain (Deputy Director, Faculty, Chairman), Prof. A. K. Srivastava (Head, DBEB), Prof. Sneh Anand (Head, CBME), Prof. Saroj Mishra (DBEB), Prof. M. N. Gupta (Chemistry), Prof. S. N. Maheshwari (CSE) and Prof. B. Jayaram (Head, Chemistry, Convenor). The internal Task Force met several times to draft a vision document and draw up a plan of action for setting up the School which is presented below. The document was discussed in the meeting of the Director with all interested faculty of IITD on 19-12-2007 and most of the suggestions are incorporated in the document. The National Advisory Committee set up for the School met on 27-12-2007. While applauding the initiative of IITD to set up the

School of Biological Sciences, the NAC made several useful suggestions which have been integrated into the vision document.

2. EXISTING STRENGTHS

There is a long and established tradition of research in biochemical engineering and biotechnology, biochemistry, biomedical engineering at the Institute. IIT Delhi was the first among the IITs to recognize the importance of the broad area and set up specialized centres/cells/facilities to foster and promote interdisciplinary research in biotechnology, biochemistry, biomedical engineering and bioinformatics.

Over the years research activities that may be considered to come under the umbrella of Biological Sciences have grown vastly in the Institute. A quick survey of the departmental and faculty web sites leads to the realization that the research and development areas of the Department of Biochemical Engineering and Biotechnology, Department of Chemistry, and Centre for Biomedical Engineering, Centre for Atmospheric Sciences, Centre for Rural Development, Computer Science Centre, CPSE, IDDC, CARE and several other departments (AM, EE, CSE, Physics, Mathematics, Textile Technology, Civil Engineering) has been related to biological interface. Some innovative designs and technologies have emerged from interactions. Some of the other fundamental research directions include chemical and molecular biology of proteins/enzymes, computational genomics, *in vivo* and *in silico* protein folding and protein structure prediction, biological nano-systems and nana-biotechnology with applications to drug delivery and drug design, design of biomaterials, biosensors/transducers/biophotonics, quantum medicine, neurobiology, tissue engineering, bioactive/biofunctional textiles and studies in environmental biology and biosustainability. In addition to the above there are research initiatives in instrumentation, bioinformatics, computational biology and systems biology in departments like EE Mathematics and Computer Science and Engineering. It is instructive to note that the above list of research areas is highly overlapping in that for every research area there is more than one ongoing independent research effort in more than one department/centre at IITD. Integration shall bring technology breakthrough in health care and clinical medicine.

3. RESEARCH VISION

The exercise of defining the research vision for the School of Biological Sciences at IIT Delhi can work with the premise that the existing strengths will facilitate in realizing a challenging vision. The research vision needs to have well defined focus, should bring together and build upon the considerable internal strengths and at the same time be in line with vision statements that have international acceptance and have the potential of being extremely relevant and important to Indian conditions. Focus is important not only to ensure that the activity does not get diffuse and fail to generate generous outside support but also in recognition of the fact that the funds and/or resources/infrastructure available will not be unlimited. Also as ramp up time will be small there will be greater chances of achieving international standards in five or six years time.

Based on the expertise in an IIT environment, the scientific challenges involved and the national priorities, the following theme areas are proposed for the School:

(1) Engineered Biomaterials,
(2) Cognitive & Computational Neurosciences, and
(3) Infectious diseases & Non-communicable disorders.

Notwithstanding the advances in immunology and drug design infectious diseases in India have reasserted their importance. Increasing resistance to antibiotics challenges the curability assumption about the nature of infections. New infectious agents continue to emerge and old diseases escape control. Tuberculosis has been declared an emergency by WHO. Parasitic diseases like malaria continue to be a major cause of mortality and avian influenza is a new disease whose impact is global. Traditional approaches focusing on the study of microorganisms are now being supplanted by research aimed at deciphering the interplay between the pathogen and the infected organism. A recent (2005) WHO report indicates that 53% of premature mortality in the most productive age group in India is due to non-communicable diseases such as (i) cardiovascular (25%), (ii) Cancer (9%), Chronic respiratory diseases (9%), Diabetes (2%), other chronic diseases (8%). There is a unique opportunity to set up a world class activity in the areas of infectious diseases and non communicable disorders in collaboration with AIIMS, country's top medical research institution and institutions like NII. Cancer research is a good window to the advances taking place in modern biology. Discovery of oncogenes and tumor suppressor genes, insights into the molecular basis of spread of cancer, possibilities of immunotherapy etc. are a good reflection of the revolutionary advances in genomic analysis, molecular and cellular biology. The institutional strengths and interests in biochemistry, nano-biotechnology based targeted drug delivery (in progress in collaboration with AIIMS), molecular drug design, proteomics, biochemical signaling and metabolic pathway studies are the foundation on which a multidisciplinary research programmes that focus on various aspects of the themes discussed above which also focuses on understanding the molecular and cellular mechanisms that impact the diseases under focus. A related area is biology of cell aging and cell death. Understanding of the machinery and the control of programmed cell death, regulation of cellular lifespan and the acquisition of cellular immortality, and control of DNA repair along with basic issues relating to biological clocks and cell aging are problems answers to which will have far reaching consequences on general issues relating to prediction and prevention of disease and control of life.

Another area that is likely to have profound social impact is engineered biomaterials. Biomaterials are increasingly used in applications such as drug delivery and gene therapy, scaffolds for tissue engineering, replacement of body parts, and biomedical and surgical

devices, low cost diagnostics etc. Advances in understanding of proteins that function as adaptors and modulators of cell-matrix interactions have provided new insights into the process of healing and the possibility of direct control of cells involved in healing has opened up. Tissue engineering now explores the possibilities of combining living cells and materials to replace defective tissues and organ parts. There are good reasons to believe that in the next decade or two problems associated with generating vascular and tubular structures would be understood well enough for revolutionizing the treatment of defects in body parts.

The area of cognitive and computational neurosciences is attractive because the current nature of research themes are interdisciplinary and bring together diverse disciplines like electrical engineering, computer science, physics and mathematics around the core of discipline of neurosciences. Research in this area will build upon the traditional strengths of the Institute and will keep the window open to development and advances that are likely to be far reaching in the decades to come.

It is proposed that in the beginning the above three broad themes be the major focus of activity in the School of Biological Sciences. These are inherently interdisciplinary fields where the existing expertise in the Institute can both collaborate as well as initiate independent initiatives of research. It would be, however, desirable that a concerted effort is made to hire experts already working in these areas. What is more likely is that the new faculty will be trained molecular and cell biologists who are interested to move into working in this exciting and challenging areas. There are good reasons to believe that such a group can be created out of the talent that already exists at the Institute with additional recruitment from among those who are already working in the country and from those who at this stage are interested in returning.

Specific research themes that will be pursued in these areas will ultimately be the responsibility of the researchers involved. On the basis of research strengths that already exist in the Institute it would be reasonable to anticipate that initial impetus in the area of Engineered Biomaterials will focus on, (i) Bioinspired Smart Materials, (ii) Biosensors & Innovative Bioinstrumentation, and (iii) Nanobiotechnology and Targeted Drug Delivery. While, at present, no active focused research is ongoing in the areas of Infectious diseases & Non-communicable disorders at the Institute the existing expertise can be expected to initiate research in these areas on themes that can be explored around investigations at the molecular level involving (iv) Genomics, Proteomics & Metabolomics. In line with the current trends it is expected that the School will also initiate research at understanding of the biological phenomena involved at the systems level, i.e. go beyond enumerating the molecular components of the system but model the system using molecular components and study the dynamics of the system both quantitatively and qualitatively and build models with prediction capability. (v) Systems Biological research has already started in the Institute in a number of departments, and the School will therefore provide the umbrella to initiate collaborative research in this exciting and futuristic area. As stated earlier these are representative themes of research and enable definition of coherent initial thrusts. Research themes will continue to evolve and will ultimately be a function of both the manpower involved and the national priorities. It needs to be stressed that the model of research activity that we would like to promote in the School is collaborative that brings together interdisciplinary expertise and approaches. Collaboration would be not only between experts within the Institute but with researchers in Jawaharlal Nehru University, National Institute of Immunology, Institute of Genomics and Integrative Biology, ICGEB, INMAS, DIPAS, NIPR, NSC NICD and All India Institute of Medical Sciences. It should be noticed that all these institutions are within a few kilometers of IIT Delhi. The School would also promote and encourage collaborations with the Pharma, Chemical, Biotech and Biomedical industries. It should be ensured that for

such collaborations to succeed specific mechanisms to facilitate networking should be put in place.

This collaboration with industry can take many forms such as, consulting, specific research projects funded by the industry for product development, etc. Transfer of know how developed at the School. This transfer could be of developed technology that could be commercialized as well as running specialized human resource development programmes.

It needs to be stressed that beyond the initial infrastructure set up using funds provided by the major stakeholders, the primary model of conducting research will be through funds attracted by faculty from the governmental agencies as well as industry. This will not only keep the research initiatives in line with national priorities and international trends, it will also be in line with the healthy tradition at the Institute that a significant amount of funds needed for continuous modernization of the facilities are being generated through the research activities of the School itself.

It must be emphasized however, that the thrust has to be on excellence and not necessarily on a sharp definition / specification of the vision.

4. LABORATORY INFRASTRUCTURE PROPOSED

It is recognized that apart from the laboratory infrastructure that will be created for the School, faculty of the School would have available to it specialized infrastructure at nearby institutions (JNU, IGIB, NII, ICGEB AIIMS, INMAS, …..) and the faculty with which it is hoped collaborative research efforts would be initiated. Also, there do and would exist centralized instrumentation facilities like NMR/Mass/Supercomputing at the Institute use of which would play a significant role in providing a jump start to research in the School. Nevertheless, there will be a very significant investment needed in creating state of the art laboratory facilities in the School right from the inception of activities. It is this investment that will act as the major incentive for high quality researchers to be attracted to this initiative.

For pursuing research in the theme areas suggested, the school may require the following core facilities:

(1) Cell Culture facility with III level safety
- Cell culture hood, Incubators /shakers etc.
- Liquid nitrogen facilities & cold room & cell maintenance
- Cancer cell lines
- CHO Cell lines

(2) Small animal House with facilities
- (for holding Rabbits, Albino rats, Balb mice etc.)

(3) Microscopy & Imaging facilities
- MRI
- Laser Scanning Confocal Microscope (LSCM)
- Florescence & Electron Microscopes

(4) Immunology Facilities
- Elisa Reader
- Clinical immunology set up

- Tissue Culture facilities

(5) Cell Biology facilities
- HPLC
- Clinical pathology facilities for lipid, protein analysis
- Gamma irradiation facility
- Scintillation reader
- In-vivo Imaging system
- (Ultra Centrifuges, Flow cytometry, Sonicator, Speed Vac, Lyophilizers etc.)

(6) Genomics & Proteomics facilities
- 2 D Gel electrophoresis
- Real time PCR
- DNA sequencer

(7) Bimolecular interactions
- Circular Dichroism
- Dynamic Light Scattering
- Isothermal Calorimeters
- SPR, Raman, FTIR etc.

(8) Clinical microbiology with VIROLOGY facilities etc..

(9) Sequence and structural studies
Single crystal X-ray, NMR (700 MHz and above etc.), Mass spectrometers etc. which could be procured as central facilities

(10) Centralized (which can be located at Computer Service Centre, IITD) Computational resources required for Genome analysis, structure prediction, drug design, systems biology, image processing, data collection, storage and transmission related work.
10 Tera flops of compute capacity
100 terabytes of storage + switches etc..+ high speed network etc..

(11) Biomedical Engineering facilities
- Oscilloscopes, Network analyzers, PCRS, FRET FLIM, Magnetic Resonance Analyzer etc..

Organization of these centralized laboratory resources can be planned in many ways. One possibility is along the lines of analytical division, materials division etc..

5. TEACHING PROGRAMMES

The School will focus initially on academic programmes which generate human resource for research. These programmes will be Ph.D. and M.S.(Research). Keeping the increasing use of quantitative techniques in biological research and its increasing interdisciplinary nature, it is desirable that admission to these programmes is open to engineers and degree holders in physics and chemistry apart from biologists who have studied mathematics at the university level. Academic contents of the programmes will have to be designed keeping this diversity in mind.

Introduction of an integrated Ph.D. program to groom the right students could also be considered at a later date. It is suggested that teaching should commence 3 to 4 years after the School's core faculty is in place.

6. PERSONNEL

It is expected that within two to three years of starting the School, the faculty resources involved in its research and academic programmes will be between 20 to 30. It is expected that 50% of these will be faculty already in the Institute who may transfer to the School full time, half time or be associated with the activities as adjuncts who participate in specific collaborative research initiatives undertaken at the School. The remaining 50% (i.e. about 10 to 15 faculty) would be new appointments. It should be emphasized that the School's initiatives will be dominantly driven by the full time faculty of the School. It is they who will define the directions of research, laboratory development, and the details of the academic programmes. In view of the perceived interdisciplinary nature of the initiative, it is important that the new blood from outside be not only be good scientists in their own right but have established credentials in initiating and driving research and academic efforts that transcend traditional academic boundaries.

To attract the right faculty talent that has perhaps already created a well oiled work environment around them will require incentives that are both monetary and professional. The monetary incentives are viewed as top up salaries, attractive travel support etc.. The professional incentives will be a very high quality work environment as well as colleagues, and availability of highly motivated and talented students.

Human resource would form the core of the school and would decide the success. Leveraging strengths of the existing faculty and IIT students in quantitative skills supplemented by new recruitments is expected to realize excellence in theme areas. Collaborations inside/outside could address focused research problems. School's thrust must be on academic research and new knowledge generation.

7. BUILDING INFRASTRUCTURE

Physical spaces (approximately 20,000 sq. ft., initially the IBM building):

Laboratories (6 x 800 sq ft); Classrooms (2 x 1200 sq ft)
Faculty Offices (20 x 150 sq ft); Student common rooms (500 sq. ft.)
Faculty research areas including student work benches (20-30x400 sq ft.)
Common areas (includes office, library, committee room, etc.)

Related infrastructure:

Biological and chemical work-benches, Furniture
Special-purpose storage and waste-disposal systems, animal house
AC plant, with back-up; DG, 100 KVA UPS power back-up and distribution,
Electronic Voice benches (40 ports) and data network (200 ports)

Infrastructural requirements such as power supply, water, space, instruments and academic freedom are some ingredients for success. Faculty specific and generic instruments and animal house, could be housed in the school.

8. BUDGET

A budgetary outlay of Rs. 100 crores spread over 5 years be earmarked to set up a state of the art school. However, flexibility is suggested in budgeting for equipment and faculty support (the latter estimated at ~ Rs. 10 to 20 lakhs / per faculty.) While most of the faculty support will come through sponsored projects, it is expected that generous seed money is provided for new faculty.

9. TIME LINES & MILESTONES

1st year

(A) Intra-IIT administrative approvals (Senate, Board of Governors etc.)
(B) Recruitment of core faculty & a Coordinator for the School
(C) Recruitment of PhD students and initiation of Ph.D. programme
(D) Recruitment of technical and administrative staff
(E) Infrastructure, Building and Renovation
(F) Procurement of Equipment & Development of Laboratories
(G) Sourcing of funds from IIT, Ministry of Human Resources & Development

2nd year

(A) Initiation of Sponsored Research Programmes
(A) Initiation of MS (research) programme (20 students)
(B) Core Faculty recruitment (target of at least 5 by the end of the year)
(C) Recruitment of Ph.D. students (target of at least 10 during the year)
(D) Procurement of Equipment & Development of Laboratories

3rd year

(A) Sponsored (Govt.) & Consultancy (Industry) Research Programmes
(B) Core Faculty recruitment (target of at least by the end of the year)
(C) Recruitment of Ph.D. students (at least 10 during the year)
(D) Procurement of Equipment & Development of Laboratories
(E) Sourcing of funds from Department of Biotechnology, Department of Science & Technology, Department of Information Technology

4th year and beyond

(A) Sponsored (Govt.) & Consultancy (Industry) Research Programmes
(B) Core Faculty recruitment (full time equivalent strength should be between 25 and 30 by the end of the year)
(C) Ph.D. Programme (at least 15 during the year)
(D) Procurement of Equipment & Development of Laboratories

Annexure-2

MEMORANDUM OF UNDERSTANDING

Between

KUSUMA TRUST UK

And

THE INDIAN INSTITUTE OF TECHNOLOGY DELHI

This MEMORANDUM OF UNDERSTANDING is entered into this 18th day of February 2011 between **KUSUMA TRUST UK** a charitable company with charity registration number 1126983 and registered company number 6753811 hereinafter referred to as the **'DONOR'**

AND

The **INDIAN INSTITUTE OF TECHNOLOGY DELHI**, an Institute of Excellence for Human Resource Training, Research and Development in Science, Engineering and Technology and operated under the laws of India having its registered address at Hauz Khas, New Delhi 110 016, and its postal address at Hauz Khas, New Delhi 110 016 hereinafter referred to as the **'GRANTEE'**

WHEREAS:

(a) The GRANTEE is an Academic Institute with the vision of becoming pioneers in modern biological sciences *inter alia* by nurturing and sustaining a vibrant comprehensive program in research and teaching through the promotion of goal-orientated, innovative, interdisciplinary research with applied engineering scientists to address problems affecting human health and welfare, and training scholars to be the next generation of scientists.

