

CARBOHYDRATE NEWS LETTER

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Editor

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FROM THE EDITOR'S DESK...

The importance of carbohydrates both as foodstuff and structurally important compounds involved in an enormous range of very precise and sophisticated processes is well understood. They act as an energy source, in biological signaling and recognition mechanisms and as basic structural building blocks controlling the architecture of nature. Therefore, much of the cutting edges of synthetic, medicinal and biological chemistry meet at the crossroads of Carbohydrate science. The vital roles that these key classes of biomolecules play in nature have to be explored in this exciting science from a molecular standpoint.

Currently, a tremendous challenge before the Carbohydrate Chemists and Technologists is to utilize Cellulose biomass as biofuel. Cellulose is not only most abundant and valuable renewable energy source worldwide but also become a new low cost industrial raw material for profitable processing toward low priced, highly competitive motor fuel, Bio-ethanol. Need not to say that Ethanol from Cellulose holds great potential due to the widespread availability, abundance and relatively low cost of cellulosic material.

As you may be aware that due to the sincere and earnest effort of the ACCTI, the International Carbohydrate Organization (ICO) at their meeting in Whistler, Canada in 2006 has decided to hold its International Carbohydrate Symposium at the I.I.Sc., Bangalore, India in 2014. Even in the recently held Carbo XXI at Delhi University in 2006, many famous Carbohydrate Scientists from abroad have delivered the fascinating talk along with celebrated researchers of the country.

Keeping this in mind, not only distinguished academicians and researchers from different part of the country are expected to participate in the forthcoming Carbo XXII at NIPER, Chandigarh but renowned carbohydrate chemists from North America, Europe and Japan would also be part of deliberation. Moreover, the theme of Carbo XXII is also rightfully chosen as Carbohydrate: Chemistry, Biology and Industrial application especially to heighten the industry participation as well. Also one session (at least two hours) is proposed on starch, cellulose and industrial polysaccharide in future CARBO MEETINGS. We look forward to see you there in Carbo XXII.

Last but not least, the last General Body meeting of the association at Delhi University in 2006 has given me the responsibility to edit and publish the future CNLs and as you know without your active support it may not be possible to publish the CNL successfully. Therefore, could I request you all to kindly share any news item, information, event, scientific data, position available, prizes won, visit abroad, which you think should circulate in coming issues of CNL for contemporary and especially young researchers working in the area of Carbohydrate Chemistry, you are welcome to send it to me.

Season's greetings and have a Meaningful and Fulfilling New Year!

Naveen K. Khare

XXI Annual Convention of Carbohydrate Chemists

Presidential Address

Dear Friends,

I feel privileged to welcome you all to the XXI Annual Convention of Carbohydrate Chemists on behalf of the Executive committee of ACCTI. 22 years back, it was in 1984, Late Dr. H. C. Srivastava, Senior Deputy Director ATIRA conceived the idea to form the Association that would provide a common platform to the carbohydrate chemists, technologists and industry for discussing the trends in research and development in this sector. Since then we have come a long way and with the active participation of scientists, technocrats and industrialists, the 22 Year old Association has grown stronger successfully over this period to fulfill the dreams of its founder Chairman Dr. Srivastava.

Today, we have assembled here in the prestigious Delhi University Auditorium to interact and discuss the present scenario in carbohydrate research and the requirements of the industry. Distinguished scientists from various universities, research organizations and industry have gathered here for this event. The stalwarts in the respective field will make presentations on the various theme areas of the convention. This is the first time that we have crossed the national boundaries and invited researchers on the specialized subjects from across the globe for participation in the CARBO XXI.

I am pleased to welcome the scientists from abroad who have accepted our invitation and honoured the ACCTI. Friends, on this occasion I am pleased to share with all of you that that executive body of International Carbohydrate organization has honored ACCTI by accepting our proposal to hold the Mega event International Carbohydrate Conference in 2014 at IISC, Bangalore as already mentioned by Dr. Asish Sen, Hon. Secretary of ACCTI.

Dear friends, Indian economy is moving fast towards high GDP and India is emerging as a big economic power. This changing economic scenario is due to good Technology Architecture. The infusion of technology in business has dramatically changed the modern enterprise function. Enterprise Resource Planning (ERP) solutions that combine multiple functions in a flexible package has become inevitable for the faster growth of the industry. Fast pace of industrial

development also needs uninterrupted supply of power. Indian energy sector largely depends on oil and escalating oil prices shake the economy severely. High oil price, energy security concerns and growing awareness of changing climate have put the prospects of a Carbohydrate based economy back on the public agenda. Less than 200 years back, industrializing societies were carbohydrate economies. Plant biomass in fact acts as battery of stored chemical energy. Successful substitution of living plants for fossilized plants would profoundly and positively influence the future of agriculture, the environment, world trade and energy security. Whether the result will truly benefit farmers, the world economy and the natural environment depends on the nature of the policies we design to achieve the transformation.

In CARBO XXI, we intend to cover several topics including carbohydrates as chiral pool for asymmetric synthesis; carbohydrates in nucleic acid world; carbohydrates in glycobiology/glycomics; carbohydrates in healthcare and nutrition, carbohydrates as promising materials in green chemistry; carbohydrates as food ingredients; carbohydrates as renewable resource materials in pharmaceutical, agrochemical and other industries; carbohydrates their structure, synthesis and biocatalytic modifications.

Colleagues we are living in an era of tumultuous change. Yet we should recall Bertrand Russell's distinction between change and progress. "Change he argued, is inevitable. Progress is controversial. Change is scientific, progress is ethical".

We will have change, whether we desire it or not, but progress comes only when we design rules that channel human ingenuity and entrepreneurial energy and investment of capital towards constructing a society and economy compatible. With the values we hold most dear:

THE CARBOHYDRATE ECONOMY BECKONS

With these words, I welcome you one and all once again and wish a great success for XXI CARBO.

P. L. Soni
(President, ACCTI)

Announcement

The next **CARBO XXII (XXII Carbohydrate Conference)** is scheduled to be held from December 13 to 15, 2007 at National Institute of Pharmaceutical Education and Research (NIPER), SAS Nagar (Mohali), Punjab. The Conference will comprise of Invited lectures, Oral presentations, Interactive sessions as well as Poster presentations. The meeting will serve as a unique and important platform for bringing together scientists and technologists from academic fields as well as industries to share their research results and exchange ideas and views with students and fellow researchers in the field.

Looking forward to see you there and enrich our scientific programme and scintillating social-cultural evenings.

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XXIV International Carbohydrate Symposium (2008)

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Rising to the challenge of greening carbohydrate chemistry

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([#]Prof. Gammon was part of the committee that awarded the International Carbohydrate Symposium meeting to India in 2014. He was the South African representative at the International Carbohydrate Organization (ICO) meeting held at Whistler, Canada in 2006).

The greening of carbohydrate chemistry might seem an ironic task. Carbohydrates are, after all, produced in the cleanest and most efficient of ways in nature - complex, single diastereomers assembled selectively from carbon dioxide and water using the sun's energy. However, it is our attempts to mimic nature's efficiencies that now provide the challenge.

Synthetic carbohydrate chemistry has come a long way from its proud origins. It is interesting to re-read Emil Fischer's Nobel lecture,[1] delivered on the occasion of the award of the 1902 Nobel Prize for Chemistry, in which he modestly summarizes his considerable achievements in synthesizing the monosaccharides and laying the foundations for preparation of glycosides and other sugar derivatives. While Fischer did suggest at that time that "the extreme limits of synthesis have been reached" he also drew his audience back to the inspiration of Nature, and the challenge to match her in achieving true asymmetric syntheses, and also to find ways to exploit biological transformations in organic synthesis. A certain reverence for Nature is expressed in placing his achievements in context: "And so, progressively, the veil behind which Nature has so carefully concealed her secrets is being lifted where the carbohydrates are concerned."

