

My Journey in Pharmacology

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Choice of Pharmacology: In 1951 when I chose Pharmacology for PG postgraduate course, Professor Iswariah said, “He must be a mad cap to select Pharmacology after securing 6 gold medals as best outgoing student of his batch”. In those days there was no stipend for PGs in clinical subjects; on the other hand they had to pay Rs.30/- pm for working as Senior Housemen. My father retired as Head Master the same year. With a family to support I could not afford to think of clinical subjects. Hence I joined as a Demonstrator in Pharmacology at Stanley Medical College and registered for MD. We had to pay Rs.200/- towards cost of chemicals likely to be used in research, pay for the animals, and any special chemicals. Post Graduation & Research is considered as personal affair. One Principal asked me if I took permission to work late in the Department. Another said that research is not part of the duty of staff and cannot be demanded. I took MD in 1952 at the age of 25.

Many chose Pharmacology out of circumstances. Sir Henry Dale, Nobel Laureate, was recruited by Burroughs Wellcome though he informed that “he had never heard a lecture or read a text book on Pharmacology and that he had nothing to offer”. Yet he was appointed “at a salary, which would make it possible for him to marry”.

Professor Iswariah was an ardent supporter of Therapeutics with Pharmacology. He introduced M.D. (Pharmacology & Therapeutics) in Andhra University with 2 examiners in Pharmacology, 2 in Medicine with a Practical in Pharmacology and a clinical examination in Medicine. At that time Professors of Pharmacology like Hardikar and Dr. MY Ansari at Hyderabad, and Dr. Ojha at Cuttack had clinical wards. I thought Pharmacology is not far from clinical medicine, a notion proved wrong later. MCI deleted ‘Therapeutics’ and clinical examination, from the MD degree. Subject of pharmacology is restricted to the first clinical year. ‘Therapeutics’ is still fondly used in Text Books of Pharmacology. A Postgraduate is disqualified in all other subdivisions of medicine except his specialty. No patients will consult a Pharmacologist. It does not mean that I disliked the subject. I liked it, loved it and lived by it.

I record here my personal encounters, en route, in my journey in the academic world which had its highs and lows as in any journey; but I can now look back with satisfaction at whole path I traveled.

Madras – Stanley Medical College

I joined as Demonstrator in Pharmacology, Stanley Medical College on 17-2-1951, 11 days before I completed house surgeon ship. Capt TR Krishna Murthy, Tutor and ASV Subba Rao Pharmacist were the other staff. Dr. Iswariah was Professor of Pharmacology for both Madras and Stanley Medical Colleges. He used to visit Stanley three days in a week to take lectures 8-9 am. We used to fear him for his direct remarks and respected him for his sudden appreciations. I registered for MD degree in Andhra University with him as my guide. There were no PG selections in those days and one can register from any where from a reputed Institution.

For my thesis I thought at first of indigenous drugs and selected Erythrina Indica (Baadida in Telugu, Mullu Murukka in Tamil) which is said to have neuro muscular blocking action. The technician brought from the market instead Coccus Indicus seeds! This contains picrotoxin

and hence discarded. After getting the correct Erythrina seeds, we attempted to extract the powder with petroleum ether in a Soxhlet apparatus. My colleague Mr. ASV Subba Rao instead of placing the flask in a water bath applied direct heat with a Bunsen burner. It caught fire. Fortunately he sustained only superficial burns on hand. I gave up the idea of extraction.

I was then attending evening classes for Diploma in German Language of Madras University in their Senate Buildings close to Presidency College (Marina Beach). One of my classmates in German classes took me to Professor TR Govindachari, Head of Chemistry Department in Presidency College. (He became later Director, CIBA Research Centre, Mumbai). When he learnt of my interest, he entrusted the extraction of alkaloids from Erythrina Indica to one of his PG students. I cannot forget his kindness and generosity. He supplied the alkaloid hypaphorine from his lab. But I could not find any neuromuscular blocking activity (curare-like) in experiments.

I changed my research topic to Antihistamines Mepyramine and Phenergan just then introduced by May & Baker.

Madras Medical College

I was selected as Temporary Civil Assistant Surgeon and posted to Madras Medical College as tutor in Pharmacology and joined on 20-9-1951. It was a 3 months leave vacancy of Dr. Ranjan David, son of Dr. JC David. Dr. Iswariah took me to Dean, Dr. RV Rajam. "This boy is a real assistant to me and not burden on my neck. He is afraid he will be transferred when Dr. Ranjan returns." Dr. Rajam replied 'Don't worry; Dr. JCD does not own the Department of Pharmacology'. I learnt method of chemical extraction of Alkaloids from the Department of Chemical Examiner, next door. The extraction of atropine from the Datura seeds was demonstrated to me. This has been helpful. However soon in November 1951 Dr. MN Guruswami returned from USA with MS (Michigan) and I was transferred.

Stanley Medical College & Hospital

I was posted as Assistant to Surgeon Ist District in Stanley Hospital. I thought I am posted to Surgery! The post was to look after the employees of Government Press and Public Workshop nearby. Dr. C. Raghavachari was the Dean and Surgeon, Ist District and very helpful. I applied for permission to work in Pharmacology Department of Medical College in the evenings to continue my research work. Dr. Raghavachari used to take marathon revision classes in surgery in the evenings before examinations, attended fully by students of both Madras & Stanley medical colleges. I adopted this pattern of revision classes through out my tenure as teacher.

I sincerely attended to my duties in Government Printing Press and found that the exhaust fans were not working for the previous 9 months in the lithograph department using molten Lead and staff exposed to lead vapors. In collaboration with Dr. Adi Subrahmaniam, Professor of Preventive medicine, I examined workers for lead toxicity - blood smears for basophilic stippling and urine for presence of lead and any renal damage. Fortunately no evidence was found and I assured Mr. Siddique, Superintendent of Govt. Printing Press of the same. He was relieved and thanked me, as he is answerable to the Factory Inspectors!

I was on night duty in casualty once a week in Stanley Hospital. I used to inject Mepyramine locally for scorpion sting with immediate relief. Is it anesthetic effect or antihistamine action or both?

In April 1952 Dr KP Sarathy became Professor of Pharmacology at Stanley Medical College and I was posted back as tutor in Pharmacology, Stanley Medical College. I used to work till late in the evening with an attender Ramanathan helping me. Once the Principal and Professor of Anatomy came round to the Pharmacology Department in the same floor and complemented me for working late till 8 pm. Then he asked if I took permission to work late in the Department. I applied and was given permission. At National Institute for Medical Research (NIMR), Mill Hill, London in 1958-59 I used to work till midnight! I could go to the Library and take books leaving a note on the Librarian's table. The librarian helped me to get a PhD thesis from France for reference. After my return in Kurnool Medical College, there was no restriction on times of work for research. Dr. HVK Bhatt used to work in the night to study sleep in dogs. All staff had a key and access to the key cupboard to open any part of laboratory.

Early contact with stalwarts in research:

In 1953, WHO arranged visit of several experts including Nobel laureates (Dr. C. Heymans -1938, Sir Alexander Fleming- 1945) to spend 3 weeks in the Departments of Stanley and Madras Medical Colleges; demonstrations during the day and lectures in the evening. Dr. C. Heymans (Belgium) demonstrated the carotid sinus mechanism in dogs with cross circulation anastomosing the carotid arteries of donor and recipient dogs. The cardiac end of carotid artery severed high in the neck of donor dog is passed through a 10 x 3 mm metal tube and everted over it. The cephalic cut end of carotid artery cut lower in the neck of the recipient dog is slipped over it and ligated intima to intima. Since this is an intima to intima anastomosis no anticoagulant was used. Bilateral occlusion of the carotid anastomosis produced elevation of blood pressure in recipient dog.

Dr. E. Lundsgaard (Denmark) demonstrated liver perfusion in dog. A large mercury filled glass 'U' tube was attached on one side to an artificial respiration pump and on the other to a circuit with glass valves to draw and pump blood providing a pulsatile flow into the hepatic artery. The blood from Hepatic vein was returned back into a 1 litre measuring cylinder containing saline. Oxygen was bubbled at its bottom. The incoming venous blood falls on the froth at the top and was immediately oxygenated, an artificial lung! By the time blood reaches the bottom of the cylinder it is completely oxygenated. This was drawn back by the pump to be delivered to the liver.

These stalwarts have shown that it is not the equipment but the approach that paves the way for good research.

I was selected by the Public Service Commission, but ranked lower than those with lesser college career. The Medical Directors, technical members of the Commission grade the candidates as though it is an examination, but the non technical members have different criteria. I was hurt to find that my brother with an MS (ENT) was not even selected! He went away to Central Health Services. Personal influence counts not merely in selection but also in ranks which stay like birth scars till the end, in government service. Once during University Practical examinations in Pharmacology PSC Member came to the examination hall and sent in his card to Dr. Iswariah. Dr. Iswariah was furious. He came out and told him 'I know who you are and what for you have come. First get out of this place. If any of my applications come to you, you turn them down!' Those were the strong ethics of doctors who defied Service Commission Members.

I submitted my MD thesis 'Antihistamines and Procaine compared' which was appreciated by Dr. Iswariah - 'It is like a PhD thesis'. It was published as two papers 1. Local and Spinal Anaesthetic Actions and 2. Actions on Heart. I appeared for MD examination at Visakhapatnam in December 1952 with Prof. Iswariah and Professor Nath from Nagpur as examiners in Pharmacology, Dr. TK Raman and Dr. Pisharoti were examiners in Medicine. I took clinical examination with long and short cases and pharmacology experiments major, minor and viva. When all were satisfied, they sought my age (25 yrs). Dr. Iswariah retorted 'he won't become very old by next year'. I was fortunate to be awarded MD degree at first attempt in those days.

Guntur Medical College

The Andhra State with Kurnool as capital was formed on 1 October 1953. All Andhra officers were transferred on that date. At that time there were only two medical colleges in Andhra, Andhra Medical College, Visakhapatnam (full fledged) and Guntur Medical College only with the preclinical departments Anatomy, Physiology and Biochemistry. Since Dr. AV Ramalingam (AVR) took his MD only in 1951, Dr. AR Govinda Rao (non Andhra) was retained as Professor at AMC (Special Officer on deputation). With no post in Dept .of Pharmacology, I was posted in Anatomy at Guntur Medical College after my MD in Pharmacology. Dr. Sarah Souri, Principal and Professor of Anatomy told me that it does not matter if I have MD in Pharmacology; 'You have to do dissections and take lectures in Anatomy'. I took lectures on 'arches of foot' and opted to help in Anatomy museum. I had the bones cleaned to whiteness and painted the muscle attachments. I filled sacral bone with wax and carved out the sacral plexus. Sections of the limbs at different levels with a band saw were taken and mounted in Plaster of Paris. These more than 30 specimens ought to be there in their museum even now.

After Anatomy, in November 1953, I was transferred to Physiology. There I noticed in dissected frogs ovaries showing regular movements. I published two papers on the contractions of the frog ovary and the smooth muscle component in the mesovarium.

In 1953, I was offered post of Professor of Pharmacology at Trivandrum by Dr. Hojer, Dean (WHO officer to start the College) on contract basis for 3 years @ Rs.500/- pm. Hoping that I will become Professor at Guntur itself, I declined.

