

Chemistry museum at Göttingen University – A solution to the problem?

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Museums are the custodians of the past and provide an opportunity to appreciate and recollect the heritage of the yesteryears. Past is experience, present is action and the future is plan. Looking into the past can be a lesson by itself and to feel proud of it is a self-encouragement to move forward! India's heritage in science (also in chemistry) is rich and admirable. A museum in chemistry merits a serious thought and consideration as it could help to attract young talents to the pursuit and progress of chemistry! The chemistry museum at Göttingen is a recent example which provides a rewarding experience and conveys a message.

It is a well-known fact that *museums* in general are a living heritage of the *past*. They stand to serve as a source of information, education and even inspiration to carry on with the *present* for a better and brighter *future*. One of the authors of this article was pleasantly surprised, during his recent visit to Göttingen, to learn that there exists a museum in the chemistry department of this university and it has so much of interesting and exciting things to offer, besides possibly suggesting a remedial measure for the existing scenario of higher pursuits in chemistry in our country.

Museums *per se* may have their own reasons for existence. But one dedicated to a specific discipline of science such as chemistry here is something rare, special and perhaps a timely solution!

It is well acclaimed that science has been truly international and has rewarded mankind bountily. However, let us not forget ourselves that these benefits to society have been the consequence of proper cultivation of science over generations. It is often said now-a-days that the interest of the younger generation to consider a career in science has declined and continues to decline! It is feared that good job prospects and lucrative offers from the field of electronics and computers, information technology and management have adversely affected and will have a long-lasting effect on the practice of science. Though this contextual scenario poses a challenge to the preservation and promotion of scientific tempo and activity, one has to learn to handle and deal with it as it cannot be ignored. Any and every effective remedial measure has to be thought of and tried with vigour and firm commitment to

counter this situation, so that it guarantees a good inflow of able and enthusiastic young talent to science.

It is in this connection that dedicated museums could play an effective role as they are primarily visual in nature and serve to kindle the young minds and enhance their liking to science. Let us remind ourselves that undoubtedly the *visual effects* make a deeper impact on the mind!

The chemistry museum at Göttingen University is indeed a trendsetter and a classic example in this regard. Justifiably, the department which owns the museum has the pleasure and pride of the reputation it has built in cultivating chemistry for over 250 years! In the neighbourhood, something similar and dedicated to chemistry exclusively can be seen at only two other places – the Liebig museum at Giessen, Germany, and the Berzelius museum at Stockholm, Sweden. Needless to say that the European countries have nurtured the museum concept very well and in Germany itself, there are museums dedicated to sugar, balances, energy, nuclear research, pharmacy, history of medicine, technology and labour, optical instruments, analytical instruments and oil, besides the famous German museum at Munich.

The chemistry museum was started in 1979 thanks to the idea and the initial efforts of the originator, Oskar Glemser, who was then director of the Inorganic Chemistry Institute at Göttingen (Figure 1). It is praiseworthy that after over twenty years of existence, the support and help needed for its maintenance and continuous expansion work comes now from the members of the Museum Supporters Union (a private association), in addition to a share from the university itself!

In this context, it may not be inappropriate to mention a few words about Göttingen itself and its scientific heritage. Göttingen is not a town with a university, but a university with a town. Göttingen known as *university town* remained untouched and unaffected during the fury of the world wars and is therefore able to boast today of its

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unadulterated history of at least 600 years. Scientifically also, it has something very special to narrate. The university founded in 1734, is over 250 years old. Several geniuses of science were a part of this university in the past. Max Born, Carl Friedrich Gauss, Otto Hahn, Werner Heisenberg, Gerhard Herzberg, Max von Laue, Walther Nernst, Otto Wallach, Wilhelm Weber, Adolf Windaus, Friedrich Wöhler, Richard Zsigmondy are just a few to name. A majority of them are laid to rest at the town's cemetery. May be due to the effect of these great souls Göttingen which at one time was a famous trade centre has now been fully transformed with education as the primary occupation and interest in the town. Statistically, it is amazing that about 25% of the town's population (approx. 125,000) belongs to the university. An extraordinary index of academic content of the town! Göttingen also has four Max Planck Institutes dedicated to biophysical chemistry, inner medicine, aerodynamics and history.

The chemistry museum in the department has an available space of 100 m² and is located in the ground floor of the Inorganic Chemistry Institute built with all modern amenities. It presents a variety of things of high interest to chemists! One can get to know all the famous chemists who worked here. Some of the famous personalities who brought name and fame to the department and the university through their work have been mentioned in Table 1.