(b) The DONOR is committed to and wishes to offer financial support and donations to a limited number of Charities, and charitable institutions in the United Kingdom and elsewhere that it has identified through its agents and employees in the United Kingdom and elsewhere.

(c) The DONOR has appointed its CEO to *inter alia* develop a system for the purposes of project monitoring, to provide detailed and accurate reports to the DONOR and to advise the DONOR on the implementation of its Objectives.

(d) The DONOR has been established to advance purposes which are charitable under the law of England and Wales ('the Objects'). The GRANTEE appreciates that the directors of the DONOR are under a legal obligation to ensure that the assets of the DONOR are used in the furtherance of the Objects, and not for any other purposes whatsoever, and that the DONOR will have absolute discretion to decide how any grant shall be used.

NOW IT IS HEREBY AGREED as follows:

DEFINITIONS AND INTERPRETATION

In this MOU, the following words shall have the following meanings:

Commitment Period	means the period commencing 1 January 2011 and expiring 1 December 2013;
Grant	means the funds that the DONOR agrees to provide to the GRANTEE under the terms of this MOU;
MOU	means this Memorandum of Understanding and any substitute thereof or supplement thereto and as the same may be amended from time to time;
Project	means all activities of the GRANTEE undertaken directly or indirectly in the pursuit of the implementation of the activities funded by this MOU.

Project Proposal	means the Project Proposal which is included in Annex 1 of this MOU;
PIP	means the Proposal Implementation Plan which is included in Annex I of this MOU;
FCRA	means Foreign Contribution (Regulation Act) 1976.

In this MOU, unless the context otherwise requires:

Any reference to the **DONOR** and **GRANTEE**, where the context so permits, shall mean and include, without limitation, their respective employees, duly authorised servants, office-bearers, successors-in-office, legal representatives, assignees, nominees and person or persons claiming through or under them;

Words importing any gender include every gender;

Words importing the singular number include the plural number and vice versa;

Words importing persons include firms, companies and corporations and vice versa;

References to numbered clauses and annexes are references to the relevant clause in or annex to this Agreement;

Any obligation on any Party not to do or omit to do anything is to include an obligation not to allow that thing to be done or omitted to be done;

Headings contained in this MOU are for reference purposes only and should not be incorporated in this MOU and shall not be deemed to be any indication of the meaning of the clauses to which they relate;

Where the word 'including' is used in this MOU, it shall be understood as meaning 'including without limitation';

References in this MOU to statutes or statutory provisions include those statutes or statutory provisions as amended, extended, re-enacted or replaced from time to time and any orders, regulations, instruments or other subsidiary legislation made thereunder.

1 Project Title

Kusuma School of Biological Sciences (KSBS)

2 Purpose

The main objectives are:

2.1 To assist in setting up of a new "Kusuma School of Biological Sciences" at IIT Delhi.

2.2 To assist in the creation and development of new teaching and research programs at the Under-graduate and Post-graduate levels in biology, with an emphasis on infectious diseases and non-communicable disorders.

The Project will be run in a charitable manner without any profit motive.

3 Information on the proposed Kusuma School of Biological Sciences

3.1 The Kusuma School of Biological Sciences will house state-of-the-art experimental and computational facilities for carrying out teaching and research programs on infectious diseases.

3.2 The facilities will allow development of research towards functional annotation of human/pathogen's genomes.

3.3 The facilities will aim at pioneering specific aspects of biological research such as arriving at drug molecule design against identified drug targets from the annotated genomes and proteomes.

3.4 Theme research areas will include non-communicable disorders.

3.5 The Kusuma School of Biological Sciences will be guided by an advisory board and administered as per the extant norms of IIT Delhi. The Advisory Board will provide broad guidelines for the activities of the School and meet (in person or, through video conferencing) at least once a year. Composition of the Advisory Board will be as follows:

1. Director, IIT Delhi	Chairman
2. CEO of Kusuma Trust (UK)	Member
3. School Coordinator/Head of School	Member, Convener
4. One nominee of Kusuma Trust (UK)	Member
5. Dean (AAIP), IIT Delhi	Member
6. Faculty members of the Kusuma School	Members
7. Two scientists from R&D / Academic Institutions	Members

4 Milestones

4.1 Phase 1: Jan 2011 to Dec 2011

a) Release of grant of GBP 1,400,000 (One Million and Four Hundred Thousand Pounds; see Clause 5) and naming of the space allocated (~ 20,000 sq. ft.) by IIT Delhi to the School as "Kusuma School of Biological Sciences"
b) Setting up of a formal Advisory Board for the Kusuma School of Biological Sciences
c) Processing of equipment purchases
d) Creating the curriculum and seeking administrative approvals at IIT Delhi for initiation of minor area specialization in Biological Sciences for Undergraduate students at IIT Delhi
e) Establishment of laboratories for teaching and research and
f) Initiation of the "Kusuma Outreach" program of training few selected students outside IIT Delhi for a year in biological research at the Kusuma School.

4.2 Phase 2: Jan 2012 to Dec 2013

a) Initiation of Minor area program (if approved at IIT Delhi) to popularize Biology among undergraduate students at IIT Delhi
b) Release of matching grant up to a maximum of GBP 1,400,000 (One Million and Four Hundred Thousand Pounds; see point 5) as and when the GRANTEE approaches with appropriate documentation demonstrating funding commitment from other sources. The matching grant would be utilised for strengthening the facilities and the academic programs, in consultation with the Advisory Board.
c) Establish a defined programme of research.

5 Contribution

5.1 The DONOR hereby agrees to grant up to GBP 2,800,000 (Two Million Eight Hundred Thousand Pounds) to the GRANTEE during the Commitment Period to carry out the activities as detailed in the Project Proposal (Annex 1) and subject to Milestones detailed above in Clause 4 and other terms of this MOU. Funds are to be spent in accordance with the agreed Budget (Annex 2) and cannot be used for any other purposes. The grant will include an initial grant amount of GBP 1,400,000 (One Million and Four Hundred Thousand Pounds) and a subsequent matching grant of GBP 1,400,000 (One Million and Four Hundred Thousand Pounds) subject to the GRANTEE securing a matching grant amount from other sources.

5.2 The DONOR is a foreign entity and, therefore, any contribution made by the DONOR to the GRANTEE will be treated as a foreign contribution as per the FCRA. The GRANTEE has taken appropriate legal advice and has represented to the DONOR that it has the requisite permission and approvals under the FCRA and all other

applicable laws, to receive the contribution from the DONOR in terms of this MOU and the GRANTEE shall keep the DONOR indemnified in respect of any tax liability or penalty due to violation of any laws in receiving the funds, for all times to come.

5.3 The Trust may further associate itself financially with the School as per the needs of School.

5.4 The school will enjoy a special relationship with the DONOR and a continued association beyond financial assistance.

6 Obligations and Distributions

6.1 Bank Account

Distributions related to this MOU in favour of the GRANTEE will be remitted to the State Bank of India Account Number 10773569063 and it is the responsibility of the GRANTEE to inform the DONOR about any modifications in the account number.

6.2 This Bank Account is a separate Bank Account (which is the designated bank account to receive only Foreign Contribution(s) in terms of the Provisions of the FCRA set up in the name of the GRANTEE, which is designated as the account which will only receive all contributions (grants, donations, etc.) from the DONOR and any other foreign source (as defined under the FCRA). The details of the Bank Account must be notified to the DONOR so that grants can be made directly to this account. The GRANTEE agrees that the funds representing grants from the DONOR will be clearly identified at all times. Bank account details of the GRANTEE are as follows:

Bank Name	State Bank of India
Branch	I.I.T. Branch, New Delhi
Branch Code No	SBIN0001077
Address	SBI, IIT, Hauz Khas, New Delhi-110016, India
Account Type	Current Account
Account Name	I.I.T. Delhi Charitable Gift Fund Account
Account No.	10773569063
Swift Code No.	SBININBB547

6.3 Distributions

The DONOR will make three distributions to the GRANTEE's bank account. The first distribution will be made once this MOU is signed and will comprise the initial amount of GBP 1,400,000 (One Million and Four Hundred Thousand Pounds). The second and third installments will be distributed subject to the GRANTEE securing and providing evidence of matching funds from other sources, and subject to achievement of the Milestones in Phase 1.

No.	Installment	Amount in GBP	Date
1	First Installment	1,400,000*	Jan 2011
2	Second Installment	700,000	Jan 2012 (see Annex 2)
3	Third Installment	700,000	Jan 2013 (see Annex 2)
	TOTAL	£2,800,000	

* Annex 2 contains details of the "Capital Equipment" that are required to be procured in

Phase 1. Purchase processes for capital equipment typically take 6-9 months (to procure and commission the equipment) from the day funds are available[#] due to (a) rigorous scrutiny and audit at IIT Delhi, and, (b) time required for import and installation. The faculty team of the Kusuma School will coordinate to complete the procurement and commissioning of the equipment expeditiously. This will enable initiation of the academic programmes of the Kusuma School with contributions from all the faculty members individually and collectively, by Dec. 2011. Copies of "Purchase orders" for the equipment will be included with the appropriate Quarterly Financial Reports.

[#]Availability of funds is the pre-requisite to form a "purchase committee" for initiating the purchase process at IIT Delhi.

7 Remittance Advice and Acknowledgement

The DONOR will send by facsimile or mail a remittance advice with every remittance sent to the GRANTEE. This will provide the details and destination of funds sent and should be signed by GRANTEE and returned within five working days of receipt of funds in the Bank Account to confirm the exact amount and the date it was received. The GRANTEE should immediately inform the DONOR of any delays experienced in receiving funds.

8 Project Administration and Budget Compliance

8.1 Reallocation of Funds

The Grant shall not be used for purposes other than those outlined in the PIP (Annex 1) and the agreed Budget (Annex 2). An amount not exceeding 10 percent can be reallocated between budget lines without prior approval from the DONOR.

8.2 Interest Income

The GRANTEE is encouraged, whenever feasible, to deposit the grant funds in an interest-bearing account and is required to apply the interest earned on the balance of grant funds from time to time to the purposes of the Project. The accrual and use of interest earned on grant funds must be reported in the Annual Financial Report and Annual Programmatic Report defined in Clause 11 of this MOU.

8.3 Use of Grant Funds

Grant funds, income earned on those funds, and any currency conversion gains may not be spent:

a) For any purpose other than that for which the grant is made;
b) To carry on propaganda or otherwise attempt to influence legislation;
c) To influence the outcome of any specific public election or to carry on, directly or indirectly, any voter registration drive;
d) To make a grant to any individual for personal travel, study, or similar purpose;
e) To make a grant to any other organisation;
f) For any purpose other than the purposes set out in this MOU or the annexes to this MOU which are charitable under the laws of England and Wales.

9 Capital Equipment

9.1 Equipment reports must be submitted for all equipment purchased with a value of GBP 1,000 (One Thousand Pounds Sterling) or greater. Equipment reports must list the equipment purchased, confirm the date of purchase or receipt of the equipment, and will need to be provided to the DONOR for a minimum of three years from the date of purchase, even if this time period extends beyond the term of the original grant. This Report should be submitted together with the Annual Financial Report.

9.2 Any equipment procured with the DONOR funds will be the property of the GRANTEE and the GRANTEE will hold the equipment solely for the purposes of the Project but, in the event of any early termination of this MOU, the GRANTEE will then hold the property as trustee or nominee to the order of the DONOR.

10 Financial Report Keeping and Retention

10.1 Financial and accounting policies will conform to the applicable accounting practice for a registered UK charity. The DONOR requires that the GRANTEE keep separate accounting records for the Project.

10.2 The GRANTEE is required to track separately all income and expenditure under this agreement. All accounting records for the utilization of the contribution made by the DONOR, with all breakdown of costs, receipts, supporting bills, vouchers and invoices and any other documentation to support entries, must be maintained separately for this Project and made available to the DONOR for examination for a minimum of four years after completion of the use of the grant funds and the GRANTEE shall ensure that the contribution of the DONOR is duly and appropriately utilised as per the terms and conditions of this MOU.

11 Reporting Protocols

11.1 Timing
The GRANTEE is required to send Audited Financial and Programmatic reports to the DONOR on the following dates of the Commitment Period:

Period	Date Due	Milestones
Jan- Mar 2011	10 Apr 2011	Quarterly Programmatic Report Quarterly Financial Report
Apr – Jun 2011	10 Jul 2011	Quarterly Programmatic Report
Jul – Sep 2011	10 Oct 2011	Quarterly Financial Report
Oct – Dec 2011	10 Jan 2012	Quarterly Programmatic Report Quarterly Financial Report
		Quarterly Programmatic Report Quarterly Financial Report Annual Programmatic Report Annual Financial Report
Jan - Mar 2012	10 Apr 2012	Quarterly Programmatic Report Quarterly Financial Report
Apr – Jun 2012	10 Jul 2012	Quarterly Programmatic Report
Jul – Sep 2012	10 Oct 2012	Quarterly Financial Report
Oct – Dec 2012	10 Jan 2013	Quarterly Programmatic Report Quarterly Financial Report
		Quarterly Programmatic Report Quarterly Financial Report Annual Programmatic Report Annual Financial Report

Jan- Mar 2013	10 Apr 2013	Quarterly Programmatic Report Quarterly Financial Report
Apr – Jun 2013	10 Jul 2013	Quarterly Programmatic Report
Jul – Sep 2013	10 October 2013	Quarterly Financial Report
Oct – Dec 2013	10 January 2014	Quarterly Programmatic Report Quarterly Financial Report
		Quarterly Programmatic Report Quarterly Financial Report Annual Programmatic Report Annual Financial Report

The programmatic reports will provide information on progress against the PIP and the key milestones, including how these milestones are measured (extracted from the PIP (Annex 1)).

11.2 Reporting Format

Programmatic and Financial Reports shall be submitted to the DONOR in the agreed form according to the schedule above. Each report shall include:

a) Completed Annual Financial Reports showing expenditures since the beginning of the financial year and a forecast of expenditures for the next quarter using the Financial Reporting Format in Annex 3.
b) Completed Annual Programmatic Reports following the guidelines and using the Reporting Form in Annex 4.

11.3 Additional Reports

The DONOR reserves the right to request additional reports as needed to monitor the progress of the Project. In the event that all grant funds are not expended by the date of the final report prepared during the Commitment Period, the GRANTEE agrees to provide additional financial and narrative reports until all grant funds are expended.

11.4 Other Reports

The GRANTEE will send a copy of the FC-3 along with its annexure in accordance with the Provisions of the FCRA after filling the same with the appropriate authority every financial year.

12 Rights and Privileges

12.1 Inspection of Documents

The GRANTEE shall always be obligated to abide by and promptly comply with the instructions for the terms of this MOU, as if such instructions or directions or advices have come from the DONOR itself. The GRANTEE agrees that the DONOR may at any time or times and without notice visit the offices and other premises of the GRANTEE for the purpose of inspecting such documents and/or other evidence referred to above or to otherwise satisfy that all grants made have been used for the stipulated purposes.

12.2 Retention of Documents

The GRANTEE reserves the right to retain original copies of any documents that must be kept in its possession as required by governmental regulatory authorities and/or other funding agents. In such cases, electronic copies shall be provided to the DONOR. DONOR acknowledges that details of this Memorandum of Understanding

and any records relating to it may be subject to review and inspection by said regulatory authorities.

12.3 Publications
The GRANTEE shall have the right to publish the trade name; trademark and/or logo of DONOR on any publication describing work performed with funding provided by DONOR and may publicly state the fact that it has received funds from DONOR. The GRANTEE acquires no other right or privilege to use the DONOR's name, trademark or logo.

