

special and expensive apparatus and difficulties in matching to pattern.

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Life on American University Campus

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IT was early spring when I first arrived on a mid-western American campus. The weather was still chilly, the trees were regaining foliage and the green grass was just growing on the big spacious lawns. The first impression of the campus life was quite exciting. Hundreds of boys—tall and husky and wearing those typical zipper-jackets—and girls—smart and good-looking and covered with bright coloured spring coats were moving hurriedly, with big bundles of books in their hands, from Department to Department at the end of every hour. I still remember some of the remarks which I could overhear while I was taking a stroll on the College campus. "No Bob I can't very well make it. I have a test tomorrow", or "Jee wizz Sallie! for heaven's sake how can I go out with Dick this evening? I have got to finish my home-paper tonight." I was wondering why these college kids were worrying so much about their studies at the beginning of the

term. In India I was used to a habit of dusting off the books at the end of December and start preparing for examinations coming two or three months after. As I started my graduate work, I soon realized that the entire American system of education is quite different than one I had been used to in India.

I soon learnt that this mid-western campus is a self-contained University town. On this campus there are different Departments or Colleges such as, Chemical Engineering, Chemistry, Physics, Mathematics, Botany, Zoology, Agriculture, Bacteriology, Metallurgy, Engineering, Home-economics, Statistics, Architecture, Journalism, Music, etc., most of them of scientific subjects as this University is for science and mechanic arts. There are also dormitories (Hostels), fraternities and sororities (these are residential clubs for boys and girls, respectively, organized on membership).

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basis), Y.M.C.A. and Y.W.C.A. buildings, International House which is the main centre of activities of the foreign students on the campus, college dispensary and press, radio and television stations organized by the college authorities, play-grounds, gymnasium, swimming pools, tennis courts, golf course and Memorial Union.

This Memorial Union is a big institution, organized by the alumni (past students) and college authorities, and it serves a multi-purpose in the college life. It is a gorgeous building, four floors high and situated on a small hill in front of a lake, which is used for winter-games and skating during the winter. In this Union there is a big dining-hall, a cafeteria, a snack-bar, a special dining department, several small rooms for coffee-forums and meetings; lodging accommodation for the guests of the students and for alumni, a great hall for big functions and spacious lounges with floors covered with expensive carpets, walls decorated with lively portraits of the famous personalities associated with the college organization and the space furnished with couches and sofas to rest at off-hours. Bowling, table-tennis, bridge, checkers, chess and music are enjoyed by hundreds every day. Coffee-forums, book reviews, panel discussions, conferences and other activities in the Memorial Union help to make the campus life a great experience. Food and drinks are served here at cheaper rates than outside, and especially the dairy products because these are directly supplied by the Dairy Department of the University. This mid-western University has over 1500 acres of land, with about 400 acres of campus, and 100 acres of farm land for agricultural experiments.

This is typical of the American campuses, excepting those in the big cities like New York, Chicago, Philadelphia, and others where the different schools are crowded together with very little

open space around. There are well over hundred such campuses in America and the total number of students enrolled is about 2.5 millions. The enrollment in our University was about ten thousand and this number varies with different Universities from ten to forty thousand. The New York and California Universities have reached the highest figures.

Academic year in our school (in America the term school is used for high schools and colleges as well) is divided into four quarters—Fall, Winter, Spring and Summer; in many other schools the year is divided into Winter and Spring semesters and a Summer session. Generally, schools start in late September. First thing a student who wishes to join an under-graduate school (officially called College) has to worry about is the entrance examination in English composition, mathematics and any elective subject. After passing this test, he has to consult one of the under-graduate students' advisers to chalk out his college academic programme. The under-graduate course consists of four years—Freshman, Sophomore, Junior and Senior. A student has to earn about 125 points for credits (one point is about one hour's work per week, e.g. a chemical engineering course given in these lectures per week will carry about 3 points) and in addition to this he has to earn 50 maturity credits which will be useful to him for his future profession or graduate studies. There is a great flexibility and a wide choice in this system. A student majoring in chemistry or physics, after taking the necessary courses essential for his major field of studies can also take courses in music, dramatics or humanitics. Besides these credit-courses there are also *P*(for pass). Credit-courses such as courses in typing, swimming, glass-blowing or motor-driving etc. which add to students' qualifications but may not give him any extra points. After two years' work a student can change his field of studies without losing many of his credits. Students who complete