Visakhapatnam

In July 1954, I was posted to Andhra Medical College in the place of Dr. AVR posted as Professor at Guntur Medical College in the newly started clinical courses. Dr AR Govinda Rao continues as Professor on deputation.

Dr. B. B. Dixit (1st Director of AIIMS) was the Head of the Department at AMC 1928-33. He is a devoted pharmacologist and equipped the Department with original Palmer equipment including glass valves which I used. Dr. Dixit also acquired 4 Packets Color plates of 'Indian Medicinal Plants' by Major B.D.Basu, a rare collection and valuable source of reference for research in Pharmacology, Pharmacognosy, Pharmacy and Pharmaceutical Chemistry. I identified all the equipment in the store and in deal wood boxes with help of Palmer and Gallen-Kamp catalogues.

I registered for DSc degree of Andhra University in 1954 to keep myself active. The pharmacist declined to help prepare solutions for research. In a College staff meeting the Principal stated that 'research' is not part of duty of staff. I had to depend on a lascar Thammayya paying him

for work after hours. I did liver perfusion experiments with glass coils prepared by me (I learnt glass blowing at Madras) using the model of heart pump with 'U' tube filled with mercury and a respiratory pump as demonstrated by Prof. Lundsgaard at Madras. A kerosene drum served as a constant temperature bath, with lascar Thammayya maintaining the temperature. I was studying the glycogenolytic effect of chlorpromazine. I did find enhanced release of glucose in the outflow from perfused liver. But the referees commented that even the anaesthetic causes rise of blood sugar. I found that blood sugar rose beyond even this level produced by the anaesthetic; but there is no argument with referees. Some one else published this effect after 2 years.

The DME passed orders allotting 2 beds for Pharmacology in Medical ward, KGH. The Principal and Professor of Medicine refused saying "Today Pharmacology wants beds and tomorrow Anatomy wants beds!" That is the place of Pharmacology in Medicine! I requested Dr. S. Pinakapani, Physician and Dr. B. Sundara Ramamurthy, Surgeon to try chlorpromazine for possible anti-hiccough action since its anti-emetic action was established. We published a paper. I requested the Professor of Obstetrics to try chlorpromazine in Eclampsia, which she declined. Only after it was used as 'Lytic Cocktail' (chlorpromazine + Pethidine + Phenergan) in Egmore Madras, she started using it.

I approached Dr. S. Rangaswami Head of Pharmaceutical sciences in Andhra University for any new compounds. He replied that he sends all his new compounds to Dr. UK Sheth, CSIR Department at Mumbai. Luckily Professor TR Seshadri, FRS of Delhi University sent to Dr. K. Ranganatha Rao, Professor of Biochemistry (his former student) Pterostilbenes extracted from Pterocarpus marsupium (red sanders) reputed for blood sugar lowering action. We published a paper on their hypoglycemic action in Indian Journal of Medical Sciences in 1958. Immediately Himalaya Drug Co. sent me a cheque for Rs.2,000/- for further research work. Dr. KN Rao, DME was happy and suggested that I seek official permission to accept and open an account, which he gave readily. But the Accountant General objected and suggested that I should deposit the amount in Govt. Treasury and use the amount as per government regulations. It would mean that I will not have any control. In the meanwhile, I got orders of transfer to Kurnool and I returned the cheque back to Himalaya Drug Co. with thanks! Funding or support for research was non existent then.

At Dr. Pinakapani's residence I typed our paper on 'Chlorpromazine in hiccough'. I was deeply impressed with his methods, his library with varieties of books. The lines in some books, even fiction, were carefully underlined in pencil with a ruler. Then I decided and purchased Remington Rand Portable type writer in 1955. I type only with single finger and never had time to learn with both hands. It served my personal, official and academic purposes for several years till I left the type writer in Libya in 1994 still in good condition. Since Pharmacology Department does not have a type writer or typist, I was using my machine at office mostly.

In 1954, Dr. AR Govinda Rao was transferred to Madras and Dr AVR was posted to AMC as Professor. Dr. V.S. Venkata Subbu (VSVS) who took his MSc 2 years after me, joined as Assistant Surgeon 2 years after me was posted as Lecturer to head the Department at Guntur as he was senior in PSC rank.

Dr. GJS Abraham who joined as another Asst. Professor used to say that he joined because I was in the Department. Dr. GJS Abraham is truly 'a friend in need is a friend indeed'. With his

worldly wisdom he advised and helped me at crucial stages in my career. After MD at AMC he became Professor at Guntur and later at Goa and finally Dean of Goa Medical College from 1981 to 1990. He received Dr. B.C. Roy award. His wife Dr. Mrs. Marjorie E Abraham, Professor of Physiology has retired. His two doctor sons are settled abroad and one son in Goa. He had been in constant touch with me reminiscing the past till his last days in 2010.

Dr. Mrs. G. Nirmala consulted me at the time of her choice of pharmacology for career and later advice in experimental work. She took her MD and became a Head of the Department at AMC guiding other postgraduates. She became the Principal of the prestigious Andhra Medical College. She attended the Neuro Pharmacology, workshop at Kurnool in 1977. She also spent again 1 week at KMC watching our experimental procedures. She is keenly interested in research and tried her best to work within the limitations. She also acquired skills in Biochemistry. After retirement she is giving laboratory support to his illustrious Endocrinologist son, Dr. Sridhar and published several papers. It is a family of doctors. Her husband late Dr. GMN Swami was an eminent Surgeon. Her two daughters are specialists in Dermatology and Ophthalmology. Daughter-in-law is Professor of Obstetrics & Gynecology and sons-in-law Engineer and Orthopedic surgeon

In 1956 even after I completed 4 years after MD, I was not considered for promotion. With only two colleges in Andhra I did not have a chance of promotion. Armed with an offer from Kasturba Medical College, Mangalore, I approached Dr. KN Rao, DME for relief. He advised me not to go as a Medical College is coming up at Kurnool and a batch is being admitted for I MBBS at Guntur. He further immediately deputed me to visit Kurnool to examine the facilities and to send indents even from AMC. Career is never smooth as you plan. There will be obstacles, man made and otherwise and one has to have perseverance and not lose heart.

Kurnool Medical College

I was promoted as Professor, 5 years after obtaining MD and joined on 11 October 1957 at Kurnool Medical College a few days short of 30 years age. I was posted as Professor of Pharmacology and Dr. K. Ramesh Pai Surgery, Dr. S. Pinkakapani Medicine and Dr. K. Kameswari Devi Obstetrics. I was promoted temporarily. Later Government recommended and got exemption from Andhra University for Dr. VSVS with only 3 years experience and designated him professor at Guntur on 11 November 1957. I was regularized one day after he took charge to maintain the Service Commission seniority. It affected me through out service. I know many who have been similarly affected throughout their life. A cross to carry.

Dr. C. Venkataramayya (CVR) Professor of Physiology was Principal, Kurnool Medical College. I as Professor and K Victor Moses, Pharmacist were the sole staff of the Pharmacology department. The space allotted was the first floor in the Pharmacology block excluding the left wing which was kept under Professor of Physiology. I called for quotations, prepared comparative statements and typed orders ready for the signature of Principal, KMC.

At that time I was selected for a WHO fellowship (first WHO fellowship in the state) at National Institute for Medical Research, London to work with Prof. W. Feldberg FRS. Dr. KN Rao assured me that I should go abroad and that the department can be managed with staff without PG

qualification. I was deputed accordingly and Dr. L.B.Gopala Krishna Murthy and later Dr. P. Sisodia were posted as lecturers during period of my deputation.

Professor W. Feldberg FRS asked me why I chose to work with him. I saw his paper on perfusion of intestine in *J. Physiol.* (1949) that prompted me. When I said that we do not have facilities for research in India, he asked "what do you need for research? - a kymograph and an organ bath". I learnt bioassay procedures, permanent implantation of cannulae into lateral cerebral ventricle, aqueductal cannulation and perfusion techniques, aseptic procedures. I gained confidence. I learnt the need for personal participation and cordial relations with all staff. I learnt from technicians, animal house staff, photographers about skills and team work.

Once with Professor Feldberg, I visited Dr. Vane (Sir John Vane – Nobel laureate 1982 for studies on prostaglandins and aspirin), to learn the technique of noradrenaline assay with pithed rat blood pressure. He was then a Lecturer in Pharmacology, Institute of Basic Medical Sciences, Royal College of Surgeons, University of London. It was a one man show by Vane and a stimulating demonstration for me in the early phase of my research career, which taught me many techniques. Every item and procedure was improvised. Drawing pins, bent paper clips with rubber bands attached serving as retractors, burette formed by a 1 ml pipette for i.v. administration of drugs, all were improvised by him. The arterial, venous and tracheal cannulae are drawn from polyethylene tubes. The procedure was: Pyrex glass tube 5" x 1" is fixed vertically a little above a Bunsen burner. A polyethylene tube about 3" long, held a little above the tube horizontally is slowly rotated till it melts slightly in the middle. Take it off, draw it to suitable tapering and dip it in cold water to fix it. Cut oblique in the centre. It gives two identical cannulae. His Nobel Lecture in 1982 was devoted to the importance and sensitivity of various tissues used in bioassay. The techniques were simple and priceless and did not cost anything.

I was originally deputed for one year but later extended for another year recommended by Professor Feldberg. Since WHO does not permit acquiring qualifications during Fellowship, I requested the Andhra University to change my guide for DSc registration as Dr. Feldberg.

I had to work only with isolated tissues (bioassay) for 3 months till I received Home Ministry license to work with anaesthetized animals as per rules. I learnt successfully bioassay methods, working up to midnight which helped me after return.

There is a weekly review of research findings, gathering and finalizing the results. I learnt the art and craft of preparing a paper for publication. (I included in this book my paper 'How to write a scientific paper' and 'Presentation and preparation of slides'). Dr. Feldberg was on the Editorial Board of both *J. Physiol* and *Brit. J. Pharmacol.* He used to sit with the authors some times coming from Europe and correct their papers. He felt that authors with new findings have to be assisted and encouraged to publish.

In the western universities, researchers are expected to collect animals from the animal house, return them and clean their operation tables without any lab assistance. Such a luxury was available only in pure research laboratories like Burroughs Wellcome or National Institute of Medical Research (NIMR) London.

They have exceptionally skilled and devoted hands like LW Collison, Chief Technician NIMR (who is the highest paid staff member next to Head of Department). He controls all the staff, arranges for next days experiments, places indents and skillfully edits kymograph tracings for publication by blacking out artifacts. He designed and built apparatus for many distinguished scientists. The Collison cannula used by several investigators was his design of a cannula fixed to the skull to inject drugs through a rubber diaphragm. He started his career as a boy of 14 in the Burroughs Wellcome laboratory under Sir Henry Dale and accompanied him to the NIMR in Hampstead in 1920 which was later shifted to Mill Hill in 1949. There he worked with Professor W. Feldberg. He received New Year Honor M.B.E as Laboratory Technician in 1952, a sign of the importance of the laboratory technician in medical research. He retired at the age of 80. I learnt how to edit graphs and slides for publication from him. Details are given separately.