13 Obligations and Modification

13.1 Permission to Modify
The GRANTEE agrees to expend and utilise the funds granted by the DONOR in accordance with the agreed Budget (Annex 2) and program of activities. Any modifications to the agreed Budget (Annex 2) beyond that described in Clause 8.1 above or to the agreed program of activities must have prior authorization by the DONOR.

13.2 Review
This MOU will be reviewed at mutually agreed and periodic intervals to incorporate any necessary amendments to the PIP (Annex 1) and the Budget (Annex 2).

13.3 Unexpended Funds
Funds distributed by the DONOR under the terms of this MOU (including any income earned thereon) but not expended will revert to the DONOR upon completion of the Commitment Period or termination of the agreement, whichever is earlier, unless these funds are credited to any future agreement, at the direction of the DONOR, during the Commitment Period.

14 Dissemination

The GRANTEE agrees to make key findings, conclusions, results of all the studies, etc, arising from the Project available to the Advisory Board and the DONOR.

15 Grant Announcement and Public Reports

15.1 Access to Documentation
Authorised representatives of the DONOR shall be allowed to visit the GRANTEE's premises from time to time, and should be given, when requested by the DONOR, access to all books, documents, accounts, financial records, minutes of meetings, membership registers and reports of GRANTEE and any other evidence to otherwise satisfy the DONOR that all grants made have been used for the purposes of the Project and no other purposes.

15.2 Annual Audit
The GRANTEE should arrange audit of its entire operations on an annual basis as per its internal regulations and must send a copy of the audited financial statements to the DONOR within six months of completion of the audit. Such a report should contain separate disclosure of total income and expenditure relating to the Project funded by the DONOR.

15.3 Control Audits
From time to time the DONOR may carry out its own reviews of the GRANTEE's accounts and procedures, as part of a continuing process of ensuring that the reputations of the GRANTEE, and the DONOR for financial probity are maintained and that all grants made have been used for the stipulated purposes and no other purposes.

15.4 Other Reports

The Grantee will send a copy of the FC – 3 along with it annexure after filling the same with the appropriate authority every financial year.

16 Disclosure

The GRANTEE shall provide the DONOR with a written disclosure statement that includes a good-faith estimate of any funds that any other person has agreed to provide to or has been providing the GRANTEE under the terms of a Memorandum of Understanding or any other means, whether orally or in writing or a combination of both.

17 Liabilities

The DONOR shall not be responsible for any liability, including any tax liabilities of the GRANTEE, consequential or otherwise. The DONOR will not assume any obligations financial or otherwise, entered into by the GRANTEE with any third party. It is furthermore accepted and agreed that the DONOR shall not be liable to pay any balance or any sum to the GRANTEE if this agreement is terminated in accordance with Clause 18 during the Commitment Period.

18 Termination

18.1 Notice

The DONOR may terminate this agreement by giving the GRANTEE not less than 90 days' notice in writing and the GRANTEE may terminate this agreement by giving the DONOR not less than 90 days' notice in writing.

18.2 Recovery of Funds and Equipment

In the event of termination, the DONOR reserves the right to take such action as may be necessary to recover any unspent funds or unauthorised expenditures and to demand the return of the equipment bought with the DONOR funds.

19 Notice

Communications made under or in relation to this MOU shall be made in writing or by fax or email to such addresses or numbers as shall be agreed between the parties from time to time. A copy of all notices to the DONOR by the GRANTEE shall be mandatorily marked to the DONOR.

20 Resolution of Disputes

20.1 Mutual Settlement

If any dispute between the GRANTEE and the DONOR cannot be settled by an amicable mutual settlement, then it should be submitted to an arbitrator chosen by both parties. If the parties cannot agree on the choice of arbitrator, the dispute should be submitted to the President of the Law Society of England and Wales.

20.2 Jurisdictions

The parties submit to the exclusive jurisdiction of the laws of England and Wales, and the resolution of disputes is governed by the laws of England and Wales.

21 Annexes

The GRANTEE undertakes to utilise the DONOR's financial support in accordance with the following annexed documents, all of which should be considered as integral parts of this agreement:

Annex 1: Proposal and Implementation Plan (PIP) – attached to this MOU
Annex 2: Budget – attached to this MOU
Annex 3: Quarterly Financial Report (QFR) & Annual Financial Report (AFR) – separate
Annex 4: Quarterly Programmatic Report (QPR) & Annual Programmatic Report (QPR) – separate

IN WITNESS WHEREOF the parties hereto have signed this MOU on the day, month and year first above written:

EXECUTED for and on behalf of the DONOR,
KUSUMA TRUST UK

Signature: _____

Name: JOHN RHODES

Title: DIRECTOR

Date: 16 March 2011

EXECUTED for and on behalf of the GRANTEE,
THE INDIAN INSTITUTE OF TECHNOLOGY DELHI

Signature: _____

Name: सुरेन्द्र प्रसाद
SURENDRA PRASAD

Title: निदेशक/Director
भारतीय प्रौद्योगिकी संस्थान, दिल्ली

Date: Indian Institute of Technology
नई दिल्ली/New Delhi-110 016

Annex 1
Proposal & Implementation Plan (PIP)

1. Background
The Kusuma School of Biological Sciences (KSBS) would aim at popularizing biology amongst the youth. This would be achieved by the School being an integral part of IIT Delhi, which is renowned for its commitment to, and excellence in, undergraduate and post-graduate education in science and technology. To do so, state-of-the-art teaching and research infrastructure in biological research would be required to be put in place. Considering the advances in modern biology, and, the need to develop approaches for combating human disease (especially in high population density countries like India), the KSBS would focus on the themes of infectious diseases and non-communicable disorders. This would be done by creating a research facility for handling infectious agents, capable of carrying microscopic/structural work at the whole-cell levels along with genomic and proteomic research at the molecular level. The research facility will also be utilised for developing specialized training programs for nurturing the current generation of students towards becoming pioneering biological scientists of the future.

More specifically, the KSBS will have three objectives:

(i) Building of necessary infrastructure for carrying out genomic, proteomic research with the objective of eventually identifying drug targets for selected pathogens.
(ii) Builiding up of necessary infrastructure for popularizing biology among undergraduate and postgraduate students at IIT Delhi.
(iii) Development of "Kusuma Outreach Fellowships" that would provide state-of-the-art training and exposure in biology, for one year, to a few selected candidates in consultation with Kusuma Trust UK. These fellowships were conceived during a verbal discussion with Dr. Balwant Singh, CEO, Kusuma Trust (UK) during one of his visits. Some details of these proposed fellowships are as follows (subject to modification/finalization by the Advisory Board):

a. Aims/Objectives: Providing exposure and opportunities in state-of-the-art biological research and education to students coming from disadvantaged backgrounds who have completed their Bacherlor's or Master's degrees.
b. Selection Criteria: To be decided by the advisory board. One possibility is to select candidates from programmes supported by the Kusuma Foundation in India and/or abroad or by nomination by Kusuma Trust.
c. Fellowship period: One year.
d. Fellowship assistance: Equivalent to assistance given to first year doctoral students in India (~275 GBP per month).
e. Outputs/Outcomes: Exposure to the academic environment of IIT Delhi will open several professional avenues for these fellows. For example, these students can apply for doctoral studies at IIT Delhi or any other international premier university/institution, or, they can apply for jobs in the private sector by the virtue of being skilled in state-of-the-art biological research.

A specific example to achieve the above objectives is presented below (however it needs to be noted that extensive brain-storming with the Advisory Board would be essential to proceed with the idea presented below):

2. Facility on Infectious Diseases – FinD
In line with the mission of the School, interest of the nation and integration of expertise of the School faculty members, it is proposed to set up a one of a kind, state-of-the-art national "Facility on Infectious Diseases (FinD)" that would specialize in whole scale functional annotation of pathogenic genomes in the School. Most importantly, "FinD" is expected to carve a global niche for the Kusuma School of Biological Sciences at IIT Delhi by pioneering efforts aimed to arrive at drug molecule designs against identified druggable targets from the annotated genomes and proteomes.

Overall, the dream of "FinD" can be summarized as below:

Infectious Agents → Genome → Proteome → Druggable Targets → Drug Molecule Design

The goal would be to annotate whole genomes of pathogens, especially those relevant to the Indian scenario in the first few years (for example, water borne pathogens or secondary infections in Indian hospitals) both computationally and experimentally. This would involve a holistic approach of building a comprehensive mapping of genomic, proteomic and metabolomic systems governing the dynamics with in the infectious agents as well as the dynamic interplay of the infectious agents with their host (specific cells or whole physiology). The final goal would be to identify targets for drug intervention, computational design followed by chemical (organic) synthesis of drugs and testing of the drugs up to the level of at least the specific *in vitro* systems. IIT Delhi does not have an animal facility, therefore collaborative efforts or out-sourcing of animal testing leading to pre-clinical and clinical trials would be undertaken via sponsored research funds generated by using the proof-of-concept *in vitro* (cell culture based) results obtained in the School.

3. Scientific motivation behind FinD

While the excitement of the global scientific advancements in sequencing whole genomes of life forms, including humans, is shared well in India, much remains to be done in terms of scientific contributions from the country.

Several islands of genomic research do exist in India. However, they also rely completely on genomic information on infectious agents derived elsewhere, and, more relevant to non-Indian conditions. More importantly, just the availability of genomic data proves to be quite futile in absence of proper annotation that is expected to provide the real information in terms of translatability of the genomic data that manifests itself in the form of the final infection or disease. Following examples highlight the above more specifically:

(i) While widespread morbidity (and mortality) is caused by *Mycobacterium tuberculosis* in India (which by chance also qualifies as a major source of secondary infection in the Indian medical conditions), there is no team till date that has been able to realize whole scale functional annotation of any infectious strain in a verifiable/verified manner. Efforts are limited to only a very few drug intervention targets that have been formulated more on the basis of reduced biochemical systems rather than on the whole systems level understanding.

(ii) Leprosy has been the thrust of biomedical research in India off and on, however, there is no systems level understanding even today for the prime causative agents *Mycobacterium leprae* and *Mycobacterium lepromatosis*.

(iii) There is a plethora of primary and secondary infections that appear on a seasonal basis in India, origins of which are unknown. These are popularly classified as "viral" diseases. There is no facility present in the country currently that is capable of simply analyzing the serum of the affected patients for a "genomic scan". This is certainly going to be useful in developing a database of potential genomes of these "viral" infectious agents.

(iv) Some prevalent and well acknowledged viral diseases in the Indian sub-continent like Dengue have no or negligible whole-genome scale information on the specific strains that evolve locally or are locally active. From diagnosis to drug therapy, our information is limited to serotypes more prevalent in other parts of the world (e.g. Japan) because of active research initiatives in those regions.

The above are just a few examples that are aimed at highlighting the need to establish FinD. On an even larger scale, while water-borne diseases are highly prevalent in India, there is no systematic data on either the causative organisms or region specific prevalence of these organisms in the country.

It is expected that within 5 years of becoming operational, FinD would develop its own national (and even global) niche in functional annotation of whole scale genomes. The minimum tangible output, other than design and development of drugs, would be in form of a comprehensive repository and a source of complete information on infectious diseases that would be investigated in the facility. Over the years, it is imaginable for FinD to expand to proportions, informationally much larger than the Center for Disease Control (CDC) in Atlanta, Georgia, simply because of the fact that a large portion of the world human population, and prevalence of infections, exist in this part of the world.

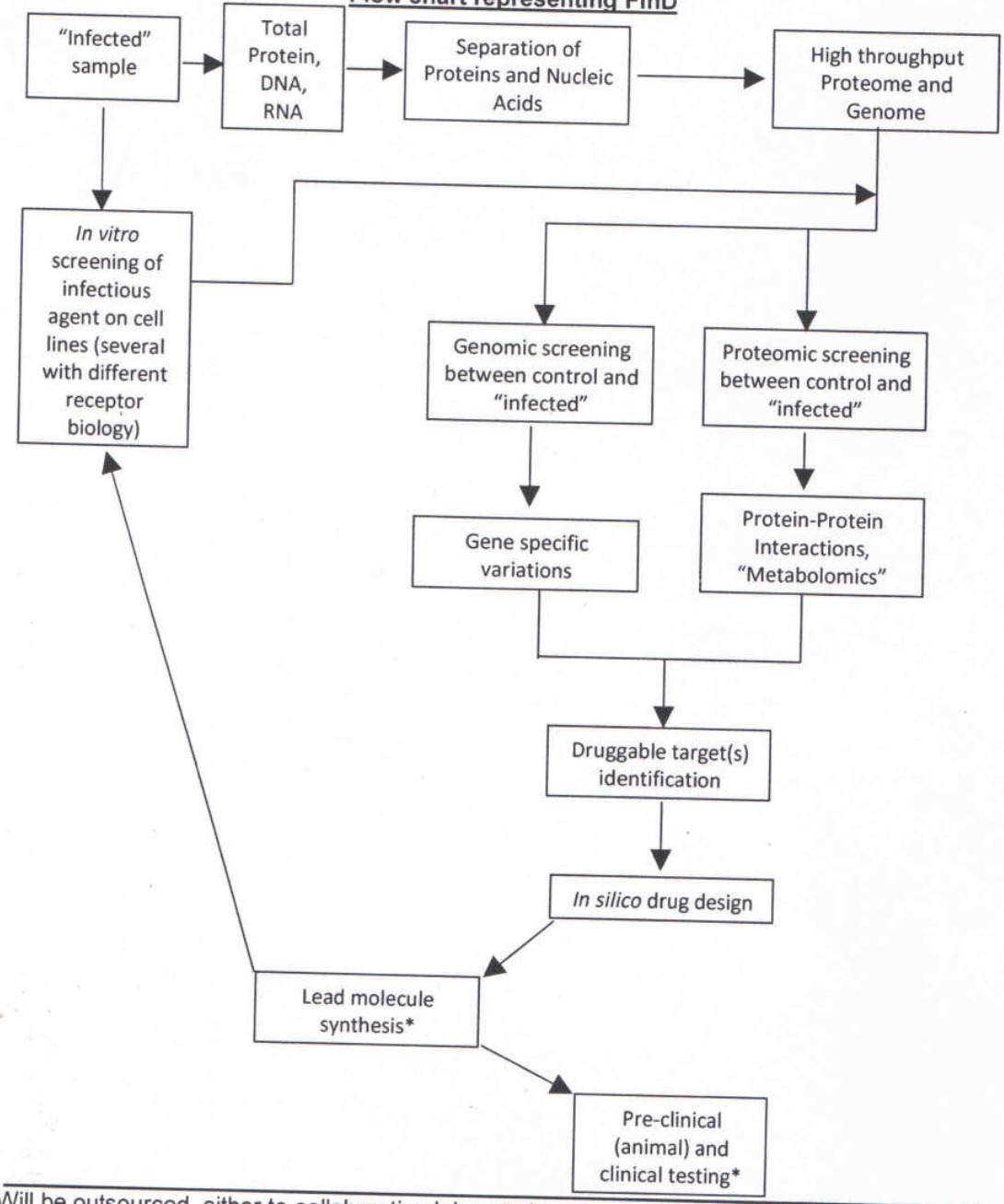
What is needed to set up FinD?

The vision to establish FinD requires as a first step, setting up of a strong multi-disciplinary team that would have technical expertise in genomics, proteomics, metabolomics, systems biology, computational biology, chemical biology, cell biology, and human physiology. A large part of this initial task has already been accomplished by IITD in the form of putting together a team of scientists with strong proven records in one or more of the above areas.

The next step is to work towards the goal of achieving complete functional annotation for at least one infectious agent to begin with (mutually agreed upon by team IIT Delhi and Kusuma trust) within two years of FinD becoming operational. This would allow for identification of targets, design and synthesis of drugs and testing of the drugs to start before the end of the third year. Therefore, within three years of time, the whole "assembly line" of genome to druggable targets/lead molecules for any infectious agent would be in place, with streamlined protocols that can work parallelly rather than serially.

Finally, on a philosophical note, FinD is expected to be an exemplary initiative in the Indian biological research scene, which would form a highway out of a country-side trekking path to curing infectious diseases.