their specified course work with average C grade are declared eligible for a bachelor's degree, and from among the graduate applicants who get fairly high grades are admitted to the graduate school (generally referred to as University). A college education in the U.S.A. is not limited to the privileged few. The cost of attending college varies, but it is not excessive, especially at the State-supported colleges. Ours being a State college, it charged nominal fees for tuition and dormitories to the residents of the state. Also there are many opportunities for students to obtain part-time employment, or to get scholarships, departmental assistantships, grant-in-aid and loans. Since there is a dignity of labour in America, there is no stigma attached to a student who serves as an elevator boy, a waiter or a gardener during his spare time. One can see on the campus a large number of students working their way through College.

Once a student is admitted to the graduate school, the first thing he has to do is to meet the graduate students' adviser in the Department concerned, and discuss with him, his graduate work. The adviser and also the research guide, taking into account the background of the student, advise him to take courses necessary for his particular field and to supplement his studies by taking additional courses according to his choice to make up his load. In our University a student had to earn 45 credits for his M.S. out of which 15 were for research and at least 100 credits for his Ph.D. Although the number of credits officially allotted to research is small it is generally seen that the research student carries out his research problem to a satisfactory conclusion. The actual course-work and the research credits to be completed for any post-graduate degree vary in detail in different schools, but the general pattern of the studies is the same.

Let me elaborate this with a specific example. Suppose a student joins the Chemistry Department with a view to major in organic chemistry. First he has to pass a qualifying examination in organic, inorganic, analytical and physical chemistry in three attempts. Side by side he can start his course work in advanced chemistry. Courses open for organic chemistry students are—reaction mechanism, chemical kinetics, synthetic chemistry, alkaloids, steroids, natural products, identification of organic compounds, elementary quantum mechanics, thermodynamics, etc. Similarly, a chemical engineering student can make up from advanced courses in mass transfer and heat transfer operations, pyrometry, furnace design and construction, plant design, powder metallurgy, etc. Besides these courses there are departmental colloquia and seminars. Every research guide also holds seminars, once in a week for his research group; however any student is welcome even to these group seminars. In American Universities this course and seminar system has provided knowledge for all, and whether a student works with a renowned professor or a budding scientist, it makes very little difference as regards learning, as long as these avenues of knowledge are open to all. Furthermore, a research student becomes sufficiently matured in his field to carry out his research with minimum of supervision or guidance.

After completion of his course-work a student has to appear for a comprehensive examination, which consists of about three hours' examinations in each of the major subjects. Finally, after termination of his research, the student has to write up his dissertation, in consultation with his guide and again appear for an oral or *viva* before a committee of at least six members, out of whom two professors are necessarily from the other departments. This examination lasts for two or three hours, and any sort of questions, relevant or irrelevant, are asked of the candidate. An unanimous

decision of the members decides the fate of the candidate. Occasionally, a candidate is asked to rewrite his thesis if it is not well presented or a candidate is declared as passed, but he is advised to carry out more research to satisfy certain members.

In American Colleges, the examination system is altogether different from what we have in Indian Universities. American system is a direct one; a student has to give several examinations in each course taught during a semester. In addition to these he is assigned library and home-work. In a graduate course there is at least one examination after every three weeks and at the end of a semester there is a final examination. Average scores at all the examinations decide the final grade in that particular course. Examinations fall into two categories—a quiz and a test. A quiz is a short examination consisting of simple but tricky questions. In a quiz which is held at the beginning of a lecture, a Professor, without any previous notice, writes a few questions on the board. Each of the students has to give written answers within a few minutes. After this quiz, the Professor starts his usual lecture. On the other hand a test is a written examination of two or more hours and about which students are previously informed.