Knowing that in India, Pharmacology is treated as a minor subject and did not have a clerk, typist, artist and photographer, I spent all my savings abroad in buying Leica Camera with copying accessories, 'UNO' stencils of all sizes and fonts, polyethylene and polyvinyl tubing, transparent ammonia printing sheets for preparing slides with blue back ground. These materials helped me in my publications and presentations after return.

Research is followed by presentation of papers at conferences and publication. I had to pay for the reprints and postage to send them to those requesting for reprints (no 'pubmed' at that time). I envy the present generation with computers to edit, easily change the text, fonts, sizes, colours and slides for preparation with access to internet for presentation and publication.

Dr. H.L. Borison was my coworker in London and a good friend. He was my host when I visited USA in 1968-69.

I was elected Member of British Pharmacological Society in 1960.

I completed the research on "Passage of adrenaline from blood to CSF and Histamine across the brain substance", which formed my thesis for DSc degree to Andhra University. My thesis was evaluated and appreciated by three foreign scientists, Sir William D Paton FRS, Dr. H.O. Schild, FRS and Dr. Marthe Vogt, FRS. I was awarded DSc degree in 1960.

From Andhra University the first person to be awarded DSc was Dr. N. Veeraraghavan, Director Pasteur Institute, Coonoor for Rabies Vaccine after MBBS. I was the 2nd person to get DSc after MD. Dr. S. Sriramachari was the 3rd with MD. Later University required a PhD qualification before DSc Degree. Dr. CRRM Reddy obtained a PhD first and later DSc and was the 4th.

Soon after I was awarded D.Sc. degree, Dr. V.S. Krishna, Vice Chancellor Andhra University asked Dr. K.N. Rao, DMS to release me to start a Department of Pharmacology, at Andhra University Visakhapatnam. Dr KN Rao declined saying that Dr. Haranath was not deputed to UK to be given away to Andhra University. Dr. KN Rao immediately wrote in 1960 to SV University to start MD Pharmacology in Kurnool Medical College. But Dr. CVR, Principal SV Medical College and Dean Medical Faculty SV University vetoed the proposal stating that I did not have enough experience as Professor! I had to wait till 1967 for starting MD along with other subjects. Dr. Sunanda Bai joined Pharmacology as Tutor in 1964. She could register for

MD as PG only in 1967. By then she had two papers in British Journal of Pharmacology in 1966 & 67. She obtained MD in 1969.

At the request of Dr. Ramesh Pai, Principal, I accepted to be warden, Men's Hostel (1960-61) and requested relief after 1 year to attend to Research. Dr. Ramesh Pai was appreciative and supported me all along.

I requested for Lectures in morning 8 to 8-50 am (a practice I learnt at Madras) giving the students 10 minutes to cross the College compound into the Hospital for ward/OP postings. With 2 practical classes and 1 Demonstration per week in the after noon, I kept two days exclusively for research. Even on the lecture days, staff was free to do research.

I organized Experimental Pharmacology Laboratory. With limited space and funds, instead of heavy 40ft long work benches, I preferred units of long kymograph tables 5' x 2' x 3' to support Extension Kymograph and short Organ Bath table 2'x2'x2'6" fitted with electrical switches for starting and stopping the drums, lever operated devices for filling and emptying organ baths. At Mill Hill we had mechanical levers to opens and close the fluid tubes easily without effort. We used pinch cocks built into wooden clamps and fixed them to the work benches. (Published).

At NIMR London there were central pipe lines fitted in the lab for compressed air, gas, oxygen and distilled water! With imported equipment unavailable we had only INCO equipment. A number of local devices were developed to overcome problems. With failed thermostats of organ baths, an external water circuit was developed with a bent glass tube heated to circulate warm water. Aerators to the organ bath were connected to long line of rubber tubing with a respiration pump / compressed air machine distending foot ball bladders to deliver a continuous flow of air evenly to all tables. Frontal levers, 'Z' shaped tips with 'X' ray films on simple levers assured light contact with the moving drums. (see paper on 'Simple Methods' in SVMC Souvenir). Smoked papers are replaced with ink writing frontal levers with a nib soldered to the tip.

I think research is truly cross disciplinary and one should be a scientist, engineer, mechanic, photographer, typist and a teacher all at the same time.

The experimental pharmacology practicals were limited to drug excretion by students, prothrombin time, rabbit eye, guinea pig ileum /rabbit duodenum and frog rectus. The success of laboratory exercises depends on using all glass/SS distilled water, ANALAR grade chemicals and suitably preserved stock solutions of the biochemicals preferably imported. Pure chemicals for test solutions with preservatives added, assured perfect responses and records.

The organ bath glass tubes have to be cleaned with Teepol detergent liquid to remove drugs of previous experiments which influence subsequent tests. Pyrex glass ware is preferred to soft glass which is alkaline. For research, we obtained all sizes of Pyrex glassware - glass tubes (capillary size to 2" diameter), rubber tubing soft and pressure, polyethylene and polyvinyl tubing.

I found that the shutter of my Leica Camera as well as kymograph drums will stagger if not used regularly. The kymographs have to be oiled and run continuously for long periods once a week for smooth movement.

After my return from UK, I planned the Central Animal House for small animals with separate sections for breeding, storing food and washing and sterilization. The Experimental Surgery Unit and Dog unit were planned away from the small animals house. At AMC the experimental surgery unit disturbed the Library located next to it with dogs howling. In Kurnool, in the dog unit dogs never howled since they are fed with meat every day and were not chained. Even when released they used to return back as they were at home in this unit. Technician Venkatayya was deputed to NIN for 3 months course of training in Laboratory Animals care. He returned and gave valuable care to the animals. However he was disappointed that he was not given a higher scale or even advanced increments for his additional qualification. Kondanna was an invaluable asset in handling animals, attending to experiments late into the night. The sweepers Thimmanna and Ranganna gave devoted attention to the Lucerne grass farms and the cleanliness of animal house. I included a note on 'Animal care' elsewhere in this booklet prepared recently for the RMMC Annamalai Nagar.

A Central Workshop was the next addition. When the Workshop of PWD was disbanded along with the staff, I got all their equipment and had the staff appointed at KMC – Vittal Singh as fitter, Jaleel as Carpenter and Chand Basha as plumber in the college posts. Roping in a qualified mechanic Rangaswami Chetty from the Regional Lab, a Central Workshop was started. The workshop was equipped with heavy duty Lathe Machine; Bench Grinder; Shaping Machine; Horizontal & Vertical Drilling Machine; Arc Welding and Spot Welding and miscellaneous hand tools. They gave such excellent service that it became a show piece to all visitors, as no such work shop is present in any other college. But unfortunately their pay scales were never raised despite representation. They built the library racks, repaired equipments of several departments, made Formica lined tables, cages for the Central Animal House. Central Workshop prepared small screws, ventricular cannulae SS with caps, even stereotaxic head holder and was an asset in preparing equipments for the laboratory and for research. A psychopharmacology apparatus was designed for rats to operate lever for food (published). It was an attraction in the medical exhibition. The massive stethoscope, microscope and the boy seated on books, hanging in the porch as one enters the college is their master contribution. Artist Khadri of SPM Department painted these designs and also master paintings to adorn the three blocks. . The facilities in workshop were so good to repair even cars that the regional State Health Transport shifted their campus to the Kurnool Medical College.

Osman, mechanic of the morgue in pathology department was trained in book binding at the Govt. Press, Kurnool to bind the old journals. Earlier old journal copies were sent to Rajahmundry jail and returned after years.

Mr. K. Victor Moses, Pharmacist was a silent, sincere, skilled and willing assistant for aseptic surgery, arranging everything at short notice including sterilization of aprons and apparatus. He was a great asset to me in all my years of stay at Kurnool. Siva Reddy, Technician was a loyal unassuming worker in research. Now many of these valued staff members are no more.

Once I noticed that the polyethylene tube delivering fluid from the slow infusion pump bends down with the formation of each drop and shoots up as the drop is released. This gave me the idea for recording drops on a kymograph. I developed a method for drop recording which was published in American Journal of Applied Physiology.

The space allotted for Pharmacology was the 1st floor in the Pharmacology block excluding the present Pharmacology Staff wing, which was still under Professor of Physiology. As I was interested in setting up Experimental Pharmacology lab, I opted for the last small room on the present staff wing when Dr. Ramesh Pai was Principal. When Dr. Venkateswarlu was Principal and myself Vice Principal, the remaining Professor room was also allotted to make it completely Pharmacology Block.

Preparation of photos and graphs for publication requires skill. I had a dark room prepared next to Professors room. We prepared all slides in the department itself. All Staff learnt the methods.

How we progressed

In the absence of imported equipment and shortage of funds, it was hard to aspire and survive. We devised new equipment and new aseptic procedures. Research is product of personal participation with team of postgraduates, assistants, technicians, animal attenders, and help from other departments. Our sincerity and zeal were appreciated by clinical departments in Kurnool and Hyderabad. National Institute of Nutrition (NIN), Hyderabad readily extended help to complete our projects. We demonstrated that working at Kurnool, a small town, lack of equipment and amenities did not stand in the way of doing research - but desire to investigate and solve problems was of paramount importance.

In the first News Letter of IUPHAR (International Union of Pharmacology), Department of Pharmacology, Kurnool Medical College was listed centre for Neuropharmacology in India.

Kurnool was treated as a small place. In 1964 or 65, I was not informed of a Conference on CNS at Regional Research Labs, Hyderabad. When I applied I was informed that there is no place even as an observer. But Dr. H.L. Borison, who attended the conference, asked 'Where is Dr. Haranath?' I was known to him but ignored by the elite at Hyderabad.

MD Pharmacology was started in 1967. Dr. K. Sunanda Bai already a Tutor was the 1st PG. My first advice to all who opted for Pharmacology is to warn them that they will lose clinical attachment permanently and to think twice before reporting. My advice to all those after getting MD was that they have not become experts, but should continue to learn and do research.

We had on Wednesdays either journal club or Lectures by Sri Gopinatha Rao in Organic Chemistry. I attended these classes to take notes, which were incorporated in my 'Synopsis of Pharmacology'. I included as authors in my papers all those working at that time as a stimulus. Sunanda Bai attached to her thesis the paper published in Brit J Pharm. Later SV University passed orders that published work cannot form thesis. Hence all subsequent PGs did two research projects - one in Neuropharmacology on the on-going projects to be published immediately and another on indigenous drugs which can be published later. But all PGs have been diligent workers to publish 2 papers - one in foreign journal and one Indian. All

Postgraduates: Drs. Sunanda Bai, Devasankaraiah, Seshagiri Rao, Shyamalakumari, Indira Narayan, Ramabhimaiah and Ramesh have whole heartedly worked to submit quality thesis appreciated by the Examiners. Dr. Ayyapu Reddy & Dr. Srinivasa Rao were PGs when I was away at Hyderabad. I mentioned the thesis of Dr. Ayyapu Reddy on non-alkaloidal fractions of *Tylophora Indica* in my 'Achanta Lakshmipathi Oration'. Dr. Srinivasa Rao submitted a thesis assisted by Dr. Devasankaraiah on the relaxing factors in Omum extract. Unfortunately the work did not reach completion for publication. Dr. K M Abdulla was the last PG with me who published a good paper. Even those who were not Postgraduates had papers – Dr. Suresh Reddy, Dr. Premalatha and Naseem Ayesha Begum. Those who joined the department after PG else where are Drs. GV Sitaramayya MD (AMC), Govinda Das, MD (BHU), A. Krishna Murthy, PhD (AU), G. Gopalakrishna, MD (AMC) all worked assiduously and published papers. Mrs. Ajaya, non-medical assistant had a good paper and fortunately got promoted to Laboratory services. All papers published with my coauthors are included in this compilation.