Flow chart representing FinD



*Will be outsourced, either to collaborative laboratories or commercial organizations

Annex 2
Budget*

*Please see separate spreadsheet titled "Budget_Kusuma_SBS"

	Capital Equipment					Recurring Expenditure		
	Facility	Equipment	Tentative Cost (INR)	Tentative Cost (GBP)	Possible Suppliers	Purpose	Tentative Cost (INR)	Tentative Cost (GBP)
Phase 1 (Jan – Dec 2011)	Visualization facility (Cryo-EM and Real time fluorescence microscopy)	Cryo-electron microscope with automated imaging system	50,000,000	700,280	Jeol	*Consumables ((Bio-)Chemicals including peptides, primers, Probes, Disposable components for processing of samples etc.)	7,280,000	101,961
	Genomics and Genetics	Microarray	17,500,000	245,098	Agilent	Contingency Plan (Electrical back-up/data back-up: Includes installation costs, Institute Overheads)	4,000,000	56,022
	Proteomics and Therapeutics	FACS	20,000,000	280,112	Aria, Beckman	Staff (2 technicians: Each technician paid ~ INR 20000 per month)	480,000	6,723
						International Conference (Dec 2011)	700,000	9,804
	Total Capital Equipment Budget (GBP)			**1,225,490**		**Total Recurring Expenditure (GBP)**		**174,510**
	Total Budget of Phase 1 (GBP)							**1,400,000**
Phase 2 (Jan 2012 – Dec 2013)	**Facility**	**Equipment**	**Tentative Cost (INR)**	**Tentative Cost (GBP)**	**Possible Suppliers**	**Purpose**	**Tentative Cost (INR)**	**Tentative Cost (GBP)**
	Visualization facility (Cryo-EM and Real time fluorescence microscopy)	High resolution (spatial) Multi-photon microscope with high resolution (pixel-temporal) digital camera	17,500,000	245,098	Olympus, Zeiss	*Consumables ((Bio-)Chemicals including peptides, primers, Probes, Disposable components for processing of samples etc.)	17,820,000	249,580
		Electrophysiology set-up coupled with high resolution real-time video fluorescence microscope	30,000,000	420,168	Olympus, Zeiss, Nikon	Contingency Plan (Electrical back-up/data back-up: For 2 years, installations done in the Phase 1, Institute Overheads)	2,500,000	35,014
	Genomics and Genetics	Automated DNA sequencer	7,500,000	105,042	Applied Biosystems	Staff (2 technicians: Each technician paid ~ INR 25000 per month)	1,200,000	16,807
		Deep sequencer (high resolution, table top)	15,000,000	210,084	Roche	International Conference (Dec 2012)	1,000,000	14,006
	Proteomics and Therapeutics	LC-MS	30,000,000	420,168	Waters, Agilent	International Conference (Dec 2013)	1,000,000	14,006
		MALDI-TOF/TOF	40,000,000	560,224	Applied Biosystems, Waters	Kusuma Outreach Fellowships(3 Kusuma fellows trained for 12 months each from Jan-Dec 2012, and Jan-Dec 2013, each paid ~ INR 20000 per month)	1,440,000	20,168
		(Post-tissue culture) Plant Growth Chamber for bioprospecting	10,000,000	140,056	Conviron	**Recurring Budget: 50% to be released in Jan 2012, 50% to be released in Jan 2013**		**100,000**
	Total Capital Equipment Budget (GBP)			2,100,840		Total Recurring Expenditure (GBP)		349,580
	Kusuma Contribution (with matching funds from other sources) in GBP			**1,050,420**		**Kusuma Contribution (with matching funds from other sources) in GBP**		**249,580**
	Total Budget of Phase 2 to be released: 50% in Jan 2012, 50% in Jan 2013 (GBP)							**100,000**
	Total Budget of Phase 2 to be released as MATCHING GRANTS ONLY (GBP)							**1,300,000**
	Total Budget of Phase 2 (GBP)							**1,400,000**

Justification for consumable costs

Few examples of facility specific costs of consumables

Facility	Item	Tentative Cost (INR)	Tentative Cost (GBP)
Cryo-electron Microscopy	Buffers, solvents, chemicals, resin	300,000	4,202
	Tubes, tips, filter paper	200,000	2,801
	EM grids, grid boxes, handling tools	400,000	5,602
	Tweezers, dewars, cutting and embedding supplies	1,100,000	15,406
	Colloidal gold, gold labeled antibodies	500,000	7,003
	Stains	100,000	1,401
	Data storage and analysis station	200,000	2,801
	Total	**2,800,000**	**39,216**
Microarray (costs per 100 samples)	Cost of In vitro amplification, Labelling kits, , Hybridization reagents	450,000	6,303
	High-definition arrays	1,500,000	21,008
	Plasticware and chemicals	20,000	280
	Data storage and analysis station	200,000	2,801
	Total	**2,170,000**	**30,392**
Automated DNA Sequencing (costs per 2000 samples)	Ready reaction mixture (ddNTPs, dNTPs, polymerase)	300,000	4,202
	Purification Columns for pre-sequencing DNA clean-up	300,000	4,202
	Purification columns for post-sequencing clean-up	300,000	4,202
	Plasticware (microcentrifuge tubes, 96 well plates, pipette tips)	40,000	560
	Data storage and analysis station	500,000	7,003
	Total	**1,440,000**	**20,168**
Deep Sequencer (costs per 100 samples)	Sample fragmentation, library preparation, amplification, sequencing reagents (usually supplied as a kit by manufacturer)	22,500,000	315,126
	Plasticware and chemicals	20,000	280
	Data storage and analysis station	500,000	7,003
	Total	**23,020,000**	**322,409**

In addition to the specific equipment/facility associated consumables costs on the left, the recurring costs also include day-to-day costs of regular cell biology (e.g. costs of plant tissue culture and mammalian cell culturing in T-flasks, 35 mm dia dishes, 6-96 well plates with proper media e.g. DMEM+Fetal Calf Serum+Antibiotics+Nutritional Supplements), biochemistry (e.g. protein estimations, SDS-PAGE, Western blots) and molecular biology (e.g. plasmid/vector transformations, Agarose gels, Southern blots) laboratory work. **This work will be routinely carried out by the existing nine (09) faculty members of the Kusuma School along with ~25 Ph. D. students (number of these students is expected to increase to ~ 35 by July, 2011).** Further routine expenditures include (but are not limited to) liquid nitrogen, dry ice, buffers, solvents and segregated lab-ware for processing of samples.

Annexure-3

PLANNING UNIT

February 25, 2013

The grant Agreement with Kusuma Trust UK has been signed by both the parties. An original set of Agreement is enclosed herewith for onward transmission to Kusuma Trust UK for their reference and record. A copy of the Agreement is also enclosed for your record.

25/02/2013

(S. Mukherjee)
Professor Incharge, Planning

Coordinator, Kusuma School of Biological Sc.

Dear Andrew,

Kindly find appended the signed, revised MOU.

Best regards.

26/2

Prof. B. Jayaram
Coordinator, KSBS

GRANT AGREEMENT

Between

KUSUMA TRUST UK

And

INDIAN INSTITUTE OF TECHNOLOGY, DELHI

This Grant Agreement REPLACES the Memorandum of Understanding signed between Kusuma Trust UK and the Indian Institute of Technology, Delhi on 16 March 2011 for the establishment of the Kusuma School of Biological Sciences for the period from 1 January 2011 to 31 December 2013

This GRANT AGREEMENT is entered into this 11 day of FEBRUARY 2013 between **KUSUMA TRUST UK**, a charitable company with charity registration number 1126983 and registered company number 6753811, with the registered address of 48-49 St James's Street, London, SW1A 1JT, United Kingdom hereinafter referred to as the '**DONOR**'

AND

The **INDIAN INSTITUTE OF TECHNOLOGY DELHI**, an Institute of Excellence for Human Resource Training, Research and Development in Science, Engineering and Technology and operated under the laws of India having its registered address at Hauz Khas, New Delhi 110 016, and its postal address at Hauz Khas, New Delhi 110 016 hereinafter referred to as the **'GRANTEE'**

WHEREAS:

(a) The DONOR promotes access to education and other life opportunities for children and young people to enable them to realise their potential and break the inter-generational cycle of poverty, and is committed to and wishes to offer financial support and donations to a limited number of charities, and charitable institutions in the United Kingdom and elsewhere that it has identified through its agents and employees in the United Kingdom and elsewhere.

(b) The DONOR has been established to advance all purposes which are charitable under the law of England and Wales. The GRANTEE appreciates that the directors of the DONOR are under a legal obligation to ensure that the assets of the DONOR are used in the furtherance of the Objects, and not for any other purposes whatsoever, and that the DONOR will have absolute discretion to decide how any grant shall be used.

(c) The GRANTEE is an Academic Institute with the vision of becoming pioneers in modern biological sciences *inter alia* by nurturing and sustaining a vibrant comprehensive program in research and teaching through the promotion of goal-orientated, innovative, interdisciplinary research with applied engineering scientists to address problems affecting human health and welfare, and training scholars to be the next generation of scientists.

NOW IT IS HEREBY AGREED as follows:

DEFINITIONS AND INTERPRETATION

In this GRANT AGREEMENT, the following words shall have the following meanings:

Commitment Period	means the period commencing 1 January 2013 and expiring 31 December 2013;
Grant	means the funds that the DONOR agrees to provide to the GRANTEE under the terms of this GA;

Grant Agreement	means this Grant Agreement and any substitute thereof or supplement thereto and as the same may be amended from time to time;
Project	means all activities of the GRANTEE undertaken directly or indirectly in the pursuit of the implementation of the activities funded by this GA;
Proposal	means the Proposal, which is included in Annex 1 of this GA;
Project Implementation Plan	means the Project Implementation Plan, which is included in Annex 2 of this GA;
FCRA	means Foreign Contribution (Regulation Act) 1976.

In this GA, unless the context otherwise requires:

Any reference to GRANTEE and DONOR, where the context so permits, shall mean and include, without limitation, their respective employees, duly authorised servants, office-bearers, successors-in-office, legal representatives, assignees, nominees and person or persons claiming through or under them;

Words importing any gender include every gender;

Words importing the singular number include the plural number and vice versa;

Words importing persons include firms, companies and corporations and vice versa;

References to numbered clauses and annexes are references to the relevant clause in or annex to this Agreement;

Headings contained in this GA are for reference purposes only and should not be incorporated in this GA and shall not be deemed to be any indication of the meaning of the clauses to which they relate;

Where the word 'including' is used in this GA, it shall be understood as meaning 'including without limitation';

References in this GA to statutes or statutory provisions include those statutes or statutory provisions as amended, extended, re-enacted or replaced from time to time and any orders, regulations, instruments or other subsidiary legislation made thereunder.

1 The Project Title

Kusuma School of Biological Sciences

2 Purpose of the Project

The Project's main objectives are:

2.1 To assist in setting up of a new "Kusuma School of Biological Sciences" (KSBS) at the Indian Institute of Technology, Delhi (IITD).

2.2 To assist in the creation and development of new teaching and research programs at the Under-graduate and Post-graduate levels in biology, with an emphasis on infectious diseases and non-communicable disorders.

The Project will be run in a charitable manner without any profit motive.

3 Project Information

3.1. The KSBS will house state-of-the-art experimental and computational facilities for carrying out teaching and research programs on infectious diseases.

3.2. The facilities will allow development of research towards functional annotation of human/pathogen's genomes.

3.3. The facilities will aim at pioneering specific aspects of biological research such as arriving at drug molecule design against identified drug targets from the annotated genomes and proteomes.

3.4. Theme research areas will include non-communicable disorders.

3.5. The KSBS will be guided by an advisory board and administered as per the extant norms of the IITD. The Advisory Board will provide broad guidelines for the activities of the KSBSand meet (in person or, through video conferencing) at least once a year. Composition of the Advisory Board will be as follows:

1. Director, IITD	Chairman
2. CEO of Kusuma Trust UK	Member
3. School Coordinator/Head of School	Member, Convener
4. One nominee of Kusuma Trust UK	Member
5. Dean (AAIP), IITD	Member
6. Faculty members of the KSBS	Members
7. Two scientists from R&D / Academic Institutions	Members

4 Key Milestones of the Project

4.1. Raising a matching grant or grants from other donors to enable the DONOR to make the disbursement under this GA.

4.2. Initiation of Minor area program (if approved by the IITD) to popularise biology among undergraduate students at the IITD.

4.3. Establishment of a defined programme of research.

4.4. Construction of research laboratories

5 Contribution

5.1 The DONOR hereby agrees to grant up to **INR 4,86,01,000 (Four Crores eighty six Thousand Lakhs and One Thousand Rupees Only)** to the GRANTEE during the Commitment Period to carry out the activities as detailed in the Proposal (Annex 1) and subject to the terms of this GA. Funds are to be spent in accordance with the agreed budget (Annex 4) and cannot be used for any other purposes. ***The grant will be made subject to the GRANTEE securing a matching grant of INR 4,86,01,000 from other sources.***

5.2 The DONOR is a foreign entity and, therefore, any contribution made by the DONOR to the GRANTEE will be treated as a foreign contribution as per the FCRA. The GRANTEE has taken appropriate legal advice and has represented to the DONOR that it has the requisite permission and approvals under the FCRA and all other applicable laws, to receive

the contribution from the DONOR in terms of this GA and the GRANTEE shall keep the DONOR indemnified in respect of any tax liability or penalty due to violation of any laws in receiving the funds, for all times to come.

5.3 The DONOR may further associate itself financially with the GRANTEE as per the needs of the GRANTEE.

5.4 The GRANTEE will enjoy a special relationship with the DONOR and a continued association beyond financial assistance.

6 Obligations and Distributions

6.1 Bank Account

Distributions related to this GA in favour of the GRANTEE will be remitted to the **State Bank of India Account Number 10773569063** and it is the responsibility of the GRANTEE to inform the DONOR about any modifications in the account number.

6.2 This Bank Account is a separate Bank Account which is the designated bank account to receive only Foreign Contribution(s) in terms of the Provisions of the FCRA set up in the name of the GRANTEE, which is designated as the account which will only receive all contributions (grants, donations, etc.) from the DONOR and any foreign source (as defined under the FCRA). The details of the Bank Account must be notified to the DONOR so that grants can be made directly to this account. The GRANTEE agrees that the funds representing grants from the DONOR will be clearly identified at all times. Bank account details of the GRANTEE are as follows:

Bank Name	State Bank of India
Branch	I.I.T. Branch, New Delhi
Branch Code No	SBIN0001077
Address	SBI, IIT, Hauz Khas, New Delhi-110016, India
Account Type	Current Account
Account Name	I.I.T. Delhi Charitable Gift Fund Account
Account No.	10773569063
Swift Code No.	SBININBB547

6.3 Distributions[1]

The DONOR will make ONE distribution of INR 4,86,01,000 to the GRANTEE's bank account in February 2013.

The distribution will be made subject to the GRANTEE securing matching grant funds and subject to completion of programmatic activities and submission of quarterly programmatic and financial reports up to 31 December 2012.

[1] Under the Memorandum of Understanding signed between the DONOR and the GRANTEE on 16 March 2011, the DONOR disbursed a total of INR 15,05,34,000 to the GRANTEE. INR 10,05,34,000 was disbursed on 18 March 2011 for the period from 1 January 2011 to 31 December 2011 and INR 50,00,00,000 was disbursed on 20 March 2012 for the period from 1 January 2012 to 31 December 2012.

7 Remittance Advice and Acknowledgement

The GRANTEE will send by email, facsimile or mail a remittance advice with every remittance sent to the GRANTEE. This will provide the details and destination of funds sent and should be signed by GRANTEE and returned within five working days of receipt of funds in the Bank Account to confirm the exact amount and the date it was received. The GRANTEE should immediately inform the DONOR of any delays experienced in receiving funds.

8 Project Administration and Budget Compliance

8.1 Reallocation of Funds

The Grant shall not be used for purposes other than those outlined in the Proposal (Annex 1), PIP (Annex 2) and the agreed Budget (Annex 4). An amount not exceeding 10 percent can be reallocated between budget lines without prior approval from the DONOR.

8.2 Interest Income

The GRANTEE is encouraged, whenever feasible, to deposit the grant funds in an interest-bearing account and is required to apply the interest earned on the balance of grant funds from time to time to the purposes of the Project. The accrual and use of interest earned on grant funds must be reported in the Quarterly Financial Reports and Quarterly Programmatic Reports defined in Clause 11 of this GA.

8.3 Use of Grant Funds

Grant funds, income earned on those funds, and any currency conversion gains may not be spent:

a) For any purpose other than that for which the grant is made;
b) To carry on propaganda or otherwise attempt to influence legislation;
c) To influence the outcome of any specific public election or to carry on, directly or indirectly, any voter registration drive;
d) To make a grant to any individual for personal travel, study, or similar purpose;
e) To make a grant to any other organisation;
f) For any purpose other than the purposes set out in this GA or the annexes to this GA which are charitable under the laws of England and Wales.