One has the sense that chemists like Fischer would have heartily endorsed the current and growing concerns to clean up organic synthesis and chemistry in general. The undeniable triumphs of chemistry have often come with a sad price: products, which enhance the quality of life having left a footprint which elsewhere, damages some aspect of life or the environment. We do not often associate carbohydrates with these concerns, which are more often associated with petrochemical products and derivatives. And indeed, carbohydrates are in some senses coming to the rescue as attention turns to beneficiation and exploitation of renewable resources and biomass. Innovative and clean methods of converting these to fuels, medicines and materials may go a long way to easing burden of chemical technologies on the environment and the inherent challenges are indeed worthy of our full attention.

But to return to Emil Fischer's interests, and our own. As Fischer did, so many of us love the challenges of carbohydrate synthesis and the application of this in the world of complex carbohydrates and glycoconjugates. Nature and biological systems continue to throw up fascinating variations on a theme - unusual carbohydrates connected in unusual ways, and having a diversity of roles in cell-cell recognition, disease processes, immune response and so

on. There is a continuing need for synthetic carbohydrates, and increasingly for arrays of systematically generated variants of these structures as biological probes - to further "lift the veil behind which Nature has so carefully concealed her secrets". And herein lies the challenge, for while the scale on which these biological probes is made is modest, and perhaps not considered to add significantly to the burden on the environment, we have a duty to look for environmentally benign synthetic processes, and to ensure that our students in their training are mindful of this imperative. So we need a green chemistry of carbohydrates.

A "green chemistry" way of looking at these challenges has emerged over the last decade or two, and been articulated in a number of ways. The "twelve principles of green chemistry" have been enunciated in a book by Anastas and Warner [2] and are publicised, for example, on the ACS Institute of Green Chemistry website.[3] It is interesting to view these from a carbohydrate synthesis standpoint: the 8th principle, for instance, enjoins the chemist to "Reduce Derivatives", and that "unnecessary derivatization (use of blocking groups, protection/ deprotection, temporary modification of physical/chemical processes) should be minimized or avoided if possible, because such steps require additional reagents and can generate waste". As any carbohydrate synthetic chemist knows, this presents a formidable challenge, since protection/deprotection sequences are almost unavoidable in preparation of complex carbohydrates (Figure 1).

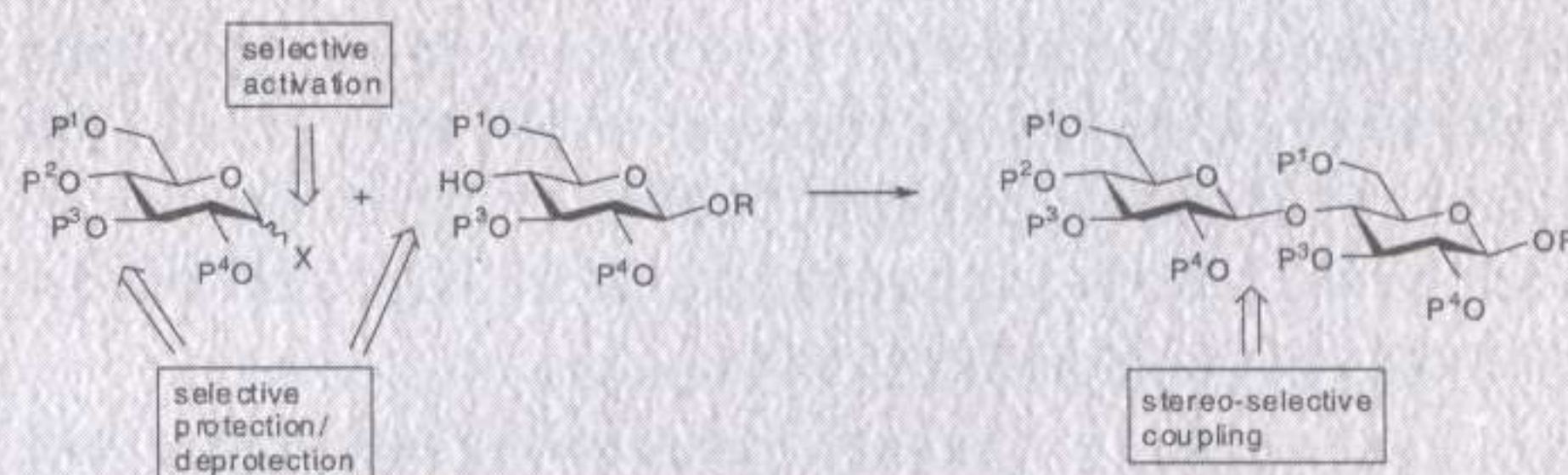


Figure 1. The synthetic challenges in the selective assembly of a disaccharide.

The challenges for a new chemistry have also been documented in other ways. In a recent article,[4] representatives of several major pharmaceutical companies identified key reactions for which cleaner alternatives were sought. These are reactions such as formation of amides, activation of alcohols for substitution, etc, which are widely used in preparing pharmaceuticals, but which pose considerable environmental threat and which therefore need to be replaced. Many of these are reactions used routinely in carbohydrate chemistry, and we therefore need to rise to these challenges in seeking innovative and creative ways of discriminating between similar functional groups or inventing new reactions with unusual selectivities in order to minimize

synthetic steps and maximize atom efficiencies. From a student's point of view this represents an intellectual challenge worthy of the higher degree to which they aspire and is a wonderful preparation for the demands of research and development in an industrial environment - where the clean technologies will be increasingly demanded and indeed legislated.

Are we making progress? While there is still a strong reliance on the traditional armoury of carbohydrate synthetic methods, new synthetic strategies and catalytic methods are being investigated. The normal assembly of complex carbohydrates involves multiple-step sequences of protection, deprotection, anomeric activation and coupling. These are of solvent-, chromatography- and time-intensive, with a high environmental impact as a consequence. As an example of a solution to this kind of problem, a promising development was recently announced by Chen-Chung Wang and co-workers in *Nature* [5] in which they described a sequential, one pot approach to selectively protecting and activating carbohydrates for formation of glycosides. This was based on formation and careful manipulation of TMS ethers of the sugars, with innovative application of known synthetic methods. Approaches like this will provide rapid access to quantities of important biologically active structures, but importantly, serve to illustrate an alternative way of thinking about chemical synthesis.

Our own recent work [6-8] has focussed on the development of new catalytic approaches to established transformations of the unsaturated carbohydrates, the glycals (Figure 2). This arises from our long-standing interests in the chemistry of glycals and in the development and application of new homogeneous and heterogeneous catalysts. Our efforts have resulted in new and efficient methods for oxidative halogenation of glycals to give 2-halosugars or 2-haloglycosides, which are useful building blocks for more complex carbohydrates. The method utilizes hydrogen peroxide as oxidant and a tungstate-exchanged takovite as solid catalyst for the in situ oxidation of halides to electrophilic halonium species, which then add to the glycals. The use of bromine, iodine or other sources of electrophilic halonium species is thus avoided and the by-products are water and ammonia.