PG course had a slow start and had set backs. A MCI Inspector from Bombay with a personal prejudice inspected the MD exam in 1973 and wrote an adverse report. After 4 years another Inspector from Agra wrote 'this is a best department'. With boom of new medical colleges now demanding teachers in non-clinical subjects there is a spurt in admissions to PG courses in Pharmacology, which earlier had empty stables.

ICMR was giving me grants for an Assistant Research Officer (ARO) continuously. I used to submit proposals of work already under way, so that I had always a publication to report success to seek further support. Dr. H. Venkata Krishna Bhatt joined me in 1966 as ARO and has 5 papers in Foreign Journals and 11 in Indian Journals. I used to advise him often to find other opportunities to acquire PhD since he was an MSc (Zoology) and I cannot help him. He persisted that he is happy to publish papers with me. A sincere and efficient worker, he used to work late in night recording sleep in dogs at midnight and simultaneously estimating ACh in c.s.f. perfusate on rat blood pressure, with Kondanna as companion. I used to visit the Department at night leaving my wife Dr. Savithri to attend Obstetric emergencies in the hospital. I was always glad to find him engrossed in his work. He was selected as Research Officer (RO) ICMR and posted to National Institute of Occupational Health, Ahmedabad in 1972. I was happy when he was awarded 'Sakuntala Amirchand Award of ICMR' for our paper "Sleep induced by drugs injected into inferior horn of lateral cerebral ventricles in dogs. *Brit. J. Pharmac.*, 59, 231-236, 1977". He made rapid progress, obtained a PhD from German University. He received Dr. BC Roy Award, FAMS, FZS and Fellowships of several academic bodies. He retired as Additional Director, National Institute of Occupational Health, Ahmedabad. He has two brilliant daughters - one BE MBA PhD and another BE ME PhD

Pharmacology department did not offer laboratory services to the Hospital. However we could confirm diagnosis of pheochromocytoma of a patient of Dr. N. Ramachandra Rao, by estimating biologically the catecholamines in urine, plasma and c.s.f. and published a paper in 1967.

What did we do?

Blood – C.S.F barrier: At a clinical meeting a case of tetanus was presented treated with repeated injections of d-tubocurarine (dTc) as a muscle relaxant. It was formerly reported that dTc injected directly into cerebral ventricles produces convulsions. Does dTc reach c.s.f. given

systemically? I was curious and showed experimentally using frog rectus for bioassay of dTc, that i.v. infused dTc passes into perfused cerebral ventricles in dogs. In general anesthesia respiratory paralytic doses of dTc are administered for muscle relaxation. Dr. LN Rao, Professor of anesthesia helped with lumbar c.s.f. samples before and 15 min after dTc administration. Small amounts of dTc were present in c.s.f. and published by us. Similar results were obtained with gallamine administered in general anaesthesia. What is the effect of these small amounts of dTc on CNS? We found it produces sleep on intraventricular administration. We found sleep with both cholinomimetic and antagonistic drugs injected into Inferior Horn of Lateral ventricles, thus localizing their site of action to the limbic system.

Drugs like atropine, noradrenaline and histamine infused i.v. reach the c.s.f. in small amounts. Membrane barriers are not absolute. With high concentrations even acetylcholine passes from intestinal mucosal surface to serosal surface, and into the aqueous humor when instilled in the conjunctival sac.

Sleep and central cholinergic mechanisms:

Dr. BB Dixit observed sleep following injection of acetylcholine into cerebral ventricles of cats. We wondered what will happen if acetylcholine is injected into carotid artery. We observed sleep following intracarotid injections or infusions of cholinomimetic drugs and their antagonists in dogs with indwelling carotid cannulae. We recorded sleep with a minute to minute record. But for publication to confirm the sleep with EEG, the animals were taken to Neurosurgery department, Osmania General Hospital, Hyderabad. (The Neurosurgery Staff complemented that our dogs cooperate better than patients. Dogs in our animal house are friendly. They are housed unchained in individual mesh separated kennels 9 ft high with a front area 6'x4' for food and sleep leading to back area 10'x4' for their run and excreta. They have mutton for lunch every day).

Similar findings of sleep with cholinomimetic drugs and their antagonists were observed on injections into vertebral artery in dogs. I learnt the aseptic technique of anastomosing blood vessels end to end in dogs from a graduate student working with Dr. WA Himwich at Galesburg, Illinois. The common carotid artery was severed close to its bifurcation and its cardiac cut end was anastomosed with the vertebral artery severed at its origin from the subclavian artery, using 6/0 arterial silk sutures. The patent anastomosed arterial loop was placed in a skin pedicle for injections after recovery.

Acetylcholine release into CSF in sleep: We studied the release of acetylcholine during sleep and wakeful state into perfused cerebral ventricles and collected from lumbar subarachnoid space with indwelling cannulae in dogs. The perfusate was immediately assayed on rat blood pressure for acetylcholine. There was no release of ACh in deep sleep but reappeared during REM sleep and wakeful states .

Human studies

We felt results in humans are important. Dr. I. Dinakar, Neurosurgeon helped us to collect c.s.f. from cerebro ventricular catheters. The biogenic amines NE, Dopamine (DA) and 5HT during sleep and wakeful state were estimated fluorimetrically at NIN, Hyderabad. NE and DA are decreased during drowsiness, sleep and REM sleep, but 5HT increased. The concentration of

biogenic amines is more in adults than in children, and more in c. s. f. from 3rd ventricle. Infection causes increase in biogenic amines.

If we stimulate a nerve a neuro-humor is released at the terminal to produce action known as chemical transmission of impulses. We were curious as to what will happen if brain itself is stimulated as a whole? Dr. T. Subrahmaniam Professor of Psychiatry helped us. We estimated biogenic amines in lumbar c.s.f. before and after electroconvulsive therapy in patients. Dopamine was reduced, but 5HT and noradrenaline increased, giving a possible clue to the neurohumoral pathology and the correcting influence of electroshock therapy.

Local anesthetics on CNS: What would happen if procaine a local anaesthetic is injected directly into cerebral ventricles? To our surprise we observed a profound rise of blood pressure and increase in amplitude of respiration and finally depression. Respiratory failure due to extension of spinal anaesthetic was more due to diaphragmatic and intercostal paralysis. The site for increase of blood pressure and amplitude of respiration is localized to the floor of fourth ventricle and the respiratory depression to the under surface of brain.

Indigenous drugs

When the University objected to submitting published work as thesis, I suggested to Dr. Devasankaraiah to investigate 'infusion of omum (Ajwan)' a grand mother's recipe for stomach pain. We were excited to find that the infusion with fried omum showed large amounts of acetylcholine by bioassay for its muscarinic and nicotinic actions, blocked by the antagonists and destroyed by cholinesterase. It was also confirmed by paper chromatography at NIN. Yet the British Journal of Pharmacology wanted Gas Chromatographic confirmation. Fortunately I met earlier, in Washington, Dr. I. Hanin who first reported GC-MS estimation of acetylcholine. I sent him the freeze dried extract of omum infusion while he was in Pittsburgh; he replied telegraphically that GC-MS estimation shows almost the same amount of acetylcholine reported by us by bioassay and in addition Choline in large amounts.

Dr. Shivpuri, VP Chest Institute Delhi reported that one leaf per day of *Tylophora Indica* for 3 days gives relief in Bronchial asthma for several weeks. I grew the plant *Tylophora Indica* in the garden of KMC animal house and tested the aqueous extract of the dried leaf. It blocks the anaphylaxis in egg albumin sensitized guinea pigs and also produced profound leucopenia in dogs to explain its immuno protective action in bronchial asthma. We published this work in 1975. Dr. Paintal, Director of the VP Chest Institute asked his colleague Dr. Aswini Kumar to confirm. Dr. Aswini Kumar wrote to me that the aqueous extract from leaves at Delhi was causing death of the guinea pigs even before protecting them. When I sent him leaf powder from Kurnool he confirmed that the leaf powder from Kurnool was safe and produced immunity. It shows that the geographical area of origin - pharmacognosy influences pharmacological potency.

Professor Subba Rao, Head and Dr. Lakshmi, PG of Chemistry department of Osmania University supplied alcoholic and nonalcoholic fractions extracted from *Tylophora* leaves. While alcoholic fraction had the same effect found with aqueous extract, the nonalcoholic fraction produced profound leukocytosis (granulocytosis) given i.v. in dogs. It is strange that in the same plant fractions with opposite action are found in nature: Opium contains Morphine with stimulant and Papaverine with relaxing properties on smooth muscle. Fried Omum extracts have stimulant and cold extracts relaxing actions on smooth muscle!

When transferred to Hyderabad, I planted the creeper of Tylophora in my house. The thick leaves were collected, dried and powdered. The powder was packed in gelatin capsules since raw leaf produces ulceration of mouth. Learning about its action from lay press a number of patients with bronchial asthma used to collect the capsules free from me. The prescribed course was to take one capsule a day on empty stomach early morning (to avoid vomiting) for one week, alternate days for two weeks and once a week for two weeks. The word spread and more used to come. When I left Hyderabad they took one years supply to be taken when the symptoms reappear. Among those relieved were Secretaries and their relations.

On recommendation by Dr. C. Gopalan, DG, ICMR, Professor TR Seshadri entrusted me with investigation of Hydnocarpin prepared in his Laboratory at Delhi for anti-hepatotoxic action. It has structure similar to 'Sylimarin' shown to have such an action. Though I did not have facilities for such research in Pharmacology, I requested Dr. L. Vasantha Professor of Biochemistry for help. She did find protection in rats against the toxicity of CCl_4 but at a dose of 40 mg/kg. I met Professor Seshadri again in Delhi for some more of the compound. But even that was not enough to complete the project. Meanwhile Professor Seshadri passed away. His successor informed that the PG who prepared Hydnocarpin was from East European country and left. This work was not published but referred in my Achanta Lakshmiopathy Oration.

In the 1970s there was no internet or pubmed. We used to subscribe for 'Current Contents', a weekly booklet which gives the 'contents' page of all journals published in the week and the addresses of authors. We had to send requests at our own expense, where as abroad printed 'Reprint Request' cards were available and postage paid by their departments. At NIMR London, all academic letters were dropped in a red box at the entrance. The office staff used to stamp them and post them at Institute expense. No one ever asked for the nature of contents. I used to get many requests for reprints of my articles in foreign journals. We used to feel happy and proud that someone abroad has actually seen our paper and wants a reprint. I had no money to buy the reprints of my articles at great expense and bear the postage to send them by air mail. I missed sending to many. One cannot use Service (Govt.) stamps for foreign letters. We have to maintain a register for the service stamps used.