Expectedly, these scientists not only attracted talent from all over the globe to work here, but have also given back to the world a large number of well-trained students who have spread far and wide and done exceptionally well in chemistry. Some of the well-known names in this category are F. Beilstein, R. W. Bunsen, G. Borsche, A. Butenandt, C. F. Chandler, F. Fittig, L. Gattermann, L. Gmelin, D. A. Goesmann, H. Hübner, W. Hückel, E. Knoevenagel, H. Kolbe, W. Lossen, I. Remsen, H. Schiff, E. F. Smith, F. Stromeyer, B. Tollens and O. Wallach.

A visit to the museum guarantees acquiring a wealth of information and inspiration as one gets to see great per-

sonalities, special collection of their writings, portrayal of their lives and accomplishments, letter correspondence, certificates, degrees and medals, the glasswares, chemicals, equipments and apparatus they made use of, samples of compounds they prepared, safety concerns they cared for, photographs depicting different moments in their lives, personal family records, etc.

The museum also offers some rare and special scientific equipments of yesteryears, which even today function to the same level of precision! For example, the first microscope and a refractometer produced by Carl Zeiss, Jena around 1860 and 1895, respectively, a polarimeter made in 1890 by Schmidt and Haensch, Berlin, an analytical balance made by Moritz Meyerstein of Göttingen around 1850, a mirror galvanometer by Ruhstrat, Göttingen in 1932, a micro torsion balance made in 1903 by Spindler and Hoyer, Göttingen, several early versions of balances made by Sartorius, Göttingen are all here. It is praiseworthy that their concern for others is reflected on seeing their write-ups on the problems they faced with some of the equipments and the way they overcame them. Some of these documents are over 200 years old!

We cannot resist but to describe here at least some facts about a few great persons whose work continues to live in this museum.

Friedrich Wöhler (Figure 2), an unforgettable name from the chemistry department, is the founder of synthetic organic chemistry. All synthetic organic chemists of the world today owe a lot to him. He clarified, by synthesizing for the first time in 1828 urea from an inorganic compound, NH₄NCO, that all molecules both found in and

Table 1. Famous scientists associated with the Chemistry department at Göttingen University

Scientist	Branch/area of work	Period
J. F. Gmelin	Medical and mineral chemistry	1775–1804
F. Stromeyer	Analytical and pharmaceutical chemistry	1802–1835
R. W. Bunsen	Inorganic and physical chemistry	1834–1836
F. Wöhler	Chemistry and pharmacy	1836–1882
O. Wallach	Organic chemistry (terpenes)	1889–1915 Nobel Prize in 1910
W. Nernst	Electrochemistry and thermodynamics	1890–1907 Nobel Prize in 1920
R. Zsigmondy	Colloids and inorganic chemistry	1908–1929 Nobel Prize in 1925
A. Windaus	Organic chemistry	1915–1944 Nobel Prize in 1928
G. Tammann	Inorganic and physical chemistry	1903–1930
H. von Wartenberg	Inorganic and physical chemistry	1933–1948
H. Brockmann	Bio-organic chemistry	1945–1972
W. Jost	Physical chemistry	1953–1971
O. Glemser	Inorganic chemistry	1952–1980



Figure 1. View of the chemistry museum at Göttingen, Germany.

related to life are synthesizable! As a tribute to his achievement and outstanding contribution the Göttingen town itself boasts of him and he is found all over in different forms. Wöhler cannot be avoided in Göttingen! Wöhler's credentials in chemistry were very varied! In 1823, during his stay with J. J. Berzelius in Stockholm, he prepared selenium. Later on, he prepared amorphous silicon, isolated cadmium from an impure zinc and prepared pure aluminum as well. A sample of iridium, tantalum and tantalum oxide originated by Berzelius are seen in the museum. Chemistry which was a part of medicine earlier, became an independent department during his time. His school certificate as well as telegraphic 'best wishes message' sent to one of his students, Viktor Meyer who was to deliver a lecture on 'artificial synthesis of urea' in 1878, fifty years after it was prepared, can be seen in the museum! Otto Wallach got his Ph D under Wöhler in 1869 and 20 years later became his successor. He practised natural products chemistry, in particular, terpene chemistry all through his life. In recognition of the services rendered by him to organic chemistry and the chemical industry through his pioneering work on compounds, he was awarded the Nobel Prize in 1910. Some former students of Wallach laid the scientific foundation for today's perfume, drug and spices industries. Some of the terpene samples prepared during his time are well-preserved in the museum.

Walther Nernst (Figure 3), a genius at Göttingen worked mainly on electrochemistry and thermodynamics and was bestowed with the Nobel Prize in 1920 in recognition of his work. About him, Albert Einstein wrote '... But for such a passion, his singularly creative productivity and his important influence on the scientific life of the first third of this century would not have been possible.' Regarding Nernst and Göttingen, again Einstein wrote '... he continued to change the place of his subsequent research work until Göttingen captured him for a long period, from 1890 to 1905!'