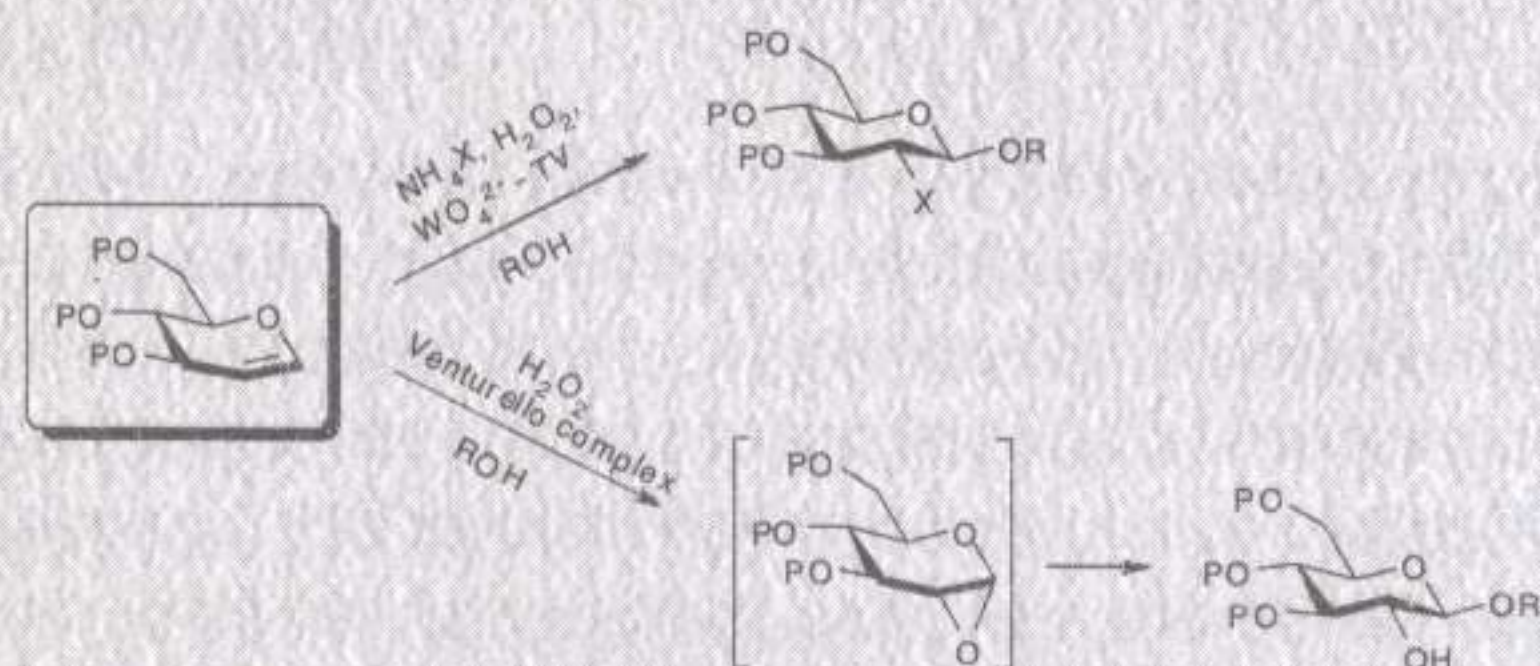


Figure 2. New catalytic methods to 2-haloglycosides and 2-hydroxyglycosides from protected glycals.

As a final example, we have addressed the problem of epoxidation of the glycal double bond - a general reaction where benign and efficient alternatives are being sought by the chemical industry. In this case we found that hydrogen peroxide could again be used as oxidant with catalytic quantities of Venturello complex or $\text{Ti}(\text{OiPr})_4$ - with water

again as the only by-product and the catalyst readily separated from the reaction mixtures. In the presence of alcohols this gives clean conversion to the trans-2-hydroxyglycosides. We are currently exploring the scope of these methods in transformations of a range of differently-protected glycals, to provide a viable alternative to the use of oxidants such as dimethyldioxirane or dimethylsulfoxide. In addition to these

These are selected examples of initiatives to develop a green chemistry of carbohydrates, representative of a growing awareness of the challenges and the scope that they present for innovative and exciting chemistry. To return to the metaphor used by Fischer, it is our duty to ensure that our manipulations of Nature's building blocks, the sugars, are carried out in a sustainable and respectful way. Our task as synthetic carbohydrate chemists is not simply to find ever more imaginative ways of making complex target molecules, nor to simply be target-driven, but rather to have a consciousness of the importance of the routes taken to our targets, and that these routes minimize the impact on the environment.

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Minutes of the Annual General Body Meeting

The Annual General Body meeting of the Association of Carbohydrate Chemists and Technologists (India) was organized by the Department of Chemistry, Delhi University on 26th November, 2006, at the Convention Centre. Thirty-eight members of the Association attended the meeting.

President, Dr. P. L. Soni, gave the introductory speech. Dr. A. K. Sen, Secretary of the ACCT(I), then, read out the minutes of the previous AGB meeting held during the XXth Carbohydrate Conference which was organized by the Chemistry Department, Lucknow University. The minutes were accepted unanimously: Proposed by Dr. Vasudeva Singh and seconded by Prof. N. K. Mathur.

Dr. A. K. Sen then described the previous years' activities of the Association. The meeting of the Executive Committee members was held on 25th November, 2006, in the evening. The norms for conducting the Carbohydrate Conference was framed which was subject to approval of the GB members. The members were delighted to know that India was awarded the International Carbohydrate Conference in 2014 by the International Carbohydrate Organization. Dr. Sen thanked Prof. A. Surolia, Prof. N. Jayaraman and Dr. M. K. Gurjar for their active support to defend India's bid. Dr. Sen mentioned that I.I.Sc. Bangalore was tentatively selected as the venue of the International Carbohydrate Conference.

The treasurer of the Association Dr. P. K. Gupta then presented the audited 'Statement of Accounts' of the ACCT(I). After a brief discussion, the 'Statement of Accounts' was accepted by the members; Proposed by Dr. Hasi Das and seconded by Dr. K. P. R. Kartha.

Dr. A. K. Sen, Hon. Editor of the Carbohydrate News Letter (CNL), then placed the 'Statement of Accounts' of CNL. Dr. P. K. Gupta suggested that the financial year should be from April to March instead of January to December. Dr. Sen agreed to the proposal. The 'Statement of Accounts' of CNL was accepted unanimously: Proposed by Dr. Vineet K Madan and seconded by Prof. Naveen Khare. The CNL is currently published once a year on 'no loss no gain' basis. The publication of the CNL is partially sponsored by the ACCT(I) and several advertisers. Dr. Sen again requested the members to relieve him from the responsibility of being the editor of CNL. He also suggested considering Prof. Naveen Khare as the editor of CNL. After some discussion, Prof. Naveen Khare gave his consent to be the Editor of CNL on the request of the members. It was also decided that more industrial houses would be approached for their involvement.

The 'Norm' for conducting the National Carbohydrate Conference was then discussed in detail. Several members took part in the discussion. It was decided that for the interest of the Industry one session (at least two hours) would be devoted to Starch and Cellulose, and Industrial polysaccharide Research. Besides, there should be one interactive session with the industrialists. Prof. C. P. Rao suggested that the young students (at least 25) should be

allowed to give oral presentation and four hours should be kept separately for this. Dr. Soni suggested that the organizers should save 10% of their expenditure and transfer it to ACCT(I) account so that the Association can send it for better cause. The members appreciated this. Prof. Parmer and Dr. Ashok Prasad, organizers of the CARBO-XXI agreed to this proposal. The 'norms' was accepted with minor revisions. Details will be available in the website.

On Dr. Sen's request, Prof. N. Jayaraman described his experience at the ICO meeting. He thanked ACCT(I) members for their help and guidance. Dr. Sen commented that ACCT(I) will take appropriate measures for successful organization of this prestigious event. He requested members to come forward with proposals for satellite symposiums, financial support, etc.

It was decided that the XXIIInd Carbohydrate Conference would be held at NIPER, Chandigarh. Dr. K. P. R. Kartha will take the responsibility. The venue of the XXIII was tentatively fixed at NCL, Pune. Prof. N. Jayaraman expressed his willingness to hold one of these conferences before the International Carbohydrate Conference. Since the XXVth Carbohydrate Conference will be held in 2010, Dr. Sen requested the interested members to come forward with definite proposals at the next GB meeting.

There were no nominations for the next executive committee. Therefore, it was decided to elect the members from the members present in the meeting. Prof. V. S. Parmer, suggested that since the current committee has done wonderful work, they should continue for another term which was accepted by all the members with a few changes. The following persons were elected for the Executive Committee (2007-2008): Dr. P. L. Soni (President), Prof. H. C. Trivedi (Vice-president), Mr. N. C. Dhuldhoya (Vice-president, industry), Dr. A. K. Sen (Secretary), Prof. Naveen Khare (Jt. Secretary), Dr. P. K. Gupta (treasurer), Prof. G. S. Chouhan, Dr. Tripathi, Dr. Hasi Das, Dr. Vasudeva Singh, Prof. Ashok K Prasad, Mr. P. K. Hissaria and Dr. K. P. R. Kartha (members).

In view of the growing activities of the Association Dr. Sen suggested that the association should have a 'registered domain name' (with sufficient band width) in the internet (such as www.acctindia.com). Dr. P. K. Gupta was given the responsibility to explore the possibilities and cost effectiveness. Dr. Soni requested Dr. Vasudeva Singh to take initiative for the publication of the "Trends in Carbohydrate Research" which he agreed. Dr. Sen also suggested that a logo and website competition be launched for the ensuing International Carbohydrate conference.