I had a request from LS Goodman for my paper on 'Passage of dtcurarine into c.s.f.' in 1973. Smith, SM., Brown, HO, Toman, JEP, Goodman, LS published a paper in 1947 the 'lack of cerebral effects of d-tubocurarine' in *Anaesthesiology*, 8, 1-14', in which Smith received dTc i.v. and a record maintained. They concluded that dTc has no central effects. But they actually described that at the end of the experiment he slept off. That was the 'sleep inducing effect' which we described. But the Text Book of Goodman ignored our papers published in *British J. Pharmacol.* Further in 1978 a paper appeared in '*Anaesthesiology*' with radio immuno assay that dTc does not reach c.s.f. I had to counter it by a 'Letter to Editor' referring to 5 of our papers on dTc, its passage into c.s.f. in man, its sleep producing effect and its localization to Inferior horn of lateral cerebral ventricle (all in *British Journal of Pharmacology*). Their reply was that the quantities found them by radio immune assay are much lower than our bioassay values. Our papers clearly showed the biological presence of dTc in c.s.f.! I found later that in USA they don't read British Journals.

Successive Principals of KMC, Dr. S. Venkateswarlu and Dr. D. Bhaskara Reddy extended maximum support and encouragement for my research.

Osmania Medical College, Hyderabad

In 1974, at the behest of then Health Minister, Medical Secretary, transferred a number of Senior Professors in Clinical and Non clinical Subjects to Hyderabad. I was transferred from Kurnool after 17 yrs of stay. My reception by Hyderabad Medical authorities was not favorable. I was not considered for promotion as Principal, Gandhi Medical College as I do not belong to Hyderabad. I was not made an examiner for UG and PG exams and selection of PGs in Osmania University. However, I was received well by the students who filled the galleries for my lectures and I had to use a mike. They nominated me for the BC Roy award! I gave lectures to PGs of all subjects. Dr. Farhana was Asst. Professor attended all my UG & PG lectures. As Vice Principal at OMC, I arranged students' seminars on Teaching methods, Integrated seminars on several topics with students and Professors of clinical and non-clinical subjects. The BC Roy award citation shows me as 'Vice Principal, Osmania Medical College'.

I was happy to be nominated by my students at Osmania and Kurnool Medical Colleges and received Dr. B.C. Roy Award in 1978, along with Dr BB Gaitonde, AS Paintal and KP Bhargava (see picture below) awardees in other categories.



I could improve the experimental pharmacology laboratory in OMC, with Mr. Narasaiah the Senior Technician willing to learn. The tissues were working and practicals were successful. But I could not do any research without willing staff. The animal house, a palace like structure had few animals with staff coming at 10 am and leaving at 1 pm. In 1975, when I was getting promoted to Additional Director rank as Principal, I requested for transfer back to Kurnool.

Back at Kurnool

As Principal, KMC 1974 -79, I could pursue my research to publish more papers. We conducted Workshop Seminar in Neuro Pharmacology and IIIrd Southern Regional Conference of IPS 9-11 September, 1977. Techniques demonstrated: 1. Cerebro ventricular cannulation 2. Anastomosis of Vertebral and Carotid arteries to form vertebral loop (simultaneously shown with closed circuit television). 3. Estimation of catecholamines in brain by Dr. PSV Ramana Murthy NIN and 4. Stereotaxic implantation of electrodes – Dr. SK Manchanda AIIMS. Delegates (84) were divided into 4 batches for closer observation and all demonstrations repeated 4 times. There was also a session on photography and preparation of slides.

With the balance amount after expenses from the conference, we purchased a type writer for the Department. An FD opened with annual interest to help a staff member attend Conference.

It has not been easy to get papers accepted in Foreign journals, who insist on advanced techniques. It was indeed a surprise when my paper on 'simple method of drop recording' was published in American 'J. applied. Physiol.' I had three papers returned by Brit J Pharm on passage of dTc and gallamine into c.s.f. and sleep induced by dTc - that I have not recorded the rectal temperature of the animals! I wrote to Sir WDM Paton the Chief Editor, that temperatures do not change that much in India and temperature has no influence on the research problem. He agreed with me and all three papers were published. ACh in Omum shown by bioassay and paper chromatography required confirmation by GC-MS for acceptance by British Journal of Pharmacology.

Bioassay is a sensitive, cheap and specific method useful for preliminary screening for biological effects, to be confirmed later with other more expensive chemical methods. Vane used bioassay extensively using 4 tissues responding to different constituents with a single superfusion.

Our paper with bioassay of adrenaline on rat uterus was published in 1960 but 10 years later our paper on noradrenaline assayed on pithed rat blood pressure was commented- 'Bioassay for Noradrenaline is an archaic procedure'. A paper on biogenic amines in CSF after electro convulsive therapy in humans estimated fluorimetrically, first received compliments from American Journal of Psychiatry, but later required estimation by HPLC. These facilities are not available in many departments. Wherever possible collaboration with others more versed in the special areas was taken to complete the project.

Fortunately I could get help from other institutions to complete my work for acceptable levels. Dogs were taken to Osmania General Hospital for recording EEG during sleep. The District Collector TNR Rao helped me to get a Polygraph to KMC from his discretionary funds in 1979. Though I could not use it as I left, it was useful to my successors.

I have no regrets, as I could contribute adequate research even from Kurnool though a less known town.

I went to USA & UK on a WHO program to study Medical Education in 1968 – 69. In USA I spent half the time visiting several medical schools to study patterns of Medical Education. I spent rest of the time with Dr. HL Borison at Dartmouth Medical School, New Hampshire. There I learnt stereotaxic placement of i.c.v. cannulae (modified by Borison with a central hollow screw instead of cap outside in Collison Cannula to reduce the dead space). He looked after me with great affection. Before me Dr. BB Gaitonde and Dr. P. Pentiah were with him. I gave seminars in Dept. of Pharmacology, McGill University where I read the thesis of Dr. E.I. Birchs on 'ganglion perfusion', used by Dr. Brahmayya Sastri on return to AMC; in Dept. of Anaesthesiology Montreal General Hospital, Canada. Thesis for PhD in USA and Canada are around 50 pages, whereas in UK & India they reach 150 to 200 pages. I also gave a seminar at Thudichum Psychiatric Research Laboratory, Galesburg, Illinois Dept. of Dr. Williamina A Himwich. There I learnt the technique of vascular anastomosis from a graduate student. I visited, Medical Institutions at Chicago and Boston. Professor Wang (Borison & Wang of CTZ) at Columbia University New York complemented me that I am the 'only Indian who continued to do research after returning home'. I spent time with Dr. GB Koelle, Dept. of Pharmacology, Pennsylvania University and visited the Head Quarters of NBE Philadelphia. I also visited E. Costa, Laboratory of Preclinical Pharmacology, NIMH, Washington DC. At Houston. I attended

the Annual Conference of Association of American Medical Colleges and also Pharmacology Department at Baylor University and the experimental surgery unit of Dr. DeBakey. In West, visitors are shown all their current work and techniques. In India one is secretive. I learnt the flexibility of education and include a paper of my impressions.

Dr. Robert E. Gosselin Professor & Head Department of Pharmacology at Dartmouth Medical School took a liking for me. He is a skilled artist, and produced several life-like paintings from persons and photos. He painted my portrait in 4 sittings and I brought it back to India. Till date we exchange New Year greetings. On my way back, I again spent a week at Mill Hill with Professor Feldberg. Dr. Vasil Georgiev, a Bulgarian Professor working with him there appreciated my work and remains in contact at New Year each year.

I demonstrated the technique of intracerebroventricular cannulation at Trivandrum, Manipal, Pondicherry and Madras in 1960s funded by National Academy of Medical Sciences. Later we had visitors spending 3 weeks in our laboratory supported by ICMR. Dr. Alice Kuruvilla from Vellore, Dr. Rosa Diniz from Goa and another from Sholapur spent 3 weeks each in our Department. Dr. G. Nirmala from AMC spent a week. They were shown all Experimental techniques including photography and editing graphs with contact copying. At that time Dr. PN Saxena, Professor at Aligarh Muslim University wished to work with me to learn the techniques of Cerebro Ventricular cannulation. When I passed on his request to Principal for permission, he forwarded it to DMS and as usual no response was received. Later Dr. PN Saxena went to work with Professor Feldberg in National Institute for Medical Research and published 9 papers! This is how our red tape prevents genuine efforts for training persons from other institutions interested in research!

The Government has iron grip. Permission was required for research publications and books and requires acknowledgement and thanks to Superintendent of hospital and Principal of College. Fortunately these were dispensed with later.

The financial limits of Professors was Rs.5/- with contingent money; Principal Rs.10,000/- with quotations and comparative statements in sanctioned budget; DMS Rs.1 lakh; and above that each order had to be granted by the Secretary of Government, more so if foreign exchange was involved.

In USA Professors receiving massive NIH grants can directly appoint staff, pay for expenses and purchases by cheque. In India, we find only CSIR grants and DST grants are sizeable. Even ICMR grants provide only for an Asst. Research Officer and expenses reimbursed partly. Research requires and prospers when funds are available at direct disposal of researcher without restrictions, for appointing staff and securing equipment at short notice.

I was elected Fellow of National Academy of Medical Sciences in 1973.

In 1966 Indian Pharmacological Society was formed separated from Association of Physiologists and Pharmacologists of India. I was elected President of IPS by a vast majority in 1976 December at Varanasi. I presided over 10th Annual Conference of IPS at Calcutta 1977 with Shri Jyoti Basu, Chief Minister as Chief Guest. Dr. Lalitha Kameswaran was the previous President. Dr. P.K. Kar (General Secretary) and Dr. Paul Stephen (Treasurer) in that year and later became Presidents of IPS. I gave Dr. BN Ghosh Oration in 1980 at Jammu.

Palepu Perindevi Suryakumari prize (PPS Prize)

In 1974, I instituted a PP Suryakumari Prize (in memory of my mother Perindevi & sister Suryakumari who succumbed to Diabetes Mellitus). The prize is awarded once in a year to Indian author/authors for the best research work published on “Diabetes mellitus, other endocrinal and metabolic disorders” in an Indian or foreign journal. This is the FIRST PRIZE instituted under IPS. Starting with Rs.2,000/- I added another 3,000/- from my BC Roy Award. Later at different times I donated to raise the amount to Rs.25,000/- The terms of the award may be changed only with the concurrence of Prof P.S.R.K. Haranath during his life time, and later by the executive committee of the Society. Dr. C. Adithan, Dr. R. Raveendran & Dr. Gitanjali Batmanabane of JIPMER, Pondicherry helped me a great deal in streamlining the award of this prize. They were an excellent editorial team for the IPS Journal. Another P.Suryakumari Prize in Arts long pending at Kurnool Medical College was successfully awarded in 2009 with the help of Dr. B. Vasundhara Devi Professor of Pharmacology and Dr. Y. Mallikharjuna, Principal.

In 1978, I was elected to the Governing Body of ICMR on behalf Medical Faculties of all Indian Universities. This election was conducted by Association of Indian Universities. It was a surprise to me. I was on the Governing body ICMR from 1978 to 1981. I was at a meeting presided over by PM Morarji Desai to select Dr. V. Ramalingaswami as Director General of ICMR.