Figure 2. Friedrich Wöhler (1800–1882).

Richard Zsigmondy, son of a doctor, studied in Vienna and Munich before joining the glass factory, Schott und Genossen in Jena. He made contributions to coloured glasses and is the discoverer of 'optical milk glass'. In 1908, he moved to Göttingen, where he studied about colloidal state and proved that colloids are heterophase systems; this won him the Nobel Prize in 1925.

Adolf Windaus (Figure 4) with a very distinguished career, came to Göttingen as a successor to Otto Wallach. He embarked on a variety of problems relating to natural products, especially on isolation and characterization of species present in nature and life. This was a task of immense challenge that demanded intelligence, skill and persuasive efforts to be successful. By his gifted brilliance, untiring and ingenious efforts, Windaus investigated several problems related to cholesterol and vitamin D and made noteworthy contributions. He is best known for his work on cholesterol and vitamin D. To quote Alfred Stock about him, 'Windaus has shown that the provitamin is not cholesterol, as had been supposed, but ergosterol. Only 1/60% of this active substance is present in cholesterol; a thousandth of a milligram is sufficient to cure a rachitic rat. The practical significance of this work cannot be esti-



Figure 3. Walther Nernst (1864–1941).



Figure 4. Adolf Windaus (1876–1959).

mated today, but we do know that, thanks to Windaus's work, we now possess an unusually active medium in the battle against rickets'. Windaus won several honours and awards and to top it, the Nobel Prize itself in 1928, for his great discoveries and contributions to mankind. Adolf Butenandt, one of the Ph D students of Windaus, also won the Nobel Prize in 1939.

Conclusion

Museums are an effective source of information and education museums. They preserve the *past* and merge it with the *present*. Chemistry museums provide an opportunity to know the chemists of the past, their works, achievements and experiences. Will this not equip the present generation to deal with the existing situation much better?

The great inheritance of chemistry at Göttingen made this university recognize its importance and set-up this museum, over twenty years ago. Systematic efforts are currently being made to attract the attention of all, particularly school and college students to the museum. The town's administration also proudly participates in this effort. This has helped the department to sustain its activity over the recent decades with good students in impressive numbers. This recent example conveys clearly a message that 'museums of this kind are a welcome measure for revival and revitalization of chemistry for the benefit of mankind'.

The great heritage must find a place in today's fast-moving era of civilization or otherwise it will be lost! India has an incredible and impressive past history of thousands of years, when glories of science existed in this great land. The country which at all times can boast of producing an ocean of intelligentsia has in the past presented to the world, top class and even Nobel Prize winning scientists. This tradition, long history and an

impeccable record can neither be lost nor undermined! Every effort should be made to restore and retain this trend. The explicit museum concept is indeed a right step in this direction.

1. van Spronsen, J. W., *Guide of European Museums with Collections on History of Chemistry*, Federation of European Chemical Societies, Antwerp, 1998, 3rd edn.
2. Pötsch, W. R., Fischer, A., Muller, W. and Cassebaum, H., *Lexikon bedeutender Chemiker*, VEB Bibliographisches Institut, Leipzig, 1988.
3. Franck, Ernst Ulrich, in *Naturwissenschaften in Göttingen*, Eine Vortragsreihe, Gottinger Universitätsschriften Serie A, Schriften/Band 13, Göttingen, Vandenhoeck and Ruprecht, 1998, S. pp. 53–67.
4. Franck, Burchard, in *Naturwissenschaften in Göttingen*, Eine Vortragsreihe, Gottinger Universitätsschriften Serie A, Schriften/Band 13, Göttingen, Vandenhoeck and Ruprecht, 1998, S. pp. 68–84.
5. Beer Günther and Roesky Herbert, W., Museum der Gottinger Chemie, *Georgia Augusta, Nachrichten aus der Universität Göttingen*, Jg. 67, November 1997, pp. 31–35.
6. Glemser, Oskar, Die Entwicklung der Chemie in Göttingen seit der Gründung der Universität 1734, *Georgia Augusta, Nachrichten aus der Universität Göttingen*, Jg. 57, Mai 1987, pp. 61–68.
7. Berl, Ernst, *J. Chem. Educ.*, 1954, **22**, 1.
8. Oesper, Ralph, E., *J. Chem. Educ.*, 1950, **27**, 158.
9. Van Klooster, H. S., *J. Chem. Educ.*, 1944, **21**, 158–170.
10. Beer, Gunther, *200 Jahre chemisches Laboratorium an der Georg-August-Universität Göttingen 1783–1983*, Vorarbeiten zur Geschichte der Chemie in Göttingen, I. die Lehrenden, Göttingen 1983.
11. Wotiz, John, H., *Chemtech.*, 1982, 221–228.

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