The meeting lasted for nearly two hours and was concluded with a vote of thanks to the chair by Prof. Naveen Khare (Jt. Secretary).

Dr. A. K. Sen (Secretary, ACCTI)

Effect of Processing on digestibility of rice starch by In Vitro studies[#]

Chitra, M., Vasudeva Singh and S. Z. Ali
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(#work presented by Vasudeva Singh at Chester, 1st International Chester Food Science and Technology, Conference, conducted during 10th to 13th April, 2007, organized by Society for Food and Agricultural Immunology, the Chester Center for Science Communication and The University of Chester.)

Rice is a staple food of Asian countries including India. World production of rough rice is around 600 million tones and from this India alone produces around 132 million tones. Nearly half of this goes for parboiling. About 90% paddy produced in India is converted to milled rice in raw as well as in parboiled form and 10% goes for the manufacture of rice products. Rice milling is the largest food industry in India and the traditional method of hand pounding is almost replaced by simple machines viz. huller, centrifugal or rubber roll Sheller. The shelling operation is followed by de-branning or polishing or milling by abrasion or by friction or a combination of both.

IR-64, an industrially used paddy in Karnataka, was subjected to various methods of parboiling viz. normal, pressure and dry heat. This processed paddy was used for the preparation of flaked rice by Edge runner as well as Roller Flaker. Rice prepared from these were used for the preparation of expanded rice. Untreated paddy was also subjected to preparation of popped rice. Optimum rice to sand ratio for maximum expansion of rice as well as popping was optimized at 1:15. Moisture content, equilibrium moisture content on soaking at room temperature of raw as well as parboiled rice varied from 10 to 12%, and 27 to 64% respectively and that of the prepared products varied from 5 to 9%, and 77 to 81% respectively. Sediment volume of raw and parboiled rice varied from 6 to 15 ml and that of products varied from 15 to 19 ml. Starch content in these varied from 77 to 85%, in products it varied from 76 to 83%. In vitro digestibility of short duration treatment varied from 2 to 10% and for long duration it varied from 9 to 37% for raw rice, different forms of parboiled rice as well as for the products prepared. Among the rice, least digestibility was seen in raw rice and highest digestibility was observed in pressure parboiled rice and among the products, least was seen in popped rice and highest was seen in roller flakes, in between was seen in expanded rice and edge runner flakes.

Welcome new members of ACCTI

All old and new members are requested to send their current complete address, telephone no., e mail address etc to the editor, CNL (CNL.ACCTI@gmail.com) to make the list more meaningful. Please also motivate your colleagues, friend and students to become member of the ACCTI to strengthen the Association. Thanks.

OM/1/2007

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LM/148/2007

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LM/142/2006

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"What I do as an artist is take an ordinary object-say, a lamp post-and, by urinating on it, transform it into something that is uniquely my own." (One dog talking to another.) Published in The New Yorker, 2002

Glyco-quantum dots powerful Luminescent system with tremendous applications

R.P. Tripathi

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"The term 'molecular imaging' implies the convergence of multiple image-capture techniques, basic cell/molecular biology, chemistry, medicine, pharmacology, medical physics, biomathematics and bioinformatics into a new imaging paradigm". One of the keys to molecular imaging's value in drug development is probes, which provide the imaging signal or image contrast in most molecular imaging assays. They are similar to stains used in histological analysis of tissue samples, but unlike stains, they are injected into living subjects to create images of specific biological or molecular events. Advances in microscopy of living cells over the past three decades have transformed the biological sciences. Critical developments have included fluorescence, confocal and two-photon optics, green fluorescent protein, photoelectronic detectors and image deconvolution.

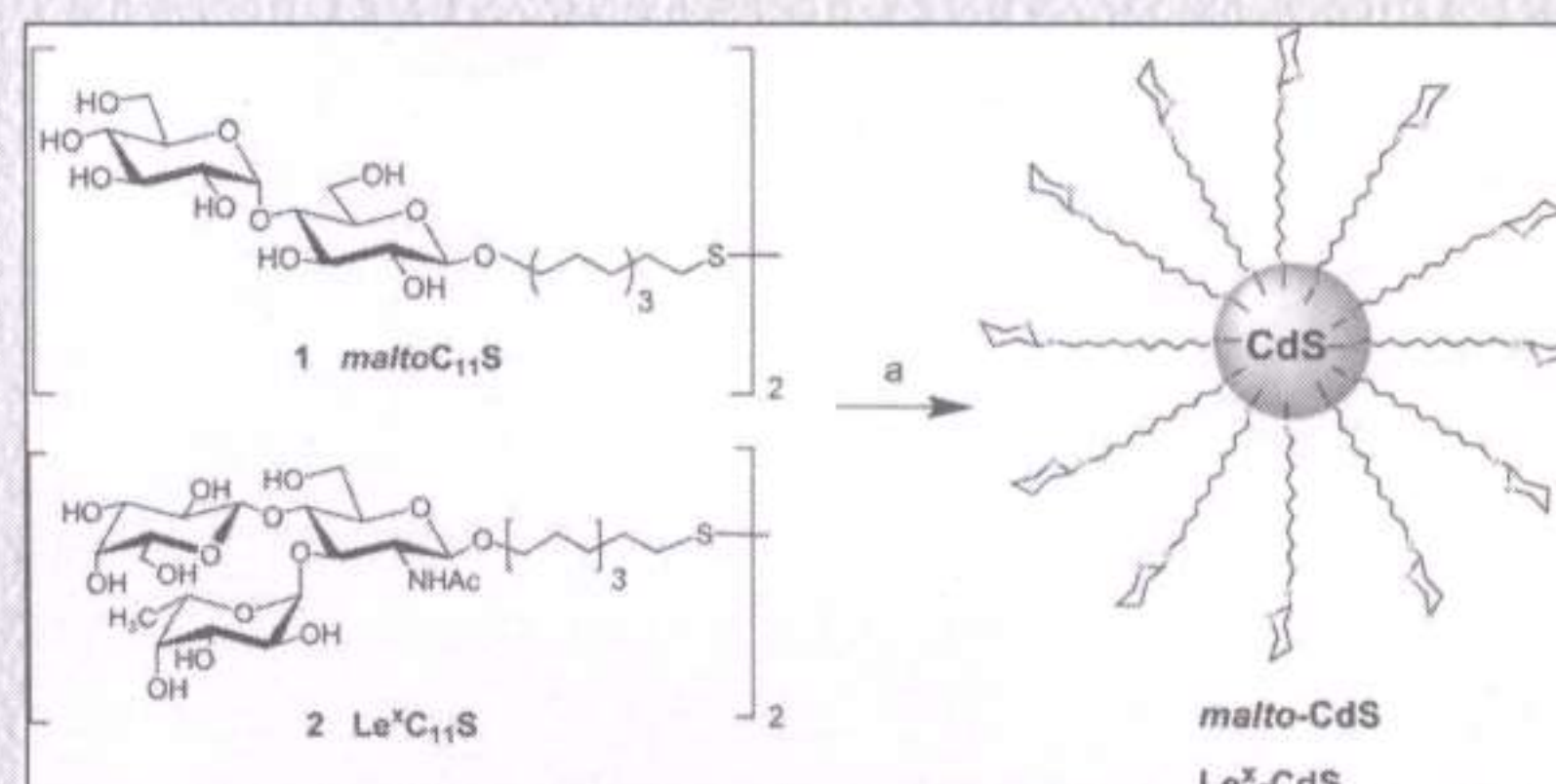
In particular in the last decade, with the development of green fluorescent protein (GFP) and rainbow of multicolored probes it is now possible to specifically label virtually any molecule and directly probe its function in live cells by light microscopy. This ability to visualize, often for the first time, the dynamics of proteins in vesicles, organelles, cells and tissue has begun to provide new insights into how cells function in health and disease. Such work yield unique mechanistic insight by directly illustrating the complex spatial-temporal dynamics of fundamental cellular processes studied by many labs here including: mitosis, morphogenesis, polarization, T cell recognition, embryonic development, membrane trafficking, and cytoskeleton dynamics.