In 1979, I submitted a monogram “Blood – CSF Barrier” which was accepted by Indian Academy of Sciences INSA. But the special committee asked me to update it. Since I moved over to administration, I could not do it. Recently Dr. OD Gulati one of the members told me, I could have done a few changes and resubmitted as the members were in favor of its acceptance.

I received Dr. B. C. Roy National Award for 1978 in 1979.

The proposal in 1974 was by Students and PGs of Osmania Medical College and Dr. Devasankaraiah.

I deem Kurnool as my home town having spent 20 happy years there with my wife Dr. Savithri. Associated from the start of the Department, I could shape it to the academic requirements for teaching and research with equal importance. The administrative duties helped me in developing the department. Though facilities and funds were minimal, cooperation and freedom were maximal. I did not have time to make friends but friendly with all. Most of my postgraduates joined the Department out of their regard and affection for me.

It was heartrending to learn that the devastating floods entered the Kurnool Medical College premises into the lecture galleries. I shudder to think of the fate of the animal house. The cattle at Mantralayam were released to some extent in time!

I went to whole time administration in 1979 as Addl. Director of Medical Education. Dr. Dayananda Rao, former Dy. Director remarked that the work at Directorate is “Transferring persons, canceling the transfers and attending meetings”. He preferred to go back as Principal, OMC. It is the truth. I was happy I could successfully organize the Medical Entrance test with imported answer sheets and computer evaluation at Electronic commission with the help of

UPSC. The age of retirement was raised to 58 in November 1979 when I was due for promotion and lowered to 55 in February 1983. I retired as DME at the age of 55 yrs 2 months. I have no regrets. I was active and could contribute further.

I had to look for employment. Post of Professor Psychopharmacology was a newly created at National Institute of Mental Health and Neuro Sciences and I joined on 2-2-1984. It is a well laid Central Institute with buildings, gardens, library and offices. I had the luxury of a clerk, stenographer and typist. Dr. Pradhan MD (Psychiatry) was the Asst. Professor. He is a great mathematician and familiar with scientific advances. The draw back was that my pay is restricted to last pay drawn in AP and my pension was deducted from the pay. I was drawing a net pay less than that of the clerk of my department. When I got an offer from Benghazi, Libya, I resigned and left on 20-5-1984.

I was at Benghazi, Libya from 1984 to 86. Working hours are 8 am to 2 pm. Duration of course is 1 year preceding Clinical Subjects, but concurrent with Pathology and Microbiology and Parasitology. They prepare a fixed time schedule in Pharmacology for the whole year, apportioning subjects to all teaching staff. Each staff member takes allotted lectures serially and conducts 3 tutorials in batches in the following week. An MCQ test at end of each tutorial is valued immediately to form the internal assessment. They have 2 semester tests only with MCQ and a Final exam with MCQ and short notes. The major disadvantage was that students have inadequate knowledge in English. The entire lecture has to be written on the black board. They copy word to word and study. They are intelligent and often approach staff for clarifications.

Research: In Libya spices cost 100 times more than in India. With experience with Omum (Ajwan), I tested biologically infusions of fried seeds of a number of spices for the presence of acetylcholine. Surprisingly maximum quantities of acetylcholine were present in Red Pepper and Cardamom and also in Zeera, Somph and Coriander seeds. Again Dr. Hanin helped me with GC-MS analysis for actual content of acetylcholine and Choline in the freeze-dried extracts. Dr. MH Akhtar MSc (Pharmacol) from AIIMS was my colleague. Dr. Suleiman Sharif was the Chairman of the Department. After return, I sent the paper on Acetylcholine in Spices to Journal of Pharmacy & Pharmacol. They passed on our article to 'Phytotherapy Research' just started and its Editor wanted this paper to be included in their first issue. Dr. Israel Hanin, though unwilling to be a coauthor in this paper from Libya, helped me in clarifying doubts on GC-MS raised by the journal.

I was surprised with this finding of ACh in spices and wished to study role of ACh in plants. What is acetylcholine doing in plants? I studied germination and growth in Kabuli Channa (Pedda Senagalu) kept in Petri Dishes with water. I found ACh, Eserine and Atropine increased the growth and dTc inhibited the germination and growth. I was called in Libya a Vegetarian Pharmacologist!

Why is ACh released only when fried? Most physiological and pharmacological substances were first found in plants - histamine, acetylcholine, 5HT, atropine, muscarine, nicotine, endorphins (from morphine).

Bombing of Tripoli and Benghazi by American planes cut short our stay and I and my wife returned back to India in June 1986.

I joined as Emeritus Scientist ICMR at National Institute of Nutrition in May 1987 and left in January 1988. I was struck with the grandeur and facilities available in NIN. If I had these facilities earlier, I could have done wonders. I was pursuing the role of acetylcholine in Plant germination using different seeds without much progress.

My classmate Dr. RS Rajagopalan, cardiologist, Chennai induced me to join Raja Muthaiah Medical College, Annamali University in February 1988, just starting its clinical courses.

When I joined on 8 February 1988 in the RMMC it was under construction. I took marathon lectures 5 per week and students appeared for their university examination in April including practicals in Pharmacy and Experimental Pharmacology. The space allotted was in the 1st floor, large halls and few rooms. I designed the Experimental Pharmacology over the cement ledges from the walls to take the drums and extensions and work tables, as in Kurnool Medical College. The space served as Practical hall for Experimental Pharmacology for 12 -15 groups on one side and Practical Pharmacy on the other and Demonstration in the centre. Glass racks up to the ceiling accommodated the equipment and accessories. It was a repeat performance for me. But the management promptly supplied everything I asked. I asked for items which I used to dream of: Grass polygraph, David-Kopf stereotaxic equipment, Sartorius digital balances and to the Biochemistry Department freeze drier, HPLC.

The central animal house was started in a temporary structure. With special breeds of rabbits, rats, mice and guinea pigs air lifted from NIN, Hyderabad, the animal house was started and was soon houseful with no takers. Pellet food, Aluminum cages, Lucerne grass grown in the premises have been at great help. Mr. K. Vasudevan MSc (Zoology) joined as Assistant, Animal Care to help. I induced him to register for PhD with Dr. K. Veeraraghavan, Professor of Zoology as guide and myself as co-guide. He obtained his PhD and published two papers with me. Dr. AR Annamalai submitted thesis on indigenous medicine 'Trikatu' and obtained PhD.

I had no time for making friends in my life. My only friend and life partner was my wife Dr. Savithri, Professor of Obstetrics & Gynecology, who passed away in 1990. When my first contract with RMMC ended by February 1990, she advised me to return back to RMMC. I joined again at RMMC. I occupied myself in a frenzy of work with photos, charts, diagrams. At that time I gave the Achanta Lakshmi pathi Memorial oration of NAMS at Chennai. Dr. K. Ramakrishna Reddy, PhD from Andhra University joined as Reader and was interested in joining research. When he had an offer to join a pharmaceutical company in USA he left. When the MCI Inspectors mentioned in 1992 that I completed 65 yrs of age, I was designated PG Coordinator. Professors Natarajan and Professor Vembar joined the Department. I drafted the syllabi of all PG degrees and Diplomas of Annamalai University to be approved by the Academic Council. At that time, I had a personal letter of invitation from Dr. Suleiman Sharif, Head of Department of Pharmacology, Arab Medical University, Benghazi, Libya, which I accepted. I was given a touching farewell by the Staff and Students of RMMC. The students surprised me by presenting a life size idol of Lord Vinayaka. I was overwhelmed with the warmth of their affection and left it there in a glass case to be preserved as a token of my association with RMMC.

I was touched when Annamalai University sent me a Resolution of the Syndicate placing on record my services to the University. Professor S. Vembar, who succeeded me was a Senior Professor first at Madurai Medical College and later retired as Director Upgraded Department of Pharmacology MMC. He was an apt successor and developed the department further. Active, practical, straight in principle and practice, he is popular with the staff and management. He became the Dean and now Advisor to the VC, 20 years after I left. He is in constant touch with me exchanging ideas. I have a paper with him.

Dr. Nirmala present HOD took her MD at MMC from Dr MGR Medical University in 1991 and returned back to RMMC before I left. She is deeply interested in research and guiding postgraduates in experimental work. She has opened new models for research 'induced colorectal carcinoma in rats' 'isoproterenol induced myocardial injury' and 'paracetamol induced liver Injury in rats' and published papers in International and National journals. She submitted PhD thesis on "Effect of Bioflavonoids with reference to flavonols in colo rectal carcinoma in male wistar rats". She often consults me in her research.

There were tears in the eyes on both sides at every place, I worked and left, leaving behind fond memories.

My second journey to Benghazi, Libya has not been pleasant. With air sanctions against Libya still present, I had to travel up to Cairo by air and from there by land to Benghazi. Though I had a tourist Visa, I was not permitted to go into Cairo. The Egyptian authorities corrupt to core and fleecing money arranged to escort me up to the Libyan border! Fortunately I was received well at Benghazi and my earlier colleague Dr. MH Akhtar helped me in accommodation and in research.

I tried new fields for research: Whether fast growth of yeast is associated with ACh as in the Seeds of Channa. I could not progress being a new area. But it is worth pursuing other antibacterial agents for any cholinomimetic or antagonist action; and cholinomimetic and anticholinergic drugs for antibacterial actions. In Libya Pink tea is prepared with Hibiscus Sabdariffa (Karcude) sold in bags said to be useful in cardiac ailments. I found it augments contractions of isolated rat auricles. We also studied under microscope the microcirculation in mouse ear and published a paper.

I spent my spare time in preparing manuscript of 'Synopsis of Pharmacology'. I learnt more pharmacology while writing the book, though late. The Arab Medical University, Benghazi praised my stay there with a certificate. There were further sanctions and freezing of assets of Libya and we could not remit funds back each month unless we wish to leave finally. I opted to come back in 1994, traveling by ship from Tripoli to Malta and thence to fly back to Mumbai.

I left in Benghazi several books as I could not carry them back: Jackson's experimental pharmacology; JH Burn - practical pharmacology; Edinburgh Manuals –intact animals and isolated tissue; Manuals by M.N. Ghosh, UK Sheth, S.Kulkarni and Palmer Catalogue; laboratory manuals from Oxford, Dartmouth Medical School, Ann arbor Michigan, Baylor College of Medicine – Houston; Hugo Sachs (German) catalogues. I collected rare books at throw away prices on Experimental Pharmacology – Russian translated to English in the 'old books' on pavements of Chennai, Hyderabad and Mumbai bearing stamps of libraries.

I prepared the 'Synopsis of Pharmacology' for use of students in Libya with their Professor Suleiman Sharif as coauthor. I completed the book during my second visit to Libya. Students study before examinations. When I found medical students studying books meant for Diploma in Pharmacy or Nurses, I published 'Synopsis of Pharmacology' to help them. When I returned back in 1994, Publishers wanted to send it for opinion to others. I did not relish. I published 1000 copies of the book at my own expenses about Rs. 80,000/- and priced it low at Rs.250/-. I handed over 120 copies to Dr. Sharif, Libya when he visited India.