8.4 Without prejudice to Clause 18 of this GA, in the event that the DONOR has reason to believe or suspect that the GRANTEE has breached any of the terms of this agreement, the DONOR may withhold or cancel any grants which it may have agreed to make and may by notice to the GRANTEE require the immediate repayment of an amount of money equal to the aggregate amount of any grants which the DONOR has reason to believe or suspects may have been used otherwise than in accordance with the terms of this GA, as identified in such notice.

8.5 The GRANTEE shall operate from an FCRA sub account at the Project location and maintain separate books of accounts for the grants provided by the DONOR.

9 Capital Equipment

9.1 Equipment reports must be submitted for all equipment purchased with a value of INR 30,000 (Thirty Thousand Rupees) or greater. Equipment reports must list the equipment purchased, confirm the date of purchase or receipt of the equipment, and will need to be provided to the DONOR for a minimum of three years from the date of purchase, even if this time period extends beyond the term of the original grant. This Report should be submitted together with the Quarterly Financial Reports.

9.2 Any equipment procured with the DONOR funds will be the property of the Project and, in the event of any early termination of this GA, the DONOR reserves the right to take such action as may be necessary to recover all assets, acquired by the GRANTEE through the support of the DONOR.

10 Financial Report Keeping and Retention

10.1 Financial and accounting policies will conform to the applicable accounting practice for a registered UK charity. The DONOR requires that the GRANTEE keep separate accounting records for the Project.

10.2 The GRANTEE is required to track separately all income and expenditure under this agreement. All accounting records for the utilisation of the contribution made by the DONOR, with all breakdown of costs, receipts, supporting bills, vouchers and invoices and any other documentation to support entries, must be maintained separately for this Project and made available to the DONOR for examination for a minimum of four years after completion of the use of the grant funds, and the GRANTEE shall ensure that the contribution of the DONOR is duly and appropriately utilized as per the terms and conditions of this GA.

11 Reporting Protocols

11.1 Timing

The GRANTEE is required to send Financial and Programmatic reports to the DONOR on the following dates of the Commitment Period:

11.1.1 Monthly Financial and Programmatic Reports for the preceding month to be received by the DONOR by the following dates:

- 5 February 2013
- 5 March 2013
- 5 May 2013
- 5 June 2013
- 5 August 2013
- 5 September 2013
- 5 November 2013
- 5 December 2013

11.1.2 Quarterly Financial and Programmatic Reports for the preceding month to be received by the DONOR by the following dates:

- 5 January 2013
- 5 April 2013
- 5 July 2013
- 5 October 2013
- 5 January 2013

11.1.3 End of Grant Financial and Programmatic Reports to be received by the DONOR by 5 January 2014

11.2 Reporting Format

Programmatic and Financial Reports shall be submitted to the DONOR in the agreed form according to the schedule above. Each report shall include:

a) Completed Quarterly Financial Reports showing expenditures since the beginning of the year and a forecast of expenditures for the next quarter using the Quarterly Financial Reporting Format in Annex 5.
b) Completed Quarterly Programmatic Reports following the guidelines and using the Quarterly Programmatic Reporting Format in Annex 6.
c) Completed Monthly Financial Report following the guidelines and using the Monthly Financial Reporting Format in Annex 7.
d) Completed Financial Review
e) Completed End of Grant Report

11.3 Additional Reports

The DONOR reserves the right to request additional reports as needed to monitor the progress of the Project. In the event that all grant funds are not expended by the date of the final report prepared during the Commitment Period, the GRANTEE agrees to provide additional financial and programmatic reports until all grant funds are expended.

11.4 Other Reports

The GRANTEE will send a copy of the FC-3 along with its annexure in accordance with the Provisions of the FCRA after filling the same with the appropriate authority every financial year.

12 Rights and Privileges

12.1 Inspection of Documents

The GRANTEE shall always be obligated to abide by and promptly comply with the instructions for the terms of this GA, as if such instructions or directions or advices have come from the DONOR itself. The GRANTEE agrees that the DONOR may at any time or times and without notice visit the offices and other premises of the GRANTEE for the purpose of inspecting such documents and/or other evidence referred to above or to otherwise satisfy that all grants made have been used for the stipulated purposes.

12.2 Retention of Documents

The GRANTEE reserves the right to retain original copies of any documents that must be kept in its possession as required by governmental regulatory authorities and/or other funding agents. In such cases, electronic copies shall be provided to the DONOR. The DONOR acknowledges that details of this GA and any records relating to it may be subject to review and inspection by said regulatory authorities.

12.3 Publications

The GRANTEE shall have the right to publish the trade name; trademark and/or logo of the DONOR on any publication describing work performed with funding provided by the DONOR and may publicly state the fact that it has received funds from the DONOR. The GRANTEE acquires no other right or privilege to use the DONOR's name, trademark or logo.

13 Obligations and Modification

13.1 Permission to Modify

The GRANTEE agrees to expend and utilise the funds granted by the DONOR in accordance with the agreed Budget (Annex 4) and the PIP (Annex 2). Any modifications to the agreed Budget (Annex 4) beyond that described in Clause 8.1 above or to the agreed PIP (Annex 2) must have prior written authorisation by the DONOR.

13.2 Review

This GA will be reviewed at mutually agreed and periodic intervals to incorporate any necessary amendments to the PIP (Annex 2) and the Budget (Annex 4).

13.3 Unexpended Funds

Funds distributed by the DONOR under the terms of this GA (including any income earned thereon) but not expended will revert to the DONOR upon completion of the Commitment Period or termination of the agreement, whichever is earlier, unless these funds are credited to any future agreement, at the direction of the DONOR, during the Commitment Period.

14 Dissemination

The GRANTEE agrees to promptly make key findings, conclusions, results of all the studies, etc, arising from the Project available to the DONOR within a week of their availability for publication, and ensure confidentiality of all those accessing project services.

15 Grant Announcement and Public Reports

15.1 Access to Documentation

Authorised representatives of the DONOR shall be allowed to visit the GRANTEE's premises from time to time, and should be given, when requested by the DONOR, access to all books, documents, accounts, financial records, minutes of meetings, membership registers and reports of the GRANTEE and any other evidence to otherwise satisfy the DONOR that all grants made have been used for the purposes of the Project and no other purposes.

15.2 Annual Audit

The GRANTEE should arrange an external audit of its entire operations on an annual basis and must send a copy of the audited financial statements to the DONOR within six months of completion of the audit. Such a report should contain a separate disclosure of total income and expenditure relating to the Project funded by the DONOR.

15.3 Control Audits

From time to time the DONOR may carry out its own reviews of the GRANTEE's accounts and procedures, as part of a continuing process of ensuring that the reputations of the GRANTEE, and the DONOR, for financial probity are maintained and that all grants made have been used for the stipulated purposes and no other purposes.

16 Disclosure

The GRANTEE shall provide the DONOR with a written disclosure statement that includes a good-faith estimate of any funds that any other person has agreed to provide to or has been providing the GRANTEE under the terms of a Memorandum of Understanding or any other means, whether orally or in writing or a combination of both.

17 Liabilities

The DONOR shall not be responsible for any liability, including any tax liabilities of the GRANTEE, consequential or otherwise, nor will the DONOR assume any obligations financial or otherwise, entered into by the GRANTEE with any third party. It is furthermore accepted and agreed that the DONOR shall not be liable to pay any balance or any sum to the GRANTEE if this agreement is terminated in accordance with Clause 18 during the Commitment Period.

18 Termination

18.1 Notice

Either party may terminate this agreement by giving the other not less than 90 days' notice in writing.

18.2 Recovery of Funds

In the event of termination, the DONOR reserves the right to take such action as may be necessary to recover any unspent funds or unauthorised expenditures.

19 Notice

Communications made under or in relation to this GA shall be made in writing or by fax or email to such addresses or numbers as shall be agreed between the Parties from time to time. A copy of all notices to the DONOR by the GRANTEE shall be mandatorily marked to the DONOR.

20 Resolution of Disputes

20.1 Mutual Settlement

Any dispute between the GRANTEE and the DONOR shall first be the subject of an amicable mutual settlement.

20.2 Jurisdictions

The parties submit to the exclusive jurisdiction of the laws of England and Wales.

21 Anti-Bribery and Anti-Corruption Policy Compliance

By signing this GA, the GRANTEE agrees to comply with the DONOR's Anti-Bribery and Anti-Corruption Policy (which is included as an Addendum to this GA) and agrees to inform all its staff and stakeholders of the policy and the DONOR's requirement that all of the GRANTEE's staff and stakeholders adhere to its provisions.

22 Annexes

The GRANTEE undertakes to utilise the DONOR's financial support in accordance with the following annexed documents, all of which should be considered as integral parts of this agreement:

Annex 1: Proposal
Annex 2: Project Implementation Plan (PIP)
Annex 3: Milestones
Annex 4: Budget
Annex 5: Quarterly Financial Reporting Format (QFRF)
Annex 6: Quarterly Programmatic Reporting Format (QPRF)
Annex 7: Monthly Financial Reporting Format (MFRF)

IN WITNESS WHEREOF the parties hereto have signed this GA on the day, month and year first above written:

EXECUTED for and on behalf of the DONOR,
KUSUMA TRUST UK, London, United Kingdom

Signature: _____ Signature: _____

Name: John Rhodes

Title: Chairman, Kusuma Trust UK

Date: 13.2.13

Name: Soma Pujari

Title: Trustee, Kusuma Trust UK

Date: 13.2.13

EXECUTED for and on behalf of the GRANTEE,
INDIAN INSTITUTE OF TECHNOLOGY, DELHI, India

Signature: _____

Name: _____

Title: _____

Date: _____

आर. के. शेवगांवकर
R.K. SHEVGAONKAR
निदेशक/Director
भारतीय प्रौद्योगिकी संस्थान दिल्ली
Indian Institute of Technology Delhi
हौज खास, नई दिल्ली-16/Hauz Khas, New Delhi-16

Grant Agreement Addendum

Kusuma Trust UK
Anti-Bribery and Anti-Corruption Policy

1. Introduction
The corporate conduct of Kusuma Trust UK (The Trust) is based on The Trust's commitment to acting professionally, fairly and with integrity at all times. The Trust does not tolerate any form of bribery or corruption, and will uphold all laws countering bribery and corruption.

2. Purpose
The purpose of this policy is to set out the responsibilities of The Trust and those individuals acting on its behalf in observing and upholding The Trust's position on bribery and corruption.

3. Scope
This policy applies to all trustees, employees, advisers, consultants, suppliers, partners and individuals acting on behalf of the Trust, irrespective of their location.

4. Definition
In accordance with the Bribery Act 2010, bribery is defined as the giving, taking or asking of a reward in return for acting in an improper manner, dishonestly and/or in breach of the law.

5. Statement
5.1 The Trust will not engage in bribery or any form of unethical inducement or payment including facilitation payments and 'kickbacks.' All trustees, employees, advisers, consultants, suppliers, partners and individuals acting on behalf of the Trust are required to avoid any activities that might lead to, or suggest, a conflict of interest with the business of The Trust.

5.2 The Trust expects its suppliers and partners to act with integrity and without thought or actions involving bribery and/or corruption and will, where appropriate, include clauses to this effect in relevant contracts.

6. Prohibited Activities
6.1 It is prohibited, directly or indirectly, for any employee or individual acting on behalf of The Trust to offer, give, request or accept any bribe (i.e. gift, loan, payment, reward or advantage, either in cash or any other form of inducement), to or from any person or company in order to gain commercial, contractual or regulatory advantage for The Trust, or in order to gain any personal advantage for an individual or anyone connected with the individual in a way that is unethical.

6.2 It is also prohibited to act in the above manner in order to influence an individual in their capacity as a foreign public official. Any employee or individual acting on behalf of The Trust should not make a payment to a third party on behalf of a foreign public official.

6.3 This policy requires employees and individuals acting on behalf of The Trust:

a) Not to offer, promise or make any bribe or unauthorised payment or inducement of any kind to anyone;
b) Not to solicit business by offering, promising or making any bribe or unofficial payment to suppliers;
c) Not to request or accept any kind of bribe or unusual payment or inducement that would not be authorised by The Trust in the ordinary course of business;
d) To refuse any bribe or unusual payment and to do so in a manner that is not open to misunderstanding or giving rise to false expectation; and to report any such offers;

e) Not to make facilitation payments. These are payments used by businesses or individuals to secure or expedite the performance of a routine or necessary action to which the payer of the facilitation payment has a legal or other entitlement. The Trust will not tolerate or condone such payments being made;
f) To report any breaches of this policy's principles or standards or of any associated legislation to the Chief Executive or Chair of Trustees.

7. Criminal Offence

7.1 It is a criminal offence to:
a) offer a bribe;
b) accept a bribe;
c) bribe a foreign official;
d) fail to prevent a bribe (only applies to commercial organisations)

7.2 All trustees, staff, advisers, consultants, suppliers, partners and any individuals acting on behalf of The Trust should be made aware that if they are found guilty by a court of committing bribery, an individual could face up to 10 years in prison and/or an unlimited fine. The Trust could also face prosecution and be liable to pay a fine.

8. Gifts and Hospitality

8.1 The Trust realises that the giving and receiving of gifts and hospitality where nothing is expected in return helps form positive relationships with third parties where it is proportionate and properly recorded. This does not constitute bribery and consequently such actions are not considered a breach of this policy.

8.2 **Gifts** include money; goods (flowers, vouchers, food, drink, event tickets when not used in a hosted business context); services or loans given or received as a mark of friendship or appreciation.

8.3 **Hospitality** includes entertaining; meals or event tickets (when used in a hosted business context) given or received to initiate or develop relations. Hospitality will become a gift if the host is not present.

8.4 Gifts over the value of £100 in the UK and gifts over the value of £50 in India should be logged on a **Register**, which should be reviewed by the Board and CEO respectively.

9. Raising a Concern

9.1 If an employee or an individual acting on behalf of The Trust is offered a bribe, or a bribe is solicited from them, they should not agree to it unless their immediate safety is in jeopardy. Should this be the case, the employee or individual should contact the Chief Executive or Chair of Trustees as soon as they are able to do so. The employee or individual may be required to give a written account of the events to assist with any investigation.

9.2 Employees or individuals acting on behalf of The Trust are encouraged to raise concerns about any instance of bribery or corruption at the earliest possible stage via The Trust's Whistleblowing Policy. The employee or individual raising a concern can do so in confidence and without fear of reprisals. All reports raised are taken seriously and, where appropriate, investigated. No employee or individual will be discriminated against in any way as a result of reporting a concern in good faith.