Semiconductor nanoparticles of nanosized dimensions (quantum dots) are powerful fluorescence probes, which emit light at a variety of precise wavelengths with the exact color mainly depending on the dot size. These quantum dots are about 100 times more stable against photo-bleaching as organic dyes, and often reveal a long fluorescence lifetime. These properties have been a challenge for producing QD-bioconjugates as fluorescent labels for in vitro and in vivo cellular imaging. There are several approaches for the coupling of biomolecules to semiconductor QDs. There are several techniques for quantum dot synthesis. Quantum dots bio-conjugated to peptides and proteins, antibodies, DNA, and other molecules have recently been prepared mainly by coupling the biomolecules to the thiol protected QDs and tested as biological markers.

Scientists from the Carbohydrate Group of Glyconanotechnology in Seville have reported an ingenious glyconanoparticle-based approach to developing bioactive fluorescence probes for specifically labelling carbohydrate

cell receptors. Using a novel single-step solution procedure to synthesize the carbohydrate nanoparticles numerous problems related to coupling biomolecules to semiconductor Quantum dots has been solved. Ultimately, the UK-based Midatech Group of Companies behind this new technique aims to create water soluble, stable and biologically active Quantum dots for use in in-vivo and in-vitro screening and therapeutic techniques.

Penades et.al. have used disaccharide maltose (Glc1-4Glc) (1) and the trisaccharide antigen LeX (Galb1-4[Fuca1-3]GlcNAc) (2) for nanocrystal preparation. The process involves addition of Ar degassed water solution of sodium sulphide to a Ar degassed water solution of Cd(NO₃)₂·4H₂O and the above sachharides 1 and 2 separately at pH 10, maintained by 0.1M NaOH. The glycoconjugates were purified by centrifugation process.



Cadmium-Sulphur cores which are powerful fluorescent probes emitting light at a variety of precise wavelengths depending on the dot size, surrounded by a covalently attached shell of specific carbohydrate chains. These glyco-QDs present the carbohydrate antigens in a three-dimensional and polyvalent array conferring biological specificity. As such they provide a customisable tool for visualising and investigating the antigens involved in cellular adhesion and potentially other biological phenomena.

Midatech is developing these glyconanoparticles with the aim of creating specific probes for diagnostic purposes, and also to develop carriers for therapeutic agents destined for particular cells.

References :

1. Glyco-quantum dots: a new luminescent system with multivalent carbohydrate display. JM de la Fuente, S Penadés. Tetrahedron: Asymmetry 16 (2005) 387-391
2. Gold Glyconanoparticles as Building Blocks for Nanomaterials Design. TC Rojas, JM de la Fuente et al. Advanced Materials 2002, 14, No.8 April 18, 585-588

"You can not climb the ladder of success with your hand in your pocket"

Secretary's report on the CARBO XXI held on 26-29 November 2006 at Department of Chemistry, University of Delhi

Undoubtedly the biological and medicinal importance of carbohydrates and glycoconjugates is firmly established, but many of the molecular details of how these complex compounds mediate their functions are still not well understood. Unraveling these molecular interactions is complicated by the fact that technologies for synthesis and study of complex carbohydrates are not as well-developed as for nucleic acid and protein chemistry. For example, there are no convenient methods for sequencing the structure of complex carbohydrates. Furthermore, it is extremely difficult to isolate well-defined oligosaccharides from natural sources. The latter problem is compounded by the fact that the chemical synthesis of complex carbohydrates is much more complicated than that of peptides and oligonucleotides. On the other hand, the glycosidic linkages of oligosaccharides are flexible and there are no robust methods to characterize their conformations, which address yet another important issue in this area. Problems of this magnitude can only be addressed by bringing scientists from different disciplines at one platform to develop an integrated approach to resolve specific problems in carbohydrate chemistry. Thus, the main aim of the conference on Recent Developments in Carbohydrate Chemistry was to bring together scientists from different disciplines, such as synthetic chemistry, carbohydrate chemistry, nucleoside & nucleic acid chemistry, glycobiology, medicinal chemistry, material science utilizing carbohydrates as backbone, carbohydrate-based fuel technology, drug delivery, etc., to assess progress and explore new areas of research by taking advantage of modern scientific developments.

Leading scientists from India and abroad working in the above-mentioned areas were brought together in the conference for three-days, where they propounded expert opinions in different scientific disciplines. The scientific deliberations of the conference had been divided into ten technical sessions of oral presentations and two sessions of poster presentation. In total, 7 plenary lectures, 24 invited lectures, 3 short lectures and 12 oral presentations were delivered under ten technical sessions and 58 posters were presented during two poster sessions during three days of the conference.

The keynote address to the Conference was delivered by one of the most renowned and celebrated Indian scientists, Professor Goverdhan Mehta, who brilliantly spoke on the excellent synthesis of unnatural carbohydrate molecules and gave a good impetus to the conference for rest of the days. The very first invited lecture was delivered by Professor Jesper Wengel who talked about the importance of Locked Nucleic Acids (LNAs) having modified bicyclic sugar moiety. The focus of Professor Wengel's talk was on the use of LNAs for the efficient gene silencing and development of nucleic acid-based therapeutics. Further, Professor I. S. Aidhen highlighted the synthesis and importance of 2'-deoxy-C-aryl nucleosides as molecular

probes for understanding of electronic and steric factors during DNA recognition phenomenon by enzymes. Professor Aidhen discussed his experience regarding the unusual reactivity of carbanions formed during nucleoside synthesis. Later, chemo-, regio- and stereoselective synthesis of protected nucleosides and carbohydrates using biocatalysts was well presented by Dr. Y. S. Sanghvi.

There were speakers in the conference who threw light on the areas such as synthesis of complex carbohydrate molecules and chemical biology of sugars. Prominent scientists like Dr. M. K. Gurjar, Professor C. P. Rao, Professor Rainer Haag, Professor V. S. Parmar, Professor A. Surolia, Dr. J. S. Yadav, Dr. R. P. Tripathi, Dr. N. K. Khare, Dr. B. S. Dwarakanath, Dr. Ram Vishwakarma, Dr. Chitra Mandal, Dr. Srinivas Hotha and Dr. Arun Sinha spoke about the structure and synthesis of biologically active sugar-based natural products and about biological functions of carbohydrates and their derivatives. They stressed on the tremendous challenges presented by the theme of the conference and to realize the full potential of the research capacities in India focusing on subjects of great national importance. Their ideas and creativities served as a basis for very fruitful discussions at the conference. Professor Rainer Haag from Germany actively participated in the conference and discussed the sugar-coated nano-carriers which could be used for the transport of metal nano-particles and DNA into cells especially for the uptake of anti-tumor drugs. Professor C. P. Rao presented the development of C-1 modified carbohydrate derivatives in order to study their chemical, structural and biological aspects that may influence the understanding of lectins and glycosidases.

Another important issue related to the NMR characterization of complex polysaccharides was raised by Dr. Suddham Singh and Dr. Saddik Motawia, who shared their experiences in this regard. Professor T. Pathak and Dr. N. G. Ramesh showed the extensive synthetic application of Michael acceptors derived from carbohydrates and glycals as chiral building blocks for enantioselective synthesis of a variety of natural and biologically important compounds. Professor N. Jayaraman showed the glycal route to 2-deoxysugar oligomers and septanosides. Professor D. Loganathan shared his knowledge on systematic x-ray crystallographic examination of several ?-1-N-acylamidoglycopyranoses in order to obtain a better understanding of the structural significance on the linkage region constituents of n-glycoprotein models and analogs. The importance of carbohydrates is steadily growing due to the increasing implementation of biotechnological processes in chemical industries. In this aspect, Dr. A. J. Varma and Dr. S. N. Moorthy emphasized the industrial importance of carbohydrates. Dr. Varma talked about 'carbohydrate economy', its future prospects and business opportunities from plant biomass like lignocellulose, cellulose, hemicellulose, etc. In continuation, Dr. Moorthy stressed

on the use of natural polymers like starch as source of energy and its use as industrial raw material. Dr. C. Cowden from USA and Dr. Pierre Jung from Switzerland highlighted the efficient and practical synthesis of a hepatitis-C virus polymerase inhibitor and crop protection agents. Dr. Vasudeva Singh presented an account of changes in thiamine content in different forms of parboiled rice together with other important studies on different rice variety.