The book was released by Professor MY Ansari Principal, Deccan Medical College at a meeting in Osmania Medical College. He complimented the book as equal to Lecture Notes of JH Burn. Dr. P. Sisodia arranged for the release of my book at a meeting held by the Hyderabad IPS chapter. I sent 10 copies to each of the Medical Colleges in AP for their libraries.

I sent complimentary copies to all Professors. Other Staff of Pharmacology Departments wanted free copies. I did not have so many copies. But I had good response from those who read it. They felt it useful for the staff to prepare their lectures and PGs to prepare for exams and USMLE. I toyed with a second edition but gave up the idea with same problems.

At the Southern Regional Conference organized by Drs Joy David, Thangam Joseph and B Venkataraman at Bangalore 2000 I was felicitated as one of the Founder Pharmacologists in South India. I wrote articles in their souvenir (included separately). Dr. N. Gopala Reddy, invited me to be the Chief Guest at Southern Regional Conference IPS at Tirupati in 2003. Though I missed it at the last minute, I contributed articles to the souvenir (included separately). I addressed AP Pharmacologists meet at Hyderabad in 2003 organized by Drs. Farhana & Govinda Das.

Recently I had a pleasant surprise when Dr. NTR Medical University conferred Honorary Doctorate DSc (Hon) to me in 2009. I consider it recognition to Pharmacology in AP state.

As I am tracing back my own journey in Pharmacology, I wanted to contact again all my former colleagues of two decades at Kurnool to enquire their progress in career and life. I was thrilled to talk to them and feel the same sense of partnership and warmth as before. Where some have reached heaven, I spoke with their children. I was happy to learn that most have achieved higher posts, qualifications awards and laurels and that all their children are well educated and qualified occupying high positions in India or abroad. In the final analysis the success of any ones life is gauged by how their children have been shaped to reach a higher pinnacle. The following are brief accounts of my colleagues.

Dr. K. Sunanda Bai (Sunanda S. Nayampalli after marriage) qualified for MD in 1969 with 2 papers in Brit J Pharmacol to her credit. She left to Mumbai and rose to the position of Professor at Seth GS Medical College. She inducted experimental techniques like cerebro ventricular cannulation to her postgraduates. She published papers on *Tinospora Cordifolia*, *Piper nigra* and animal models for studying mediators of allergy. Her work was appreciated by Dr UK Sheth and Dr. RS Satoskar HODs. I was in frequent contact with Dr. UK Sheth in Mumbai in his last days. I was touched by Dr. Sunanda's regular personal greetings to me for every Guru Poornima and Teachers day with gifts since the time I settled down at Mumbai. She was attached to my wife

her teacher. Her husband Suresh retired as a company executive. After retirement in 1998 she worked at Manipal College of Medical Science Pokhara in Nepal up to 1999. Later in 2002 she was at Amla Institute, Thrissur. She continues to teach pharmacology at home to students from other faculties as well. Her children are software experts - son in India and daughter in USA.

Dr. G.V. Sitaramayya took MD from AMC in 1963. He was a well disciplined person being Captain of NCC as a staff Member. He joined me at Kurnool and published two papers one in Brit J Pharmacol and another in Ind J Physiol Pharmacol in 1965. Later he was a Professor at Kakinada, Guntur and Tirupati where he became a Principal. From Tirupati he was transferred to Kakatiya Medical College, Warangal as Principal 1989-92 where he retired. After retirement he worked as Professor at Ramachandra Medical College, Chennai and Kolar in Karnataka. Towards the end he remained at Tirupati, going up to Tirumala thrice in a week to treat patients, a service which gave him immense satisfaction. He used to send me the Sri Vari Mahaprasadam packets regularly. He was deeply religious and reached Lord in his sleep, a boon reserved only for HIS special devotees. His pious wife Mrs. Krishna Leela used to help me in my visits to Tirumala. They have two sons and a daughter. The eldest Dr. Prasada Rao is a leading Psychiatrist in Hyderabad and award winner. The other two are well placed in life.

Dr. K. Premalatha worked in Pharmacology Department KMC for 2 years 1963-65 when active research was in progress. She was a co-author for four papers: one in Brit J Pharmacol and three in Indian journals. Responding to a strong call for clinical association she opted out to acquire MD in Anaesthesiology. After a stint in UK for 3 years, she returned back to AP Government service and rose to position of Professor & HOD Anaesthesiology at AMC. She was the President of Indian Society of Anaesthesiologists in 1997. She still remembers her association with Pharmacology though she drifted far away for better pastures. She visited me recently along with her husband Dr. Satyamurthy, Professor of ENT.

Dr. G. Devasankaraiah was a diligent worker and obtained remarkable results. His thesis on the stimulant and relaxing factors in Omum is indeed thought provoking. He traced the stimulant factor as acetylcholine with painstaking tests. This was published in Brit J Pharmacol. He established the constipating effects of omum in rats meticulously counting the excreted pellets. The relaxant factors are yet to be identified. He also showed by bioassay that dTc given in anaesthesia in clinical doses passes into c.s.f. He took MD in 1972. Fortunately a post of Additional Professor Pharmacology was sanctioned only to Kurnool of all state Medical Colleges in 1977. He was promoted as Additional Professor. He succeeded me to the chair of Pharmacology. The AP government turned seniority in teaching cadre for promotion to administrative posts topsy-turvy linking it with Service Commission ranks as Assistant Surgeon. At the time of recruitment as CAS no one knows their future choice. Further promotions in teaching cadre were only on basis of a PG degree in the subject and that formed the criterion for seniority as CS. Some subjects have limited number of posts. With revised seniority, Principals and Directors were holding posts for days, weeks or a few months, looking after their pension papers and not administration. Dr. Devasankaraiah was promoted as Additional Director and took charge as Principal, Kurnool Medical College for just one day! After retirement he joined SVS Medical College Mahbubnagar as Professor and rose to the positions of Principal and Dean. He and his wife Mrs. Kamala were blessed with eldest son an Engineer, second son Pediatrician and wife doctor at Hyderabad. Daughter is a doctor settled at Bangalore.

Dr. K. Seshagiri Rao, BSc passed MBBS in 1967. During house surgeoncy he underwent heart surgery. He recovered completely in a month time and married same year. He joined as tutor in Physiology, but transferred to Pharmacology for his PG. He obtained his MD in 1970. He published with me 5 papers – one in Brit J Pharmacol and four in IJMR. A serious sincere research worker and teacher he never gave any indication of heart surgery. He was promoted Professor at Guntur Medical College in 1981, but soon preferred to come back to KMC where he was at home. I met him and his wife Mrs. Venkubai at their residence in Kurnool in 1992 on my way back from Chidambaram to Mumbai enroute to Libya. He passed away on October 2 in 1993 at a young age of 55. Straight forward, honest and intensely religious, he was liked by all. They have a software engineer son in a high position at Bangalore and a daughter settled in Singapore.

Dr. G. Indira Narayan was a brilliant UG & PG. She worked on the 'Pressor effects of Local anaesthetics introduced into cerebral ventricles'. She designed Psychopharmacological apparatus, an attraction in the medical exhibition. She obtained MD in 1972 and later moved to Kakatiya Medical College, Warangal to join her husband Dr. Parthasarathy Reddy, Ophthalmologist who retired as Superintendent Regional Eye Hospital. In 1972 Kakatiya Medical college (KMC-W) was a private Medical College and was taken over by AP Government in 1977. Before handing over the college to Government, the Management of the private medical college promoted its employee with only 2 years experience after PG qualification as Professor of Pharmacology. With this fait accompli, Dr. Indira's claim for Professorship was blocked and she was forced to work under a person who qualified much later. There were no posts of Additional Professors in Pharmacology, except at Kurnool at that time. With domestic ties restricting her to Warangal, she had to wait for 19 years till 1991 to be promoted as Professor! This naturally caused deep disappointment, aversion and resentment and she wanted to get out of the shackles of Pharmacology. With great difficulty she succeeded in getting attachment to the Maternity Hospital, Hanumakonda and obtained DNB (Obstetrics & Gynecology) with ease. This remarkable achievement is hallmark of her intellect and willpower and a matter of great pride. Yet she continued in Pharmacology despite the set backs and rose to become the Principal of Kakatiya Medical College, Warangal and later Principal RIMS, Kadapa. They have a daughter Gastroenterologist settled in USA and a son MBA in Calcutta.

Dr. A. Krishnamurty took his PhD from Andhra University after extensive work on Acetylcholine release from isolated and perfused single cotyledon of human placenta working with Dr. Brahmayya Sastri. He joined KMC in 1969 as Asst. Research Officer (ICMR) and soon merged vigorously with the research problems on hand and published two papers in Brit. J Pharmacol one in Pharmacol Biochem Behaviour and another in IJMR before he left. He was an eager research worker. In 1972 he joined IDPL at Hyderabad, a Central Research Institute and rose to the position of Research Manager. He had several publications investigating synthetic compounds for actions on hyperlipidemia, hyperglycemia, central muscle relaxants and anti allergic drugs. His wife Dr. Chandrasena MD is Obstetrician & Gynecologist and retired as DME, AP. They have two sons well settled one in India and another doctor in UK.

Dr, S. Shyamala Kumari obtained MD in 1973 with a thesis on *Tylophora Indica* elucidating its immunosuppressive action. The plant with its leaves and fruit was sent to Botanical Survey of India and its identity confirmed. This leaf has good potential for use in Bronchial asthma.

Remedies for bronchial asthma like even fish medicine are in great demand. She assisted Dr. Ayyapu Reddy in investigating the non-alkaloidal fraction of the leaf which showed profound granulocytosis, a property worth pursuing. She also meticulously recorded sleep induced by small doses of dTc into cerebral ventricles, published in Brit J Pharmacol. She was a Professor at Osmania Medical College and later Principal Kurnool Medical College and Kakatiya Medical College, Warangal from where she retired. She worked in other private medical colleges. She is deeply religious and member of Brahmakumaris association. Her husband Dr. Yellarao retired as Dy. Director IPM. They have a son software engineer and daughter well settled in life and with grand children

Dr. S. Ramabhimaiah joined as PG in 1971 and took his MD in 1974. He had three publications in IJMR on the cholinomimetic actions of ouabain at different sites and passage of noradrenaline into c.s.f. He worked at Dayanand Medical College Ludhiana up to 1977. Later at MR Medical College, Gulbarga he was Assistant Professor 1977-80, Professor and HOD 1980 -2003 and Dean & Principal for last 2 years up to 2003. He published papers on several indigenous drugs and on other actions of metronidazole, tinidazole and Itraconazole. Since 2003 he is HOD Pharmacology at Navodaya Medical College, Raichur. He has a well settled family with two doctor sons with their doctor wives in USA and UK and daughter a dentist in USA with an engineer son-in-law.