9.3 If any instance of bribery or corruption is identified, The Trust will take remedial steps immediately.

Sponsored & Consultancy Research Projects & Grants

Operated by the Faculty of Kusuma School of Biological Sciences, IITD (Since 2008)

S. No	IIT Delhi sanction No.	Start Date	Funding Source	Amount (Lakhs) INR	Faculty
1.	FT/05 /1708/2013/2369*	12/11/13	Jammi Pharmaceuticals, Chennai	1.94	V.Perumal- PI
2.	IITD/IRD/RP02823/8761	24/10/13	DBT, GoI	83.19	V.Perumal- Co-PI
3.	-------	*21/10/13*	*ICMR, GOI*	*49.70*	*Bishwajit Kundu* *B. Jayaram*
4.	IITD/IRD/RP02820/8532	09/10/13	DBT, GoI	19.55	Bishwajit Kundu -PI
5.	FT/05/1698/2013/2058*	16/09/13	M/s. Hira Group, Raipur	4.50	Aditya Mittal- Co-PI
6.	IITD/IRD/RP02783/6523	05/08/13	DBT, GoI	23.30	Archana Chugh
7.	IITD/IRD/RP02767/5460	14/08/13	DST, GoI	28.99	Tapan K. Chaudhuri -PI
8.	IITD/IRD/RP02777/6156	02/08/13	CSIR	08.14	Tapan K. Chaudhuri -PI
9.	IITD/IRD/RP02773/5781	11/07/13	SERB, DST, GoI	55.00	Chinmoy S.Dey -PI
10.	IITD/IRD/RP02766/5448	28/06/13	DBT, GoI	45.00	Manidipa Banerjee -PI Archana Chugh -Co- PI
11.	IITD/IRD/RP02709/1061	28/01/13	DBT, GoI	36.88	Chinmoy S.Dey -PI
12.	IITD/IRD/RP02690/0420	12/12/12	DBT, GoI	59.06	Archana Chugh -PI
13.	FT/ 05/206/2012/2054*	01/11/12	FITT, IIT D	08.04	B. Jayaram- PI
14.	IITD/DW/24(E)/EE(E)2012/1687	30/04/12	BOG, IITD	619.83	KSBS Faculty
15.	IITD/IRD/RP02519/8752	11/10/11	DST, GoI	40.33	Aditya Mittal- Co-PI
16.	IITD/IRD/RP02517/8524	07/10/11	DBT, GoI	13.34	Tapan K. Chaudhuri -PI James Gomes -Co-PI
17.	IITD/IRD/RP02487/5482	30/06/11	ICAR	44.70	Archana Chugh- Co-PI
18.	IITD/IRD/ MI00809/231	01/04/11	IRD, IITD	99.94	James Gomes - Co-PI Biswajit Kundu - Co-PI
19.	IITD/IRD/MI00806/237	01/04/11	IRD, IITD	100.00	James Gomes- Co-PI
20.	IITD/IRD/RP02460/2671	25/03/11	DBT, GoI	28.73	V. Perumal -PI Manidipa Banerjee -Co-PI
21.	IITD/IRD/ /RP02457/2435	21/03/11	DBT, GoI	27.04	Manidipa Banerjee -PI V. Perumal -Co-PI
22.	IITD/IRD/RP02604/4130	01/04/11	DST, GoI	121.00	Seyed E.Hasnain -PI
23.	IITD/IRD/MI00881/4405	01/01/11	Kusuma Trust, UK	1991.35	KSBS Faculty
24.	IITD/IRD/ RP02427/9500	02/12/10	DST, GoI	32.90	James Gomes -PI

25.	IITD/IRD/ MI00797/9093	26/04/10	DBT, GoI	70.00	Manidipa Banerjee -PI
26.	IITD/IRD/RP02390/7016	01/04/10	DST, GoI	130.10	Chinmoy S.Dey -PI
27.	IITD/IRD/RP02294/9353	11/12/09	DST, GoI	28.05	Bishwajit Kundu -PI
28.	IITD/IRD/RP02146/3839	19/09/08	DBT, GoI	309.24	B. Jayaram -PI James Gomes -Co-PI
Total Funding (up to 20 /11/ 2013)				**4079.84**	

DBT-Department of Biotechnology, Ministry of Science and Technology, Government of India.

DST -Department of Science and Technology, Government of India

FITT- Foundation for Innovation and Technology Transfer, Indian Institute of Technology, Delhi

CSIR- Council of Scientific and Industrial Research

IRD- Industrial Research and Development Unit, Indian Institute of Technology Delhi.

BOG- Board of Governors

ICAR-Indian Council of Agricultural Research, Government of India.

IITD- Indian Institute of Technology, Delhi

SERB- Science and Engineering Research Board

* - Consultancy Project

Minutes of the First Advisory Board Meeting of the
Kusuma School of Biological Sciences, IIT Delhi

Dated: December 17th, 2011

The first advisory board meeting of the Kusuma School of Biological Sciences (KSBS), IIT Delhi was held on 2nd December, 2011 at 10:00 hrs in the committee room of the School.

Following were present:

1.	Prof. R. K. Shevgaonkar	Chairperson, Director IIT Delhi
2.	Prof. B. Jayaram	Convener, Advisory Board & Coordinator, KSBS
3.	Prof. Ashok Gupta	Dean Alumni Affairs & International Planning, IIT Delhi
4.	Dr. Balwant Singh	CEO, Kusuma Trust UK
5.	Dr. Abhijit Ray*	Member
6.	Prof. Aditya Mittal	Member
7.	Prof. Archana Chugh	Member
8.	Prof. James Gomes	Member
9.	Prof. Manidipa Banerjee	Member
10.	Prof. Seyed E. Hasnain	Member
11.	Prof. Tapan Chaudhuri	Member
12.	Prof. Vivekanandan Perumal	Member

(*Representing Dr. Pradip Bhatnagar, President, Daiichi-Sankyo Life Science Research Centre in India). Prof. C.S. Dey & Prof. B. Kundu, Faculty of the School could not attend the meeting due to prior commitments.

The Chairperson welcomed all the members to the first advisory board meeting of the Kusuma School of Biological Sciences. The progress report of the School (Annexure-1), since its conception, and highlighting its activities, particularly in the last year, was tabled to all the members by the Coordinator. Subsequently, the Coordinator made a brief presentation about the ongoing academic activities of the School and future plans.

Detailed deliberations were held, led by Prof. Shevgaonkar and Dr. Balwant Singh, expressing overall satisfaction over the progress in School activities. Based on the deliberations, the following items were specifically highlighted by the advisory board:

Item No. 1: Utilization of the funds released by Kusuma Trust UK. The advisory board appreciated the efforts towards timely utilization of funds released by the Kusuma Trust UK by the School faculty. Purchase of capital equipment (towards instrumentation for (a) genomic analyses – Microarray facility, (b) cellular analyses -fluorescence activated cell sorting/flow cytometry facility, and, (c) macromolecular structural analyses – cryoelectron microscopy facilty) was at various stages of administrative processing. While expressing their understanding for following the administrative procedures for procurement of the capital equipment, the advisory board members encouraged speeding up of the process to every extent possible.

Item No. 2: Release of next installment of funds by Kusuma Trust UK. The advisory board appreciated the efforts of the School faculty in being able to generate funding through various

grants totaling to over Rs. 5 crores (~GBP 700,000) (Details in Annexure-1). Dr. Balwant Singh suggested that it would be advisable to request the release of matching funds of Rs. 5 crores (~GBP 700,000) by January 2012 so that Kusuma Trust UK could transfer the funds within the current financial year.

Item No. 3: Creation of laboratories. The advisory board strongly recommended a faster approach towards creation of laboratories in the School. Prof. Shevgaonkar assured all support from IIT Delhi towards creation of functional laboratories by June, 2012.

Item No. 4: Teaching & Research. The advisory board took note of the impressive publication record of the School in a short span. The advisory board also appreciated the floating of minor area programme in Biological Sciences to popularize Biology among engineering undergraduate students at IIT Delhi. The advisory board also noted with satisfaction the strong strength of Ph. D. students in the School.

Item No. 5: Involvement of Ph. D. students of the School in Kusuma Trust projects. While complimenting the vibrancy of the Ph. D. program of the School after interacting with the Ph. D. students, Dr. Balwant Singh suggested that the Ph. D. students could participate in some of the educational outreach programs of the Kusuma Trust UK in India. To initiate this activity, all the members enthusiastically agreed on the suggestion to compile some experiences of the Ph. D. students about how the academic environment of the School had impacted their lives. Noting a variety of backgrounds of the Ph. D. students, members of the advisory board agreed that such a compilation could prove to be useful in the educational outreach programs of Kusuma Trust UK in India by encouraging other students in India with different backgrounds to explore options in higher education, especially those with limited exposure.

Item No. 6: Summer School in Biological Sciences. The advisory board suggested that the Kusuma School of Biological Sciences can initiate an annual summer school program in biological sciences to expose selected students from across India, especially from areas where Kusuma Trust UK is active, to the joys of working in biological sciences. All members agreed with the idea. It was decided to develop an independent proposal for initiating and sustaining such a program since the current MOU with Kusuma Trust UK does not have any funding provisions for the same.

Item No. 7: Faculty exchange program between Kusuma School of Biological Sciences at IIT Delhi and UK universities. The advisory board suggested that the Kusuma School of Biological Sciences could initiate a faculty exchange program between Indian and British faculty members to encourage collaborative research. All members of the board agreed with the suggestion. However, it was observed that a working partnership model would need to be created to initiate and sustain this kind of a program. Members of the advisory board agreed to develop a proposal for the same, after Kusuma Trust UK would identify universities and/or faculty in UK who could be approached to partner the same.

Item No. 8: Other matters

The advisory board decided to finalize soon the composition of the advisory board by including at least one scientific expert from the UK. The Board appreciated the efforts of the School

faculty in putting together a major proposal to the Department of Biotechnology for funding. It was also appreciated that the Board of Kusuma Trust UK would be visiting the School in July, 2012.

The meeting ended with a vote of thanks to the chair and all the members of the board.

Prof. B. Jayaram
(Convener)

Annexure-1

Kusuma School of Biological Sciences, IIT Delhi

Vision: To become the pioneers of modern interdisciplinary biological sciences by integrating emerging disciplines with biological sciences, and to nurture and sustain a vibrant comprehensive programme in research and teaching.

Mission: Promoting goal-oriented innovative interdisciplinary research by interfacing modern biology with applied engineering sciences to address problems affecting human health and welfare, and training scholars to be the next generation scientists.

Background and History: Modern Biology has departed from emphasis on individual or species level understanding to appreciating unity and diversity at the genomic level. Work in modern biology is neither restricted to individual investigators nor to people trained in traditional disciplines considered under biological sciences. Rather, it has evolved into an inter- and multi-disciplinary quantitative science aimed at molecular, structural and systems level understanding of natural phenomena that form the wonder considered as “life”. After serious deliberations, lasting over two years, it was decided that IIT Delhi was capable of providing the right integrative atmosphere and expertise to contribute significantly in taking the country forward in the area of modern biology.

The proposal to establish a School of Biological Sciences at IIT Delhi was approved by the Board of Education Research & Planning (BERP) on 23-3-2007, the Executive Committee of the Senate (29-3-2007), the Senate (19-4-2007) and the Board of Governors (28-06-2007). An Internal Task Force was set up (6-9-2007) chaired by Prof. B. N. Jain (the then Deputy Director, Faculty) to steer the establishment of the School. Following the recommendations of the above academic bodies, a high power national advisory committee (NAC), co-chaired by Prof. Surendra Prasad, Director IIT Delhi and Prof. M. Vijayan, President, Indian National Science Academy (INSA), was constituted. In pursuance of the recommendations of the Task Force, Senate, BOG and the NAC, the School was set up. An invitation was sent to all the faculty to express their willingness to join the school. A duly constituted assessment committee, based on the expressions of interest of the faculty, selected four faculty members from within IIT Delhi for transfer to the School, and appointed Prof. B. Jayaram as the Coordinator for the School. These faculty members have since joined (27/12/08) the School and initiated academic activities. A physical space of ~ 20,000 sq. ft., centrally air-conditioned, on the campus in what was known as IBM building earlier was allocated to the School. Subsequently, five new faculty members with impeccable research credentials from top academic institutions in the world have joined the School. The School with the approval of the Senate, initiated a vibrant Ph.D. programme in Biological Sciences and most recently a minor area programme in Biological Sciences for undergraduates. The Institute, with the approval of BOG, provided the necessary seed money to build basic infrastructure and to create state of the art biosafety laboratories in the School.

The National Advisory Committee suggested the following theme areas that could be pursued in the School of Biological Sciences: (a) Infectious diseases and Non-communicable disorders, (b) Cognitive and computational neurosciences, and (c) Engineering Biomaterials.

The Kusuma Trust, UK, signed an MOU with IITD (March, 2011) under which the trust agreed to donate a sum of Rs. 10 crores as an initial grant and another Rs. 10 crores as a matching grant to steer the School towards realization of its vision. The School was since renamed as Kusuma School of Biological Sciences. An advisory board was constituted under the MOU to guide the School in its mission. The advisory board comprises (1) Director, IIT Delhi (Chairman), (2) CEO, Kusuma Trust, UK (Member), (3) One nominee of KTUK (Member), (4) Dean (AAIP), IIT Delhi (Member), (5) Two Scientists from Industry/Academia (Members), (6) Faculty Members of the School (Members) and (7) School Coordinator (Member, Convener).

I. Faculty

The School currently has nine full-time faculty members and a coordinator.

1. Aditya Mittal (http://web.iitd.ac.in/~amittal/)
   Kinetics and self assembly in biological systems
2. Archana Chugh (http://web.iitd.ac.in/~achugh/)
   Cell penetrating peptides, Marine bioprospecting, Alternative medicine
3. Bishwajit Kundu (http://web.iitd.ac.in/~bkundu/)
   Protein aggregation, misfolding and disease
4. Chinmoy Shankar Dey (http://bioschool.iitd.ac.in/CSD.html)
   Insulin resistant (Type 2) diabetes, Drug resistance in Leishmania
5. James Gomes (http://web.iitd.ac.in/~jgomes/)
   Systems Biology
6. Manidipa Banerjee (http://bioschool.iitd.ac.in/Manidipa.html)
   Engineering viruses into nanoparticles for chemotherapeutic drug delivery &Structure-function study of host cell entry by non-enveloped viruses
7. Seyed E. Hasnain (http://www.seyedehasnain.org/)
   Molecular Infection Biology and Epidemiology of *Mycobacterium tuberculosis*
8. Tapan K. Chaudhury (http://web.iitd.ac.in/~tkchaudhuri/)
   Chaperone mediated protein folding in vitro and in cell
9. Vivekanandan Perumal (http://web.iitd.ac.in/~vperumal/)
   Hepatitis B virus (HBV), Hepatocellular Carcinoma (HCC)
10. B. Jayaram, Coordinator (http://www.scfbio-iitd.res.in/)
    Genome annotation, protein structure prediction and drug design

II. Staff

The School has currently 5 staff members:

i) Ms. Pushplata (Jr. Lab. Assistant)

ii) Sh. Jasbir (Cleaner)

iii) Ms. Puneeta (Project Staff)

iv) Mr. Mukesh Pal (Project Staff)

v) Sh. Inderjeet Singh (Store keeper, on sharing basis with Department of Biochemical Engineering and Biotechnology)

III. Ph.D Students

Ph.D Programme in Biological Sciences has commenced in 2009.

a) List of Ph.D. Students

S.No	Name of the Student	Date of Joining	Status*	Supervisor
1.	Vinay Dahiya	26/06/08	FT	Dr. T K Chaudhuri
2.	Suhas V.Vasaikar	26/06/08	FT	Prof. James Gomes
3.	Megha Goyal	31/03/09	FT	Dr. T K Chaudhuri
4.	Suneyna Bansal	31/03/09	FT	Dr. A Mittal
5.	Hirdesh Kumar	25/07/09	FT	Prof. James Gomes
6.	Dushyant Garg	25/07/09	FT	Dr.B.Kundu
7.	Rachana Tomar	25/07/09	FT	Dr.B.Kundu
8.	Ashutosh Pastor	25/07/09	FT	Dr. T K Chaudhuri
9.	Ankit Srivastava	02/01/10	FT	Dr.B.Kundu
10.	Neha Jain	02/01/10	FT	Dr. T K Chaudhuri
11.	Snigdha Singh	02/01/10	FT	Dr. A Mittal
12.	Chanchal Acharya	02/01/10	FT	Dr. A Mittal
13.	Pallavi Varshney	22/07/10	FT	Prof.C.S.Dey
14.	Saumya Verma	22/07/10	FT	Dr.Manidipa Banerjee
15.	Jasmine Samal	22/07/10	FT	Dr.V Perumal
16.	Amita Arora	22/07/10	FT	Prof.C.S.Dey
17.	Aastha Jain	22/07/10	FT	Dr. Archana Chugh
18.	Manish Kandpal	22/07/10	FT	Dr.V Perumal
19.	Ashutosh Shukla	22/07/10	FT	Dr.Manidipa Banerjee
20.	Upasana Aggarwal	22/07/10	PT	Dr. A Mittal
21.	Aditya K. Padhi	15/10/10	PT	Prof.James Gomes
22.	Avinash K. Mishra	15/10/10	PT	Prof. B.Jayaram, Dr.A Mittal
23.	Medha Kapoor	03/01/11	FT	Dr.Manidipa Banerjee
24.	Nisha P.	03/01/11	FT	Dr. Archana Chugh, Dr.A Mittal
25.	Bhoopesh K. Yadav	03/01/11	FT	Dr. Archana Chugh
26.	Pooja Bhatia	10/01/11	PT	Dr. Archana Chugh

27.	Yadvir Singh	21/07/11	FT	Prof.S.E.Hasnain
28.	Bhaskar Ku Chatterjee	21/07/11	FT	Dr. T K Chaudhuri
29.	Rishibha Sachdev	21/07/11	FT	Dr.B.Kundu
30.	Khushbu Sharma	21/07/11	FT	Prof.S.E.Hasnain
31.	Sakshi Kohli	21/07/11	FT	Prof.S.E.Hasnain