More than 300 delegates from various R & D organizations, universities and industries attended the conference. The conference provided a forum for students, junior faculty members, and also for those new to the area

to integrate themselves into the glycoscience (carbohydrate chemistry, carbohydrate biochemistry and glycobiology) community. After four days of scientific sessions, the conference came to a successful end with concluding remarks by many learned speakers, who expressed their appreciation of the contribution made by the conference to progress towards 'Carbohydrate Research' which was strongly supported by the young researchers from different parts of the country.

Prof. V. S. Parmar
Prof. Ashok Kumar Prasad

Life Time Achievement Award

The Association of Carbohydrate Chemists and Technologists of India (ACCTI) is privileged to honour the most successful chemists, biologists and technologists in the country who are working in the field of Glycoscience. Recently, **Prof. Harikrishna C. Trivedi**, the Vice Chancellor of Bhavanagar University, Gujarat, was awarded the Life Time Achievement Award for the year 2006 at CARBO XXI held at Chemistry Department, University of Delhi in Nov. 2006.

Prof. Trivedi received his Ph.D. degree in 1976 in Polymer Chemistry from Sardar Patel University, Vallabh Vidyanagar. He joined Chemistry Department of Sardar Patel University as a Lecturer in 1973 and worked as Reader from 1980 to 1988. He was appointed as Professor of Physical/Polymer Chemistry in the same University in 1988. He also worked as Head of the Chemistry Department of Sardar Patel University from 1996 to 2001. Since June 7, 2006, he is on lien from Sardar Patel University and he has been working as the Vice-Chancellor of Bhavnagar University, Bhavnagar, since then.

He received Hari Om Ashram Prerit Bhaikaka Inter University Smarak Trust for the best research papers six times in the subjects of Chemistry/Industrial Polymer Chemistry/Microbiology/Biochemistry. He was also awarded Commonwealth Academic Staff Fellowship from British

Council, UK for the year 1990-91. The American Biographical Institute, Inc. USA has conferred him with an honorary appointment to the Research Board of Advisors, since 2003. He has published more than 75 research papers in various aspect of Polymer Chemistry in National/International journals of repute. Thirteen students received Ph.D. degree under his guidance and eight students are presently working for their Ph.D. degree. He has successfully completed five major projects funded by different agencies. He is associated with ACCTI since 2000. Recently, he was awarded Shiksha Rattan Puraskar by India International Friendship Society at a function held in Mumbai on 9th June 2007. His main research fields are - a) Studies in Polyelectrolytes b) Solution Properties of Polymers c) Graft Copolymers of Natural and Renewable Polymeric Materials and d) Synthesis and Characterization of glass-fibre and C-fibre Reinforced Composites.

Earlier recipients of Life Time Achievement award by ACCTI were, Prof. N.K. Mathur, Retd. Professor, Jodhpur University, Prof. N. Roy, IACS, Kolkatta, Dr. K.R. Bhattacharya, CFTRI, Mysore, Dr. V.P. Kapoor, NBRI, Lucknow, Dr. P.L. Soni, FRI, Dehradun, Prof. Anakshi Khare, Head of the Chemistry Department, Lucknow University and Prof. Bishnu P. Chatterjee, IACS, Kolkatta.



Honour / Awards

Prof. B.P. Chatterjee, the former president of ACCTI, was awarded Life Time Education Achievement Award in 2006 by Health and Education Development Association, Delhi on 30th April 2007. He also presented an invited lecture in Molecular Immunology of Complex Carbohydrates - 3 at Taipei from July 8-12, 2007 and also invited to chair a session on Glycobiology of Cancer in XIX International Symposium on Glycoconjugates in Cairns, Australia from July 15- 20, 2007. He was also elected as President of Jatiya Vigyan Parisad, Kolkata.

Dr. P.L. Soni, President, ACCTI was honoured by UDCT, Mumbai by giving away Dr. B.R. Tilak visiting fellowship and invited to deliver a talk on carbohydrates with special reference to having new applications in food. He delivered a talk on 5th March, 2007 covering new methods/ technology for the production of Tamarind Kernel polysaccharides which he called as a pectin replacer and production of Food fibre from cassia tora and guar gum splits. Audience were faculty and students of Food and Fermentation Division of the BUDCT.

Dr. Anup K. Mishra, CDRI, Lucknow, has received DST Ramanna fellowship (2007-2010) of Rs. 33 lakh research grant and Rs 5000/month fellowship for three years. Also received CSIR Young scientist award 2005 in chemical sciences.

Prof. Rekha S. Singhal, ICT, University of Mumbai, a few of her research papers in **Carbohydrate Polymers** have been in Top 25 over last one year. All these are related to food applications. These papers are: "Microencapsulation of cardamom oleoresin: Evaluation of blends of gum arabic, maltodextrin and a modified starch as wall materials", "Specialty starches for snack foods", "Stability of cumin oleoresin microencapsulated in different combination of gum arabic, maltodextrin and modified starch", "The use of gum arabic and modified starch in the microencapsulation of a food flavoring agent".

Dr. Hasi Das, IGIB, Delhi is the recipient of the P.A. Kurup Endowment Award for the year 2007, based on recommendations of the awards committee and the executive committee of the society of Biological Chemists, for her contributions in the field of biomedical sciences. The work was on Rheumatoid Arthritis, a disease related to altered glycosylation of proteins. She was also invited abroad for presenting her work on Rheumatoid Arthritis at the international symposium organised at Georgia State University, Macon, U.S.A. during March 19-23, 2007.

ACCTI YOUNG SCIENTIST AWARDS - 2006

To encourage young students, the Association of Carbohydrate Chemists & Technologists (India) gives a cash award of Rs. 1000.00 (Rupees one thousand only) and a citation for the best oral/poster presentation at the 'Carbohydrate Conference' every year. Only research scholars, research associates etc. (below the age of 30) are eligible for this award.

At the XXI Carbohydrate Conference, held during 26-29 November, 2006, at the Chemistry Department, University of Delhi, paper entitled; 'A Rapid Stereoselective Synthesis

of Modified C-Nucleosides of Indoles and Pyrrole' by Debraj Mukherjee, Sujit K Sarkar, Uday S. Chowdhury and Subash C. Taneja was judged as the best poster presentation. The paper entitled 'Studies on the O-antigenic Polysaccharide Isolated from the Lipopolysaccharide of *Vibrio parahaemolyticus* O3:K6' by Koushik Mazumder and Asish Kumar Sen was judged the best oral presentation.

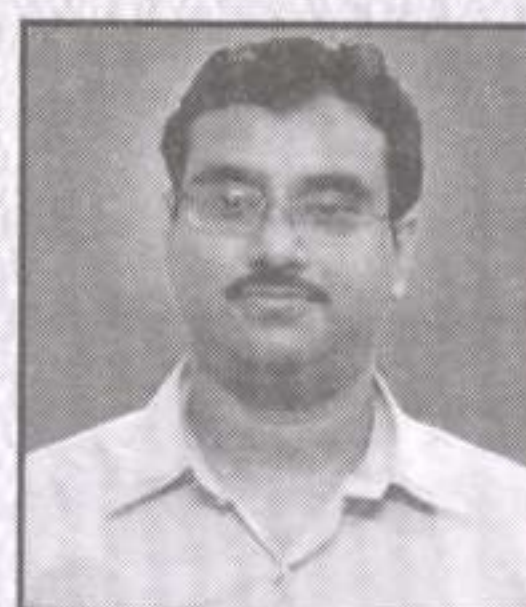
We express our heartiest congratulation to Dr. Debraj Mukherjee. and Mr. Koushik Mazumder.