Dr. G. Gopalakrishna took his MD from AMC 1968 and transferred to KMC as Assistant Professor. He merged with other staff easily and is coauthor for a paper in IJMR in 1970. He was transferred to Tirupati and later back to Kurnool. Towards the end he was the Professor and HOD at Tirupati and was examiner to several Universities. He helped in purchasing a number of copies of my book 'Synopsis of Pharmacology' while he was at Tirupati. He and his wife Mrs. Vasantha Lakshmi were excellent hosts with pleasing manners. He retired in 1998 and later worked in Medical Colleges in Karnataka before he passed away in 2001. They had three well qualified sons – eldest Dr. Raghunandan an Orthopedic Surgeon at Kurnool, second PhD IIT Chennai working with GE (USA) and last PhD Johns Hopkins and both settled at USA.

Dr. G. Ayyapu Reddy joined as PG in 1973 and got MD 1977. His thesis work with non-alkaloidal fraction of Tylophora Indica producing marked leucocytosis is a valuable finding requiring further study to develop drugs required to counter leucopenia after chemotherapy. He joined as Assistant Professor at KMC in 1979. He was Professor HOD at KMC 2000 -2003. Soft spoken and well mannered he was a successful Professor & Director of Santhiram Medical College, Nandyal. Now he is with Fatima Institute of Medical Sciences, Kadapa. He is blessed with three sons all doctors, one FRCS in Singapore, another in UK and third in West Indies.

Dr. D. Govinda Das took his MD (Pharmacology) from Banaras Hindu University in 1974. He published 'Effects of propranolol on gastric secretion in albino rats' in Brit. J. Pharmacol in 1974 and on 'Effect of vegetable banana powder and ulcerogenic agents on gastric juice' in Indian J Gastroenterol in 1985. Both are widely quoted. He joined at Kurnool in 1976. He was an eager research worker and published two papers with me. Restless and keen on advancement, he secured DM (Clinical Pharmacology- CP) working at PGIMER, Chandigarh. It was a credit worthy move extending his cherished desire to be in touch with patients. He was a Professor of CP at Guntur and later at Osmania Medical College from where he retired. He started DM

Clinical Pharmacology course at OMC. He continued publications with double blind study of propranolol and cyproheptadine in migraine prophylaxis and kamalahar, an indigenous compound in viral hepatitis. He is a tireless teacher and continues in private Medical Colleges, now at Mahbubnagar.

Dr. MA Udaya Kumar MSc (Zoology - Neurophysiology) joined as ARO in 1976. His research problem was estimating biogenic amines in c.s.f. He used to travel with the specimens to NIN for spectrofluorimetric estimation by Dr. PSV Ramana Murthy (my brother) and published two papers in IJMR. Fortunately he got registration for PhD with SV University with his Professor K. S. Swamy as guide and me as co-guide. He obtained his PhD. I left for administration to Hyderabad. He worked in Neurochemistry with Dr. B. Sadasivudu for a short time. Later he was Assistant Professor Zoology in Open University Hyderabad. God favored him and he was selected for IRS and escaped becoming a pharmacologist! He was Commissioner of Income Tax at Hyderabad and Kolkata and currently at Gulbarga and is happy. His wife Mrs Krishna Bharati is Spl. Grade Dy. Collector in Hyderabad. They have two daughters – elder one well settled in life and second practicing lawyer in Secunderabad. He keeps in touch.

Dr. S. Ramesh joined as PG in 1977 and took MD in 1980. He worked on toxicity of Organophosphorous compounds on CNS and published one paper with me. He joined as Assistant Professor at Gandhi Medical College, rose to the position of Professor and HOD and retired in 2010. For a brief period he was a Joint Director of Drugs at Directorate. After retirement he joined Shadan Institute of Medical Sciences Hyderabad. Of his two sons one is an anaesthetist in Hyderabad and another software engineer in USA. I and my wife attended his marriage at Proddatur.

Dr. M.V. Ramagopal MSc from AU worked at Kurnool as ARO in 1977. He collaborated with Dr. S. Ramesh in investigating possible antidotes against Trichlorfon a pesticide directly applied to brain by intracarotid infusion and published a paper in IJMR. He left soon to PGIMER and obtained PhD. From there he migrated to USA. He was Assoc. Professor at Coll. Health Sci, Boise State University, BOISE. He published several papers on adenosine and serotonin receptor mechanisms. I last heard from him when he was Director, Clinical Research Reproductive Health/Urology Johnson & Johnson Pharmaceutical Research & Development, Raritan, NJ 08869 USA.

Dr. Y. Srinivasa Rao took MD in 1977. He was interested in general clinical practice and obtained FCCP. I heard from him last from KIMS, Narketpalli as Professor of Pharmacology. I understand that he is practicing at Hyderabad and frequently goes to USA where his children are well settled.

Dr. K. Md. Abdulla was Captain in Indian army 1971- 76. He took part in 14 days war with Pakistan in the liberation of Bangladesh - Operation 'Cactus Lilly'. He joined AP service in 1976 at PHC Ieej. In 1978 he joined as tutor and PG in Pharmacology at KMC. He worked on the theme of transfer of biological substances across membrane barrier and studied acetylcholine transfer in intestine and eye and published a paper in IJMR. He took his MD in 1981. He became Professor at SRRMC Kakinada in 1993. In 1997 he was transferred to KMC where he was also HOD 1999-2000. After retirement in 2000 he was Professor at SVS Medical College

Mahbubnagar for 4 years and later as HOD at Santhiram Medical College, Nandyal. Wherever he worked he showed his skills in Pharmacology. He is liked as teacher by his students. As an Ex-Army Captain he is highly disciplined, efficient, quick in judgment and action and an excellent organizer. He is blessed with an expanding family. His sons are well placed one in Saudi Arabia and another software engineer in Hyderabad. Daughter is settled in Hyderabad.

Mrs. B. Ajaya MSc joined as Nonmedical Assistant in Department of Pharmacology in 1972. Gentle in disposition she was actively helping in the Department. She is skilled in biochemical work and published a paper on action of Insulin on CNS. With no chances of promotion in the Pharmacology Department she moved over to Laboratory Medicine and retired as Head of Laboratory Division, SD Eye Hospital Hyderabad in 2003. Her husband is Divisional Engineer in Electricity Board. They have a daughter specialist in Internal Medicine and son software engineer, both settled in USA.

I miss several of my non medical colleagues who formed the pillars of support for research and are no more.

Mr. K. Victor Moses was like my shadow from the date I took charge as Professor at KMC in 1957. Eager, helpful, intelligent, reliable, silent and sincere, he was an asset for me. He leaves behind wife Mrs. Kamalarani, a teacher still living at Kurnool. It was heartrending for me to learn that their house was totally submerged and she had to move to a safer place during the terrible floods in 2009. Daughter Mrs. Sulochana is a teacher at Kadapa and son lab technician at Nandyal.

K. Vittal Singh, though designated 'Fitter' in workshop is truly a design specialist. Given an idea, he could grasp the minutest detail to produce products useful for research not merely for Pharmacology, but for any department of the college. He made SS i.c.v. cannulae to the size required for dogs. He made the Collison cannulae with outside cap and Borison cannulae with hollow screw inside the cannula to reduce the dead space. The stereotaxic head holder and items like Psychopharmacological apparatus, animal cages, food cups, water bottles with brass spouts rounded at the tip are made by him in large numbers. After retirement he set up a workshop in great demand. He was in touch with my son Jagannath in the last years when his grandson was afflicted with neuroblastoma. When the child is lost, he lost his zeal and passed away in grief. Jaleel the Carpenter was equally efficient, handling the small as well as major machines with ease and supplied to the library and hostels elegant Formica lined tables.

Kondanna of Central Animal House has a remarkable ability, affection and control over animals. He used to take them for EEG records at Neurology department Osmania General Hospital, Hyderabad. The dogs were praised by the staff as more cooperative than humans! He was loyal and worked day and night willingly to be appreciated by all.

With long association with Kurnool Medical College for 20 years, I feel a sense of pride whenever any of its students excel in life to come to lime light. Even now many of students are in touch with me and invite me to come to their reunions in India and abroad. I feel happy at their achievements

Since 1994, I stay with my son Jagannath daughter-in-law Gouri and two grand daughters at Mumbai. He took MS from JIPMER and received FAMS, FICS, FACS and FRCS (Engl). He was a surgeon, Tata Memorial Hospital and after 20 years of service as Professor of Surgical Oncology and chief of G.I. Services, is now consultant at Lilavati and SL Raheja Hospitals, Mumbai.

Teaching and research: It is said that the student gains knowledge - a fourth from his teacher, a fourth by his own intellect, a fourth from his colleagues and a fourth by experience over time.

आचार्यात् पादमादत्थे
पादं स्वमेधया ।
पादं सहाध्यायभिः
पादं कालक्रमेणच ॥

The function of the teacher is to edit and present the subject in a simple form relevant to medicine. Learning is visual from teacher, experiments in laboratory and in patients. Practicals have now become theoretical or replaced by CDs and Videos. New Departments of Pharmacology ask 'do we need all this equipment'. The older institutions find the work benches and equipment a dead load. MCI recommended four PG qualified Pharmacologists, tutors, Pharmaceutical chemist, technicians, attenders, clerical staff and store keeper **NOT** for didactic lectures and practicals alone, but research as well. It is desirable to ear mark some days for research. The image of a Department depends on the quality of research work and not merely the output of PGs. Research is not attractive to many as it demands more time, collaboration with others, lack of animals, proper equipment and a guide. Lack of incentives is the main reason. In service, often, minimum qualification and seniority counts in promotions. .

Pharmacology has changed a lot in the last 2 decades. But its permanent roots are in biology and medicine. The methods of research are different. The concepts are at cellular level, receptors, genomes, requiring knowledge in new areas. I wish I had better knowledge of chemistry biochemistry, calculus and statistics.

One has to learn new techniques, methods, from other sciences and collaborate with other disciplines for meaningful research. The restriction on animal experiments need not be a constraint. One can use human tissues removed in surgery, placenta etc subject to Ethical Committees approval. Tissues collected (transported in iced flasks) from slaughter houses; poultry, fish, eggs, blood, plasma, body secretions, cells, cell cultures, tissue cultures, plants, seeds can also be studied. Research is a continuous process.

I still keep in touch with medical subjects with internet and write articles. I respond to doubts and queries from colleagues. Even in the evening of my life, if some one seeks advice in a research problem or preparing a paper, I readily volunteer.

I believe that the satisfaction of a teacher lies **NOT** in the number of years allotted to the subject in medical curriculum; **NOT** in the space allotted to it; **NOT** the number of postgraduates turned out; **NOT** the age of Institution and its location in Metropolis or Rural area; **BUT** in the number of students who felt attending his lectures worth while and delegates who felt his talks are

educative and revealing and the principles he preached and practiced in his career. These are remembered by those who were his students, postgraduates, colleagues and the public who came in contact with him. The research papers may be remembered as they indicate an approach to a problem. As days pass by many known faces will slowly fade away. But I had the pleasure and happiness when some one from the past remembered to meet me and greet me.

Knowledge stimulates curiosity and doubts arise. Ideas alone are not enough. They need follow up investigation and finally proof. This cannot always be done alone. One needs confidants, collaborators, sometimes from other disciplines as well. An idea, hypothesis or proof partial or complete has to be published in a scientific journal as a token of recognition by the concerned scientists.

A man would do nothing
If he waited until he could do it so well
That no one would find fault
With what he has done
Cardinal Newman