*FT: Full-time; PT:Part-time

b) List of Pre Ph.D Courses offered

S.No.	Course Code	Course Title
1.	SBL 101	Modern Biology for Engineers
2.	SBP 200	Introduction to Practical Modern Biology
3.	SBL 201	High Dimensional Biology
4.	SBL 301	Mini Project
5.	SBL 701	Biometry
6.	SBL 702	Systems Biology
7.	SBL 703	Advanced Cell Biology
8.	SBL 704	Human Virology
9.	SBL 705	Biology of proteins
10.	SBL 706	Biologics
11.	SBL 707	Bacterial Pathogenesis
12.	SBL 708	Epigenetics in Human Health and Disease
13.	SBL 709	Marine Bioprospecting
14.	SBL 710	Chemical Biology
15.	SBL 795	Graduate Student Research Seminar-I
16.	SBL 796	Graduate Student Research Seminar-II
17.	SBL 800	Independent Study
18.	SBL 801	Signal Transduction and Drug Target Identification
19.	SBL 802	Macromolecular Structure and Data Processing

20.	SBL 881	Advances in Chemical Biology
21.	SBL 882	Biological Membranes
22.	SBL 883	Chaperone and Protein Conformational Disorders
23.	SBL 884	Elements of Neuroscience
24.	SBL 885	Protein Aggregations and Diseases
25.	SBL 886	Signaling Pathway Analysis
26.	SBL 887	Current Topics in Computational Biology
27.	SBL 888	Current Trends in Computer Aided Drug Discovery
28.	SBV 889	Diagnostic Virology
29.	SBV 890	Kinetoplastid Parasites and Novel Targets
30.	SBV 891	Virus Host Interaction

IV. Minor Area Programme in Biological Sciences for undergraduates has commenced from the academic year 2011-2012.

Core Courses Offered

S.No.	Course No.	Course Title	L-T-P	Credits
1	SBL101	Modern Biology for Engineers	3-0-0	3
2	SBL201	High-Dimensional Biology	3-0-0	3
3	SBL200	Introduction to Practical Modern Biology	0-0-4	2
4	SBL 401	Minor Project	0-0-6	3

V. a) Equipment Under Procurement from Kusuma Grant

S.No.	Equipment	Status
1	Cryo-electron microscope with automated imaging system	Identification of L1 & ordering
2	Microarray	Identification of L1 & ordering
3	FACS	Identification of L1 & ordering

b) Equipment Procured from other Grants

S.No.	Equipment	Status
1	Real Time PCR system	Installed
2	Ultra Centrifuge	Installed
3	FPLC	Installed
4	HPLC	Installed
5	SORVAL Floor Model Centrifuge	Installed
6	Biomolecular Imager	Installed
7	Cell Disrupter	Installed
8	Lyophilizer	Installed
9	Gene Gun	Installed

VI. Creation of BSL1, BSL2 & BSL3 Laboratories

The Kusuma School of Biological Sciences is undertaking a complete renovation of the existing space to create state-of-the-art BSL1, BSL2 and BSL3 laboratories to pioneer research in the areas of Infectious diseases & Non-communicable disorders. These laboratories will boost the research effort of the faculty of the School and support its PhD programme. The School will therefore, encourage, support and nurture multi-disciplinary collaborative research and train students to become the next generation of researchers in areas of Biological Sciences emerging at the interface of engineering and life sciences.

The laboratories to be created for the School will be situated in two adjacent buildings - the main building and the annexe building. The details of the laboratories are given in the Table below.

Laboratory	Approximate Area (sq. ft.)	Safety	No.
Main building			
PG - Teaching Laboratory	800	BSL1	1
Research laboratories	600-650	BSL1+	4
Culture Rooms	125-150	BSL1+	6
Radioactivity Room	100	BARC	1
Cold Room	150	BSL1	1
Store Room	100	Nil	1
Annexe Building - Basement			
Research Laboratory for handling infectious biomaterials	600	BSL3	1
Common Research Laboratory	1600	BSL1+	1
Research Laboratories	600-650	BSL1+	2
Culture Rooms	100-150	BSL1+	2
Culture Rooms	200	BSL1+	2
Store Room	150	Nil	1
Annexe Building - Mezzanine			
Classroom	670	Nil	1
Culture Room	150	BSL1+	1

The HVAC for the buildings will be overhauled and the 24×7 water and power backup will be setup as a part of this activity. The buildings will have a finger print/digital code security system with closed circuit TV.

VII. Faculty Publications

a) Faculty Publications in Peer Reviewed Journals

1. Naresh, M., K. Gopinadhan, S. Sekhar, P. Juneja, M. Sharma and A. Mittal: "NSOM/HRTEM characterization of biologically derived cubo-octahedral nano-magnets". *IEEE Trans. Magnetics*, 2009, 45: 4861-4864.

2. Naresh M, Hasija V, Sharma M, Mittal A: "Synthesis of cellular organelles containing nano-magnets stunts growth of magnetotactic bacteria". *J Nanosci Nanotechnol* 2010, 10(7): 4135-4144.

3. Ghosh S, Kaushik DK, Gomes J, Nayeem S, Deep S, Basu A: "Changes in cytosolic Ca2+ levels correspond to fluctuations of lactate levels in crosstalk of astrocyte-neuron cell lines". *Indian J Exp Biol* 2010, 48(6): 529-537.

4. Bhattacharya SK, Gomes J, Cebulla CM: "Toward failure analyses in systems biology". *Wiley Interdiscip Rev Syst Biol Med* 2010, 2(5): 507-517.

5. Maheshwari A, Verma VK, Chaudhuri TK: Equilibrium and kinetics of the unfolding and refolding of Escherichia coli Malate Synthase G monitored by circular dichroism and fluorescence spectroscopy. *Biochimie* 2010, 92(5): 491-498.

6. Vivekanandan P, Singh OV: "Molecular methods in the diagnosis and management of chronic hepatitis B". *Expert Rev Mol Diagn* 2010, 10(7): 921-935

7. De Munshi Y and Chugh A: "Role of Traditional Knowledge in Marine Bioprospecting". *Biodiversity and Conservation* 2010, 19:3015-3033.

8. A. Mittal, B. Jayaram, S. R. Shenoy and T. S. Bawa: "A Stoichiometry driven universal spatial organization of backbones of folded proteins: Are there Chargaff's rules for protein folding ?", *J. Biomol. Struc. Dyn.*, 2010, *Vol. 28 (2),* 133-142.

9. G. Khandelwal, B. Jayaram: "A Phenomenological model for predicting melting temperatures of DNA sequences", *PLoS One* , 2010, *5(8),* e12433.

10. Taneja NK, Dhingra S, Mittal A, Naresh M, Tyagi JS: "Mycobacterium tuberculosis transcriptional adaptation, growth arrest and dormancy phenotype development is triggered by vitamin C". *PLoS One* 2010, 5(5).

11. Mittal A, Grover R:" Self-assembly of biological membranes into 200-400 nm aqueous compartments". *J Nanosci Nanotechnol* 2010, 10(5): 3085-3090.

12. Parul Gupta, Saroj Mishra,and Tapan K. Chaudhuri*: “Reduced stability and enhanced surface hydrophobicity drive the binding of apo- aconitase with GroEL during chaperone assisted refolding”. *The International Journal of Biochemistry and cell Biology* 2010, 42, 683–692.

13. Rajib Nayak, Gomes J: "Generalised hybrid control synthesis for affine systems using sequential adaptive networks". *J Chem Technol Biotechnol* 2010; 85: 59-76

14. Odegard A, Banerjee M, Johnson JE: Flock house virus: a model system for understanding non-enveloped virus entry and membrane penetration, *Curr Top Microbiol Immunol.* 2010;343:1-22.

15. Trichi S and Chugh A: "IPRs in synthetic biology: an anti-thesis to open access to research?" *Systems and Synthetic Biology* 2011,4 : 241-245

16. Lynd L R, Aziz R A, Carlos de Brito Cruz H, Chimphango A F A, Cortez LA B, Faaij A, Greene N, Keller M, Osseweijer P, Richard T L, Sheehan J, Chugh A, van der Wielen L, Woods J, van Zyl W H : "A Global Conversation about Energy from Biomass: The Continental Conventions of the Global Sustainable Bioenergy Project". *Journal of the Royal Society Interface* 2011, 1: 271-279,

17. Gomes J: "Introduction: special issue JIMB-BioMicroWorld 2009". *J Ind Microbiol Biotechnol* 2011, 38(1): 1-2.

18. Mittal A, Jayaram B: "Backbones of folded proteins reveal novel invariant amino acid neighborhoods". *J Biomol Struct Dyn* 2011, 28(4): 443-454.

19. A. Mittal and B. Jayaram: "The newest view on protein folding: stoichiometric and spatial unity in structural and functional diversity", *J. Biomol. Struc. Dyn.*, 2011, *Vol. 28(4),* 669-674.

20. Tanya Singh, D. Biswas, B. Jayaram: "AADS - An automated active site identification, docking and scoring protocol for protein targets based on physico-chemical descriptors". *J. Chem. Inf. Modeling* 2011, 51 (10), 2515-2527.

21. Md. Asif Shah, Saroj Mishra, and Tapan K. Chaudhuri: "Structural stability and unfolding transition of β-glucosidases: A comparative investigation on isozymes from a thermo-tolerant yeast". *European Biophysics Journal* 2011, 40:877–889.

22. Sanjay kumar, Nalini Shrivastava, Gomes J: "The effect of lovastatin on oxidative stress and antioxidanat enzymes in hydrogen peroxide intoxicated rat". *Food and chemical Toxicology,* 2011,49 , 898-902

23. Paul S and Chugh A : "Assessing the Role of Ayurvedic 'Bhasms' as Ethno-nanomedicine in the Metal Based Nanomedicine Patent Regime." *Journal of Intellectual Property Rights,* 2011, 16(6) 509-515.

24. Naresh, M., M. Sharma and A. Mittal: "Intracellular Magneto-spatial Organization of Magnetic Organelles inside Intact Bacterial Cells". *J.Biomed. Nanotechnol* 2011, 7: 572-577 .

25. Das S, Sen M, Saha C, Chakraborty D, Das A, Banerjee M, Seal A: Isolation and expression analysis of partial sequences of heavy metal transporters from Brassica juncea by coupling high throughput cloning with a molecular fingerprinting technique, Planta. 2011 Jul;234(1):139-56.

26. Chia-Hung Su, Lian-Jung Chien, James Gomes, Yu-Sheng Lin, Yuan-Kun Yu, Jhang-Song liou, Rong-Jhih Syu: "Factors affecting lipid accumulation by Nanochloropsis oculata in a two -stage cultivation process". *J. Appl Phycol,* 2010:1-6

27. Saurabh Bansal, Ankit Srivastava, Goutam Mukherjee, Ramendra P Pandey, Anita Kamra Verma, Prashant Mishra, and Bishwajit Kundu: "Hyperthermophilic asparaginase mutants with enhanced substrate affinity and antineoplastic activity: Structural insights on their mechanism of action". *FASEB J . (In press).*

28. Samal J, Manish K and Vivekanandan P: "Moleuclar mechanism underlying occult HBV infection". *Clin Microbiol Rev. (In press).*

b) Papers/Abstracts Presented/Published in National/International Conferences

1. Pahwa J, Kumar S, Sengupta B and Gomes J: "A Lovastatin Production Model Possessing Features for Process Control Applications", *BioMicroWorld 2009,* Lisbon, Portugal, 2-4 Dec 2009.

2. Kumar S, Shrivastava N, Sengupta B and Gomes J: " Scale-up of a Solid-State Bioconversion Process for Lovastatin Production in a 1200 Liter Reactor," *BioMicroWorld 2009,* Lisbon, Portugal, 2-4 Dec 2009.

3. Ramesh Chander Kuhad, James Gomes, K.K. Sharma, Sanjay Kumar, Bhuvnesh Shrivastava, Preeti.N.Malik, Kavish Jain, Kalyani Padhee, Subhash Kharab, H.M. Saini, Neeta Sehgal, V.R.B.Sastri: " Bioconversion of wheat straw to value added cattle feed by RCK –1 fungal isolate", *BioMicroWorld 2009,* Lisbon, Portugal, 2-4 Dec 2009.

4. Ranjan AP and Gomes J: "Decoupled Adaptive Control of Glucose and Dissolved Oxygen for Fed-batch Methionine Production Using Linear Reference Model", *American Control Conference 2010,* Baltimore, Maryland, USA June 30 - July 2, pp 5862-5867.

5. Chugh A and Trichi S: "Commercialization of Biofuel Research in India: A Socio-Economic Perspective". *In: 4th Global Asia Oceania Convention,* KualaLumpur, Malaysia June 14-16 (2010).

6. Chugh A: "Role of Traditional knowledge in Marine Bioprospecting for novel drug development in the Pharmaceutical Sector. In: Marine Biotechnology Future Challenges" *ESF-COST High Level Research Conference,* Acquafredda di Maratea, Italy June 20-25 (2010).

7. Chugh A and Trichi S: "Socio-ethical and legal implications of Synthetic Biology". *BioDesign India 1.0.* Thiruvanthpuram, Kerala, India, September 7-9 (2010).

8. Kuhad RC, Shrivastava B, Kumar S and Gomes, J, "Nutritional upgradation of animal feed produced by solid- state bioconversion of wheat straw in an industrial scale bioreactor," Malaga, Spain, 14-16 September, 2011.

9. Vasaikar S, Padhi A, Kumar H and Gomes J:" Effect of Leaky Channels in calcium Homeostasis. International Society for Computational Biology (ISCB)." Conference Abstract: 19th ISMB/ECCB Vienna, 2011.

10. Tomar R, Kundu B: "Domain-specific folding and stability studies of L-Asparaginases: indication of chaperonin function of N-terminal domain". *80th Society of Biological Chemists Meeting,* Lucknow, India,12th -14th November 2011.

11. Bansal S, Srivastava A, Mukherjee G and Kundu B: "Structural insights and mechanism of action of engineered thermophile-derived asparaginase with promising antiproliferative activity". *17th International Biophysics Congress,* Beijing, China, Oct30-Nov03, 2011.

12. B. Jayaram, Tanya Singh, Marcia Fenley: "DNA-Drug Interactions: A Theoretical Perspective in Methods for Studying DNA/Drug Interactions", *Editors,* Dr. Meni Wanunu & Prof. Yitzhak Tor, 2011,Ch-14, pp 317-338, CRC Press

13. Subramanian K and Gomes J : "Identification of Metabolic States and their Relation to Operational Conditions in Urokinase Production by HT1080 Cells," Malaga, Spain, 14-16 September, 2011, 6 pages.

14. Kumar S and Gomes J: "Comparison of Lovastatin Synthesis using Glucose and Lactose by Metabolic Flux Analysis," *BioMicroWorld 2011,* Malaga, Spain, 14-16 September, 2011, 6 pages.

15. Vasaikar S, Kumar S and Gomes J : " Computational Analysis of Protein Interaction Networks in Alzheimer's Disease : A. Systems Approach. *XIX Annual Meeting of Indian Academy of Neurosciences,* 2011, Delhi.

16. Vasaikar S, Padhi A and Gomes J: " Network Analysis of Neurodegenerative Diseases : A System based Approach to Uncover Perturbed Networks. Front." *4th INCF Congress of Neuroinformatics,* Boston, 2011.

17. H Kumar, B Jayaram, J Gomes: "Comparative Molecular Dynamics study of PfFabI inhibition, Oral and Poster presentation in MolMod2011," *International Conference* held in University of Heidelberg, Germany from 9-11 October, 2011.

18. Jain A and Chugh A: "Cell penetrating peptides as Nanocarriers: Applications in human theragnostics". *In 3rd ESF Summer School in Nanomedicine,* Wittenberg, Germany, June 19-June 24, 2011.

19. Chugh A and Bhatia P : "Role of Marine bioprospecting contracts in developing access and benefit sharing mechanism for marine traditional knowledge holders in the pharmaceutical industry". *World conference on Marine Biodiversity.* Aberdeen, Scotland, UK. September 26- 30, 2011 .

20. Bansal S, Mishra P and Kundu B: "A novel thermostable L –asparaginase with a promising anticancer activity". *3rd ICDDT*, Dubai, UAE, Feb 7th-10th, 2011

21. B. Jayaram and A. Mittal: " Universality of the spatial distribution of the backbones and a narrow band of amino acid stoichiometries amidst the structural and functional diversity of folded proteins, " *Albany 2011: Conversation 17*, SUNY Albany, USA, June 14-18,2011. *J. Biomol. Struct. Dyn.* 28: 998.