Debaraj Mukherjee is presently working as scientist B at the bio-organic chemistry division of Indian Institute of Institute of Integrated Medicine (IIIM), Jammu India. In March 2006, he has submitted his Ph.D. (Science) at Jadavpur University on "Synthetic approaches to biologically active carbohydrate compounds and analogs" under the joint supervision of Dr P Chattopadhyay and Dr. U. S. Chowdhury, in the Medicinal Chemistry department of Indian Institute of Chemical Biology Kolkata, India.

He obtained B.Sc(Chemistry Hons.) and M.Sc.(organic Chemistry) in the year 1997 and 1999 respectively from Calcutta University and cleared C.S.I.R NET(JRF) on 2000 in Chemical science.

He had been selected for the prestigious DST award for participation in the 52nd meeting of Nobel Laureates and students in Lindau Germany in July 2002 and represented India during interaction with 19 laureates in the field of Chemistry and related subjects. He had also visited various research institutions in Germany in 2002 sponsored by DFG. Apart from his academic excellence he likes to play table tennis, chess, tabla and listen to good music.



Koushik Mazumder is presently working as CSIR-SRF at the Indian Institute of Institute of Chemical Biology, Kolkata. In the department of Organic Chemistry (Carbohydrate). Very soon he is going to submit his thesis on "Bacterial polysaccharide-structure and synthesis" under the supervision of Dr. Asish Kumar Sen, at the Jadavpur University, Kolkata.

Koushik has excellent academic record through out his carrier. He obtained B.Sc. (Chemistry Hons.) and M.Sc. (Organic Chemistry) in the year 1999 and 2001 respectively with 1st class from the Presidency College under the University of Calcutta.

Apart from his academic excellence, he likes to play cricket, football and listen to good music.

MS. LUCID COLLOIDS LIMITED AWARD - 2006

To encourage research on hydrocolloids, Ms. Lucid Colloids Limited, Mumbai, offers a cash award of Rs. 5000.00 (Rupees five thousand only) and a citation for the best paper presentation on hydrocolloids since 2003. At the XXI Carbohydrate Conference, held during 26-29 November, 2006, at the Chemistry Department, University of Delhi, the paper entitled 'Evaluation of Enzyme Modified Cassava Starch as a Potential Tablet Binder' by Cijo Issac, S. Shanavas, S. N. Moorthy, M. S. Sajeev and C. R. Sudhakaran Nair, was

selected for the award. We express our heartiest congratulation to Mr. Cijo Issac



Cijo Issac is presently working as senior research fellow in the ICAR sponsored project "Potentialities of Tubers Starches in Tablets and Capsules " at Central Tuber Crops Research Institute(CTCRI), Thiruvananthapuram. This project is in collaboration with College of Pharmaceutical Sciences (COPS), Medical College, Thiruvananthapuram. He is working for his doctoral

program under the guidance of Dr. C. R. Sudhakaran Nair (Prof & Head, College of Pharmaceutical Sciences, Thiruvananthapuram) and Dr. S. N. Moorthy (Principal Scientist, CTCRI, Thiruvananthapuram).

Cijo has an excellent academic career with a first class throughout. He obtained his B. Pharm. in 2001 and M. Pharm. (Pharmaceutical Technology) in 2004, from the College of Pharmaceutical Sciences, Thiruvananthapuram. Besides studies, Cijo takes active participation in playing chess, reading, music, movies, meeting people and making new friends.

Norms for conducting the National Carbohydrate Conference in collaboration with the Association of Carbohydrate Chemists & Technologists (India)

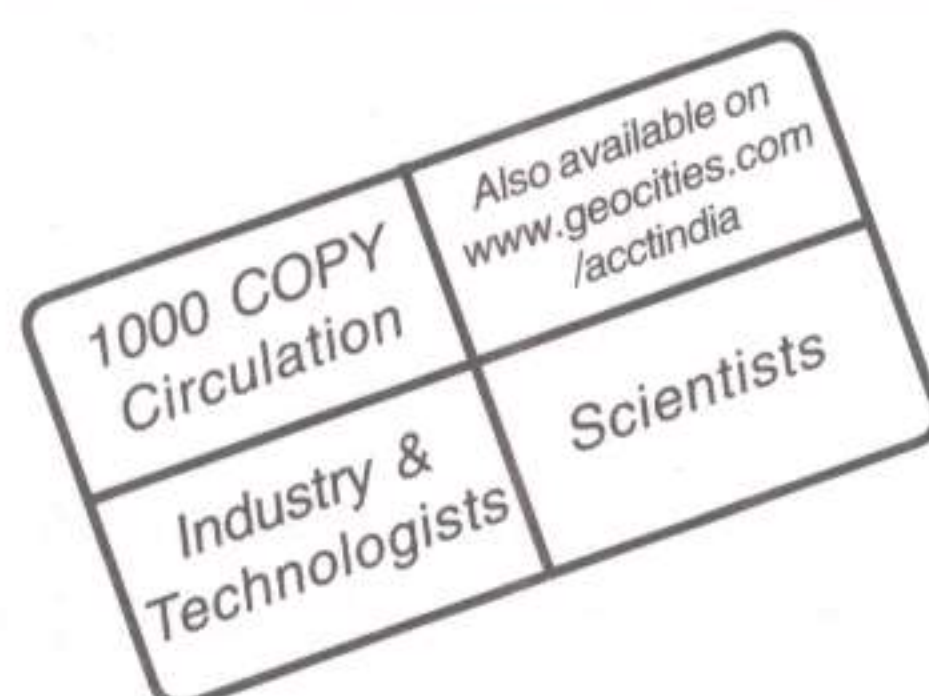
1. The conference is organized by a host Institute/ University in collaboration with the ACCT(I). The host Institute is selected at the G.B. meeting of the Association.
2. Organization:
 - a. Time of the conference is usually November-December every year.
 - b. The first circular is issued by ACCT(I) in April/ May. The host Institute circulates the second circular. A mailing list is available with the Secretary.
 - c. The local organizing committee is formed by the organizers.
 - d. National Advisory Committee is also formed by the organizers but the present president and secretary should be a part of it. The organizers are requested to include eminent scientists from all disciplines. The 'Patrons' of the conference are normally the head of the govt. agencies/ institutions (with prior consent from the persons concerned).
 - e. The registration fee should be finalized after consultation with the Secretary/President of ACCT(I).
 - f. The organizers should remit 10% of the total expenditure to the ACCT(I). The accumulated money will be spent by ACCT(I) for betterment/ appropriate functioning of the ACCT(I)..
 - g. No registration fee should be charged from retired ACCT(I) members and local hospitality should be made free to them (GB amendment).
3. Inaugural Programme should be made as short as possible. Both the President and Secretary of ACCT(I) should be on the stage and should speak on general aspects and the activity of the Association for about 15 min (in all).
4. Scientific programme and presentation of papers:
 - a. A scientific committee should be formed which will evaluate the quality of the papers. ACCT(I) strongly recommends strict evaluation of the papers for oral presentations, strictly adhering to the theme/objectives of the conference.
 - b. Young researchers (especially students) should be encouraged to give oral presentation for 10 min. (GB amendment). However, if there are a large number of papers, then posters can be arranged (scientific committee to decide).
 - c. At least four hours should be given for the presentation by the students (one or two sessions).
 - d. The organizers are requested to restrict the number of plenary (one per day maximum) and invited lectures (two per session, maximum) and should be selected strictly on the basis of the quality of the work in the field of carbohydrate chemistry and related subjects. ACCT(I) feels that only through proper and justified selection of quality research work, the standard of the conference can be raised and ACCT(I) is committed to that, specially when we are looking forward to International Carbohydrate standards.
 - e. One session should be dedicated to Starch, Cellulose and industrial polysaccharide (at least two hours). There should an interactive session with the industrialists/participants from industry (about an hour).
 - f. Sufficient time must be allotted for the poster session as the judges has to go through all the posters for proper evaluation.
4. Awards:
 - a. Lifetime achievement award (to be decided by ACCTI) ceremony should be part of the inaugural programme. The award will be given away by the president and secretary of the Association. The representative of the sponsor/s will also be present. About 30 min should be allotted for the whole programme.
 - b. There are two awards for the best paper presentation by students/scientists (below 30 years). Since there are both poster and oral presentations, a clear announcement should be

made (in the 2nd circular) about the policy of selection of best presentation, to avoid confusion. The organizers may straight away select 15 best papers for oral presentation (students) and five more from the poster session (on the recommendation of judges). From these 20 oral presentations, best two will be selected by judges.