Because of this system in American Universities, a student has to be alert and be constantly working to keep up his grade. Moreover, a teacher is also the examiner and, therefore, he can modify his course and the teaching system according to his wishes and liking. For example, our analytical chemistry professor taught his course in so called "Aristotlean" way. He used to give reading assignment of a few pages from the prescribed book at the end of a period. Next period a selected few students had to go to the boards and each one had to write on the board a detailed answer to one of the questions

from the assignment. (By the way, there are blackboards all over the middle part of the walls of a class-room in America). The whole class, then, discussed the answers. Our inorganic chemistry Professor of almost seventy, however, followed a typical high school method. During his lectures he asked several questions. Students who knew the answers used to raise their hands, and the asked ones furnished the answers. Also this treatment of the subject was old-fashioned and it bore a testimony to his old age. He avoided the electronic concept of chemical bondings as distastefully as an elderly woman would avoid application of lip-stick suggested by her modern grand-daughter. Nevertheless, I enjoyed his lectures, although I had a hard time to follow his words coming out fast from his toothless-mouth, because he was extremely agile, energetic and enthusiastic in the class room. The organic chemistry professor, on the other hand, delivered lectures in a continuous style, giving due consideration to any questions raised by the class. No doubt, this privilege of freedom to teach and examine the students demands a high sense of duty, efficiency and hard-working capacity on the part of the teachers; and as I recall, I have never seen any misuse by the teachers of their responsibility.

There are also plenty of extra curricular and social activities on the campus to take away students for relaxation from their routine hectic college life. There are social dances, balls and banquets. Then, there are movies and college plays, in which the dramatic art and skill exhibited by the students are of a high order. Symphony orchestra, singing and band concerts, variety entertainments, picnics and socials, athletics and sports add fun and pleasure to the college life. As regards sports, football and basket-ball enjoy the most popularity. Especially, in the mid-western Universities, the football game of the college is a big function for the campus

residents and also for the farmers from the neighbouring villages. The enthusiastic fans mark the game days on their calendar as prominently as Washington's birthday or independence day. Americans like games full of excitement and thrill, and sunshine, rain or snow, their game schedule is never altered.

Thus the campus life in America is full of hard-work, entertainment and fun. American educated people are known for their efficiency and hard-working capacity and it is no doubt their education system has contributed a lot to these qualities.

RESEARCH COLLOQUIA

Investigations in the technical preparation of Caledon Jade Green

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CALEDON JADE GREEN (16:17-dimethoxydibenzanthrone) dyes bright, attractive, bluish green shades with excellent fastness. On this account it is an out-standingly important vat dye. It is also the costliest among vat dyes. "Every year India imports approximately 50,000 to 60,000 lbs. of Caledon Jade Green at an average cost of Rs. 100/- per lb."¹ A preliminary cost calculation based on the I. G. processes indicated the feasibility of its economic manufacture in India. The present work was undertaken to investigate and standardise the conditions of technical preparation of this dye.

The different steps involved in the preparation of dimethoxy-dibenzanthrone starting from technical anthraquinone (98 to 99% pure) were first carried out on a small scale, following the processes described in reports on IG industries² and other patent literature.³ These processes were studied and modifications to suit local conditions were effected wherever necessary. The preparations were

then repeated on a larger scale in the pilot plant house in batches of 1 to 6 lbs.

The dye, prepared under optimum conditions, matched with the commercial ultraconcentrated brand of Indanthrene Brilliant Green FFB. The results indicate that it is possible to undertake profitable manufacture of Caledon Jade Green in India even on a moderate scale, starting from imported anthraquinone.

A process for the preparation of dimethoxydibenzanthrone starting with crude benzanthrone instead of pure benzanthrone used in the above process is under investigation.

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