VIII. Research Projects

S. No	IIT Delhi sanction No.	Date	Funding Source*	Amount (Lakhs)	Pound Sterling (£)	Faculty

				INR		
1	------	01/12/09	DST, GoI	28.05	34629.63	Biswajit Kundu
2	IITD/IRD/RP02390	01/09/10	DST, GoI	53.00	65432.1	Chinmoy S. Dey
3	IITD/IRD/ MI00797	18/11/10	DBT, GoI	70.00	86419.75	Manidipa Banerjee
4	IITD/IRD/RP02427	03/12/10	DST, GoI	32.90	40617.28	James Gomes
5	IITD/IRD/MI00806	06/01/11	IRD, IIT D	100.00	123456.8	James Gomes
6	IITD/IRD/ MI00809	06/01/11	IRD, IIT D	99.945	123388.9	James Gomes Biswajit Kundu
7	IITD/IRD/ /RP02457	23/03/11	DBT, GoI	27.04	33382.72	Manidipa Banerjee
8	IITD/IRD/RP02460	31/03/11	DBT, GoI	28.73	35469.14	V. Perumal
9	IITD/IRD/RP02487	30/06/11	ICAR, GoI	44.70	55185.19	Archana Chugh
10	------	12/08/11	DST, GoI	3.4653	4278.148	Seyed E. Hasnain
11	IITD/IRD/RP02517	12/10/11	DBT, GoI	13.344	16474.07	Tapan K. Chaudhuri
12	IITD/IRD/RP02519	20/10/11	DST, GoI	40.337	49798.77	Aditya Mittal
Total Funding (up to 30th November, 2011)				541.5113	668532.5**	

*DBT-Department of Biotechnology, Ministry of Science and Technology, Government of India.
DST -Department of Science and Technology, Government of India.
IRD- Industrial Research and Development Unit, Indian Institute of Technology Delhi.
ICAR-Indian Council of Agricultural Research, Government of India.
** One Pound Sterling(£) = INR 81.00

IX. Awards/Honours

S.No.	Awards/Honours	Faculty	Institute/University
1	Honorary Doctorate Award for Outstanding and Acclaimed Research Work on Tuberculosis	Prof.S.E.Hasnain	Queen's University, Belfast, Northern Ireland
2	MDRF Honour Lecture Award	Prof. C.S. Dey	Madras Diabetes Research Foundation (MDRF)
3	Ramalingaswamy Fellowship	Dr. Manidipa Banerjee	DBT

X. Conference Organized

Kusuma School of Biological Sciences is organizing a Conference on "Nucleic Acids in Disease & Disorder" from Dec 7th to 9th, 2011 at IIT Delhi.

XI. Any other

In a major research initiative, the school faculty have collectively submitted a proposal to the Department of Biotechnology , Government of India, for the creation of FIND (a facility for infectious diseases) with a project budget of ~ Rs 90 Crores.

Minutes of the Second Advisory Board Meeting of the
Kusuma School of Biological Sciences, IIT Delhi

Dated: 6th March, 2013

The second advisory board meeting of the Kusuma School of Biological Sciences (KSBS), IIT Delhi was held on 4th February, 2013 at 1100 hrs in the committee room of the School.

Following were present:

1. Prof. B. Jayaram	Convener, Advisory Board, & Coordinator, KSBS
2. Dr. Balwant Singh	CEO, Kusuma Trust UK
3. Dr. Pradip Bhatnagar	President, Daiichi-Sankyo Life Science Research Centre in India
4. Prof. Christopher Dobson,FRS	Department of Chemistry, University of Cambridge
5. Prof. Aditya Mittal	Member
6. Prof. Archana Chugh	Member
7. Prof. Bishwajit Kundu	Member
8. Prof. Chinmoy S. Dey	Member
9. Prof. James Gomes	Member
10. Prof. Manidipa Banerjee	Member
11. Prof. Seyed E. Hasnain	Member
12. Prof. Tapan Chaudhuri	Member
13. Prof. Vivekanandan Perumal	Member

Prof. R. K. Shevgaonkar, Director IIT Delhi and Prof. Ambuj Sagar (Dean (AAIP)) could not attend the meeting due to urgent commitments.

The Convener welcomed all the members to the second advisory board meeting of the Kusuma School of Biological Sciences. The progress report of the School since its conception was tabled to all the members (Annexure-1).

Dr. Balwant Singh released the first Flyer of the School (Annexure-2).

Subsequent to a brief presentation by the Convener on the School activities, including teaching, research, publications, grants received etc. (Annexures-3 to 5), the advisory board members took a tour of the premises, including the makeshift laboratories and the laboratories under construction.

After reassembling in the committee, deliberations of the advisory board were initiated by Dr. Pradip Bhatnagar. He complimented the conception of the School with the support of Kusuma Trust UK as fascinating and was enthusiastic in noting the progress in a relatively short period of time. He expressed an interest to initiate a collaborative program with Daiichi-Sankyo for *de novo*/first-in-class target identification, target validation and systems biology focused on inflammation and bacterial infections. Appreciating the balance between state-of-the-art computational and wet-laboratory research in the School, he suggested a need for creation of a mechanism for sustained funding towards financial requirements to meet consumable and contingency expenditures. Considering the perpetuity of the engagement between the School and Kusuma Trust UK, he suggested part of these financial requirements to be provided by Kusuma Trust UK.

Prof. Dobson complimented the Kusuma Trust UK for a fantastic job in bringing the School up to speed. He observed and appreciated the commitment of the faculty and the doctoral students of the School, while specifically noting the strengths of the School in the areas of drug discovery and new processes/materials. He emphasized the importance of building close collaborations within the School and outside the School with other disciplines, especially enabled by student interactions between different departments. Prof. Dobson stated that while it might be relatively less difficult to obtain funding for equipment, or even hiring of experts, availability of sustained funding for consumables is a global problem. While stating "What seems marginal makes life/large possible", he suggested the need of the School to have a sustained relationship with Kusuma Trust UK. Appreciating the rate and quality of publications from the School, he suggested an exploration of collaborative links with established institutions abroad. In this context, he suggested that exchange programs for students and faculty could be an avenue, including his St. John's college at the University of Cambridge.

Dr. Balwant Singh was delighted that advisory board members from both industry and academia came together and thanked them for their appreciation of Kusuma Trust UK's support in establishing the School at IIT Delhi. While complimenting the School faculty in effective and efficient utilization of the space, and observing the sense of ownership of the School in the faculty, he encouraged the Faculty to create avenues for continuing funding for the School beyond the 3rd year. Dr. Singh suggested that it might be useful to initiate periodic reviews to not only assess the comparative scientific edge of the School within Asia, but also evolve a strategic focus at both individual and collective levels in the School. Finally, he outlined that although Kusuma Trust UK was not in a position to make any further funding commitments to the School at present, he would be open to exploring proposals from the School that promoted institutional exchanges and perhaps even contributions towards modest operating costs.

The meeting ended with the Convener thanking all the advisory board members for sparing their precious time and for the positive feedback.

The meeting was followed by a lunch in the main guest house of IIT Delhi, with all the advisory board members being joined by Prof. S. K. Koul, Deputy Director (Strategy and Planning) IIT Delhi and Prof. Ashok Gupta, Ex-Dean Alumni Affairs & International Planning and current Dean Infrastructure, IIT Delhi.

B. Jayaram
Convener &
Coordinator, KSBS, IITD

Minutes of the Third Advisory Board Meeting of the
Kusuma School of Biological Sciences, IIT Delhi

Dated: 14th Jan., 2014

The Third Advisory Board Meeting of the Kusuma School of Biological Sciences (KSBS), IIT Delhi was held on 6th December, 2013 at 10:00 hrs in the committee room of the School.

Following were present:

1.	Dr. Balwant Singh	CEO, Kusuma Trust UK
2.	Prof. Anurag Sharma,	Acting Director, IITD
3.	Prof. B. Jayaram	Convener, Advisory Board, & Coordinator, KSBS
4.	Prof. Aditya Mittal	Member
5.	Prof. Manidipa Banerjee	Member
6.	Prof. Tapan Chaudhuri	Member
7.	Prof. Vivekanandan Perumal	Member

Prof. R. K. Shevgaonkar, Director IIT Delhi, Prof. Ambuj Sagar (Dean (AAIP)), Prof. C. Dobson and some faculty members of the School could not attend the meeting due to urgent / prior commitments. Dr. Pradip Bhatnagar left DSIN.

The Convener welcomed all the members to the third advisory board meeting of the Kusuma School of Biological Sciences. Minutes of the 2nd Advisory Board Meeting held in Feb., 2013 was tabled to all the members (Annexure-1).

Dr. Balwant Singh released the second Flyer of the School (Annexure-2).

Subsequent to a brief presentation by the Convener on the School activities, including teaching, research, publications, grants received etc. (Annexure-3: presentation; Annexure-4: Research output; Annexure-5: Grants & aid), the advisory board members took a tour of the premises, noted the completion of the Biosafety Labs in Annexe Building and the on-going construction in the Main Building. It was noted that the KTUK approved a no-cost extension of the tenure of the project till 31st Dec., 2014. In view of this, it was informed that any additional requests from the School for funding by KTUK will have to wait till the end of the on-going project.

While complimenting the progress achieved by the School in realizing its mandate, the committee expressed its concern at the attendance and preparation for the third advisory board meeting. Dr. Balwant Singh, in particular, emphasized on a much bigger role that the advisory board could play in the growth of the School, the need to keep advisory board abreast of the developments in the School periodically, and the necessity to plan the next meeting sufficiently in advance.

The meeting ended with the Convener thanking all the advisory board members for sparing their precious time and for the positive feedback.

B. Jayaram
Convener &
Coordinator, KSBS, IITD

KUSUMA SCHOOL OF BIOLOGICAL SCIENCES

(*http://bioschool.iitd.ac.in*)

Indian Institute of Technology Delhi

Establishment of the School

Modern Biology has departed from emphasis on individual or species level understanding to appreciating unity and diversity at the genomic level. Work in modern biology is neither restricted to individual investigators nor to people trained in traditional disciplines considered under biological sciences. Rather, it has evolved into an inter- and multi-disciplinary quantitative science aimed at molecular, structural and systems level understanding of natural phenomena that form the wonder considered as life.

Inauguration of the Laboratories of the School. From Left to Right- Prof C S Dey, Dr Balwant Singh, Prof S E Hasnain, Prof Dr (h.c.) Jörg Hacker, Prof R K Shevgaonkar and Prof B Jayaram.

It is to contribute to this fascinating and emerging area of science, the Indian Institute of Technology Delhi established the School of Biological Sciences in December 2008. The process of establishment of the school began in September 2007 when an Internal Task Force chaired by Prof. B. N. Jain (Deputy Director, Faculty) was set up. Following the recommendations of academic bodies at IIT Delhi, a national advisory committee (NAC), co-chaired by Prof. Surendra Prasad, Director and Prof. M. Vijayan, was constituted. In pursuance of the recommendations of the Task Force, Senate, BOG and the NAC the School of Biological Sciences came into being at IIT Delhi.

Vision and Mission

Vision: To become the pioneers of modern interdisciplinary biological sciences by integrating emerging disciplines with biological sciences, and to nurture and sustain a vibrant comprehensive programme in research.

Mission: Promoting goal-oriented innovative interdisciplinary research by interfacing modern biology with applied engineering sciences to address problems affecting human health and welfare, and training scholars to be the next generation scientists.

Focus: Infectious diseases & Non-communicable disorders

Courses offered:

PhD Programme

The school started a PhD Programme in Biological Sciences in 2009

A total of 49 students are currently registered in the PhD programme
The school offers 30 Pre-PhD courses to cater to the needs of the PhD students

The first batch of PhD students are expected to graduate in the next semester

Minor Area in Biological Sciences

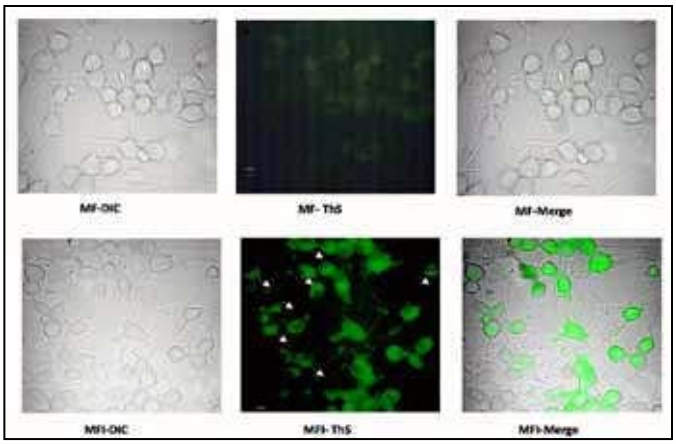
Currently the School offers a minor Area in Biological Sciences to the non-biology undergraduate students of the Institute. This has been a popular course among the undergraduates since its commencement in the academic year 2011-12.

Biology is now an essential part of the undergraduate curriculum (B.Tech)

The School will offer a new course in biological sciences as part of the recently implemented new UG curriculum for all undergraduate students (~850 students/year) at IIT Delhi. The course starting in summer 2014 will include lectures and practical hands-on training in laboratory exercises. This is a first-of-its-kind initiative for B.Tech students in India.

MS Research programme

The School will launch a Masters in Science (Research) programme in summer 2014 (pending final approval by the institute). This MS(R) programme is a research-oriented master's programme for undergraduates.



Effect of prolonged hyperinsulinemic condition on Alzeimer's-associated characteristics in N2A neuronal cells. N2A cells were differentiated in absence (MF) or chronic presence of insulin (MFI) for 3 days and stimulated with or without insulin (100nM) for 30 min. Neurofibrillary tangles were visualized by thioflavin-S (ThS) staining in MF and MFI differentiated N2A cells. Arrows indicate ThS positive spots.
A. Gupta, B. Bihst and C.S.Dey., Neuropharmacology 60, 910-920, 2011

Major Equipment Procured/Installed at the School include

1. Cryo-electron microscope
2. A complete microarray facility
3. Fluorescence activated cell sorter (FACS)
4. Next generation sequencer
5. Mass spectrometer
6. Atomic force microscope
7. Electrophysiology set-up with live cell imaging (procurement is ongoing)

Faculty

The School currently has eleven faculty members with diverse and complementary areas of expertise.

Faculty	Research Area
Aditya Mittal	Kinetics and self assembly in biological systems
Archana Chugh	Cell penetrating peptides, Plant based therapeutics, Marine bioprospecting
B Jayaram (Co-ordinator)	Biomolecular modeling and simulation, Computer aided Drug discovery
Bishwajit Kundu	Enzyme engineering of Hyperthermophilic enzymes, Amyloid aggregation and diseases, Prion biology
C S Dey	Molecular mechanism, signal transduction and target identification studies in Insulin resistant (Type 2) diabetes and Drug resistance in *Leishmania*
James Gomes	Systems Biology and metabolic pathway analysis, Neural networks for modeling
Manidipa Banerjee	Viruses as nanoparticles for drug delivery, Structure function study of Hepatitis A
Seyed E Hasnain	Molecular infection biology and epidemiology of *Mycobacterium tuberculosis*
Tapan K Chaudhuri	Chaperone assisted protein folding, Equilibrium, kinetics and thermodynamics of protein folding reactions
Vivekanandan Perumal	Hepatitis B Virus replication, Pathogenesis, Epigenetics, hepatocellular carcinoma
Ashok kumar Patel	Structural biology, Biophysics, chromatin Biology

Laboratories- BSL I, II and III

New BSLI, BSLII and BSLIII laboratories were created to support ongoing research and the PhD programme.

Achievements:

Research Grants

- The Faculty have generated ~ Rs. 20 Crores in sponsored & consultancy research projects & grants in the last 4 years.
- Kusuma Trust, UK has donated a total of Rs. 20 Crores to the School in the last 3 years.

Publications

- The faculty have published more than 90 papers in the peer-reviewed journals in the last 4 years.
- The publications (2010-2012) from the School have been cited over 450 times.

Conferences

The School has successfully organized three conferences in the last two years.

- **"Nucleic Acids in Disease & Disorder"** from Dec. 7th to 9th, 2011.
- A special issue (July 2012) of the Journal of Bioscience, a premier scientific journal from India, was brought out as proceedings of the conference.
- **"New Trends in Bioinformatics"** on July 30th & 31st , 2012.
- **"Proteins in Disease & Disorder"** (Bioworld 2012) from Dec. 10th to 12th, 2012
- **Bioworld 2013 computational Biology in disease and disorders (Scheduled Dec.9th to 11th,2013)**