- c. The organizers are requested to form a competent selection committee/s in consultation with the President/secretary/Jt. secretary of ACCT(I) (comprising of scientists from different branches of glycobiology/carbohydrate chemistry /industrial polysaccharides etc.) to evaluate the poster/oral presentations.
 - d. The nomination for the Lucid Colloid Award is decided by the representative of the Lucid Colloid group, Mumbai. However, the company should apprise the committee before finalization in order to keep the standards uniform with other awards.
 - e. The ACCT(I) awards [the citation and cash awards is arranged by ACCT(I)] must be given away at the concluding session (about 15 min time will be required) of the conference by the President and Secretary of the Association. The Lucid Colloid award is given away by the company representative.
5. Financial support:
ACCT(I) only provides a token financial support.

However, the Industries and the Govt. funding Agencies (DST, DBT, CSIR, ICMR, INSA) normally give adequate support every year. Application must be made at least 3-4 months before the date of the conference. The organizers are requested to take appropriate measures in this regard.

6. The organizers must submit the proceedings of the conference and audited financial report (by a registered chartered accountant) to the Secretary of the Association by the month of March next year.
7. Every year, the General Body meeting of the Association is held in the evening of the first day of the conference. All members of the Association present in the conference attend this meeting. However, we cordially invite all the participants and guests to attend the meeting. Normally two hours is required for the meeting. The organizers are requested to make the necessary arrangement.
8. The organizers are requested to arrange accommodation for all the EC members in the same complex if possible. An EC meeting may please be arranged by the organizers in the evening before the day of the conference.
9. The organizers are requested to keep the Secretary of the Association informed about the progress of the arrangements. The organizers may contact the Secretary / President of the Association if they have difficulty.



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Put your hand on hot stove for a minute, and it seems like an hour. Sit with a pretty girl for an hour and it seems like a minute. That's is theory of relativity by Einstein.

EXECUTIVE COMMITTEE MEMBERS (2007-2008)

The new executive committee members for the years 2007 & 2008 were elected by the General Body in the GB meeting of the ACCT(I) held on 26th November, 2006 at the XXIst Carbohydrate Symposium (Delhi University).

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Ordinary Member: Carbohydrate Chemists of eminence in India & abroad.
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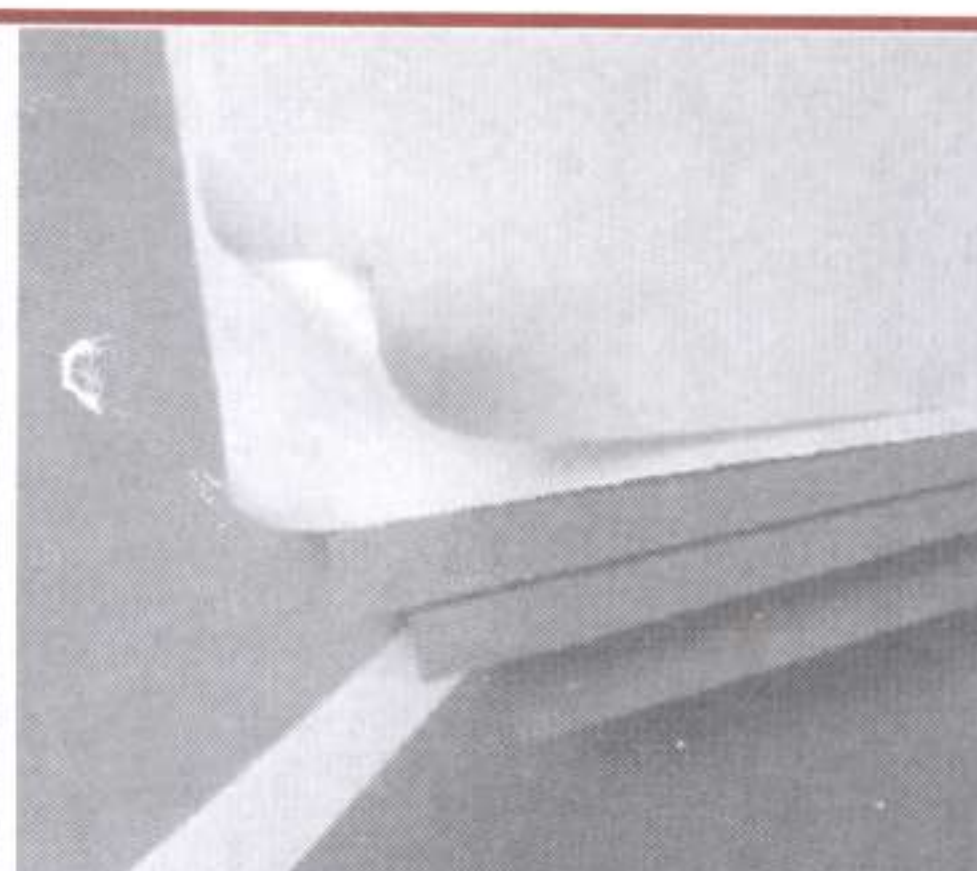
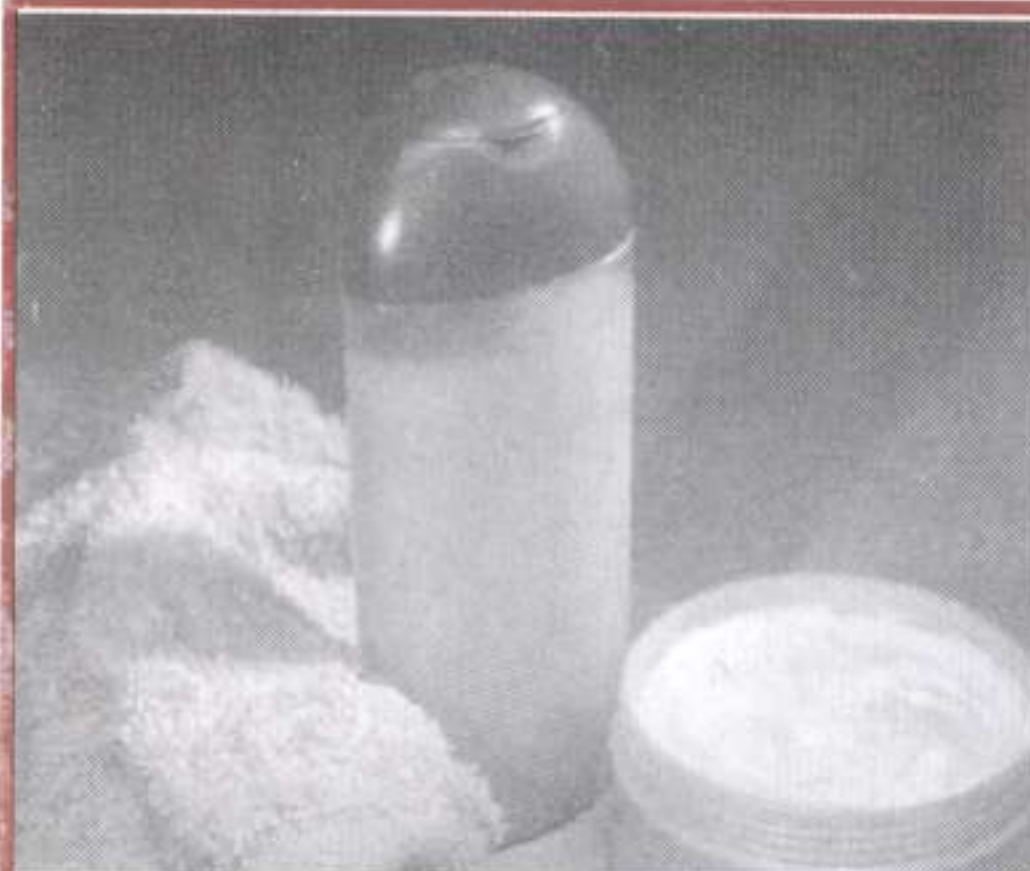
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