haphazard. In addition, the available text books are full of inconsistencies – printing as well as otherwise. The third argument is quite a valid one, but one should not overdo it. Routine programming techniques, for example, should be left to the students to be learnt by practice.

When we go out of IITs and look at the curriculum of other Universities, the situation is somewhat varied, but the general trend towards reducing science content is clearly visible. In a recent curriculum revision, some Universities in Tamil Nadu have reduced Physics and Chemistry contents of the engineering curriculum to just one course, called Physical Sciences Theory and Practice (Kaniappan, K., *Curr. Sci.*, 1999, **76**, 1173). This is an extreme situation; it could, of course, be worse, where all basic sciences could be thrown out of the engineering curriculum.

The founding fathers of the IIT system had the vision that IITs would impart what is called 'science-based engineering education', the products of which would be rich in knowledge and simultaneously have the competence to retrieve and use information pertinent to the discipline. The knowledge-base, rather than information-base, would make them engineering innovators who would foresee and work for what is to come in the future. In other words, IIT graduates would be most suitable for engineering research, development and innovation. By and large, our initial curricula were designed with this end in view, but over the years, the vision seems to have been blurred to a great extent, yielding place to primarily information-based course work.

Some IIT teachers argue that our basic science content may be low, but we do teach engineering sciences. A careful examination shows that even here, the trend is to push the relevant discipline subjects to these slots. For example, an EE Department names Electronic Circuits and Electrical Machines, which are hard core EE subjects, to fulfil the needs of engineering sciences. What is more, in some disciplines, even the science content relevant to the discipline has been relegated to the elective list or thrown out altogether. A case in point is the course on Physical Electronics, which is now an elective in one IIT's EE curriculum.

It appears to me that a hard and discipline delinked look is urgently needed at the science content in engineering curriculum, and the necessary corrective actions have to be initiated in order to motivate at least some of our bright graduates towards engineering research, design, development and innovation.

In the general atmosphere of globalization and liberalization, it is the common impression that one can import almost anything for the price. This is not, however, true in the case of technology or hardware related to our crucial national needs in some sectors like defence and space. One realizes this only when the nation faces sanctions from a developed country like the USA; in that challenging situation, we are forced to work for indigenous development. Such challenges are likely to increase in the future, and the best brains and the best trained minds are needed to meet the same. People having science-based engineering training would prove invaluable in such situations.

There have been several attempts at rationalizing the 10 + 2 education in science, but no substantial change seems to have resulted. In this context, I am of the opinion that the two years' intermediate science programme in colleges, after ten years of school, was much more effective in preparing the science background needed for engineering. I myself went through such a programme, and I vividly remember how exciting those days were, with every lecture unfolding new knowledge in a manner quite different from what we were used to in schools. Every Physics and Chemistry lecture was accompanied by live demonstrations in the class room which left an indelible impression in our young minds. Can we go back to that system?

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SCIENTIFIC CORRESPONDENCE

Crystal structure of cyclonite

Cyclonite, also known as hexagen, RDX and T4 is an important explosive. It achieved great importance during World War II and was first prepared by Lenz[1]. Cyclonite was used in detonators, primers, boosters and in mixtures with trinitrotoluene. Cyclonite has a high chemical stability and great explosive power. In our forensic science laboratory, we receive samples of various explosives including cyclonite for analysis.

Cyclonite is a white substance in crystal form. The refractive index varies from 1.57 to 1.60 and the melting point is 202°C to 207°C. The specific heat is 0.3 cal/g°C, and the heat of combustion is 2285 kcal/kg. It is an endothermic compound and this factor renders it highly explosive. It has a specific gravity of 1.820 and it is practically insoluble in water and carbon disulphide. In most organic liquids cyclonite dissolves with difficulty. The best solvent in which it dissolves is acetone, at the rate of 8.38 g/100 g of acetone at 30°C, it can be recrystallized from this. On explosion, cyclonite decomposes with the evolution of CO 25.22%, CO_2 19.82%, H_2O 16.32%, H_2 0.90%, N_2 37.83% at a

Table 1. Orthorhombic system: Mwt 222.12

	a	*b*	*c*	Volume (CD)	Z	Dx	Dm	*d*
Refs 4 and 5	11.574	13.182	10.709	1633.86	8	1.806	1.816	4.961 6.751 5.091
Present work	11.569	13.177	10.709	1632.04	8	1.807	1.800	4.956 5.342 3.046

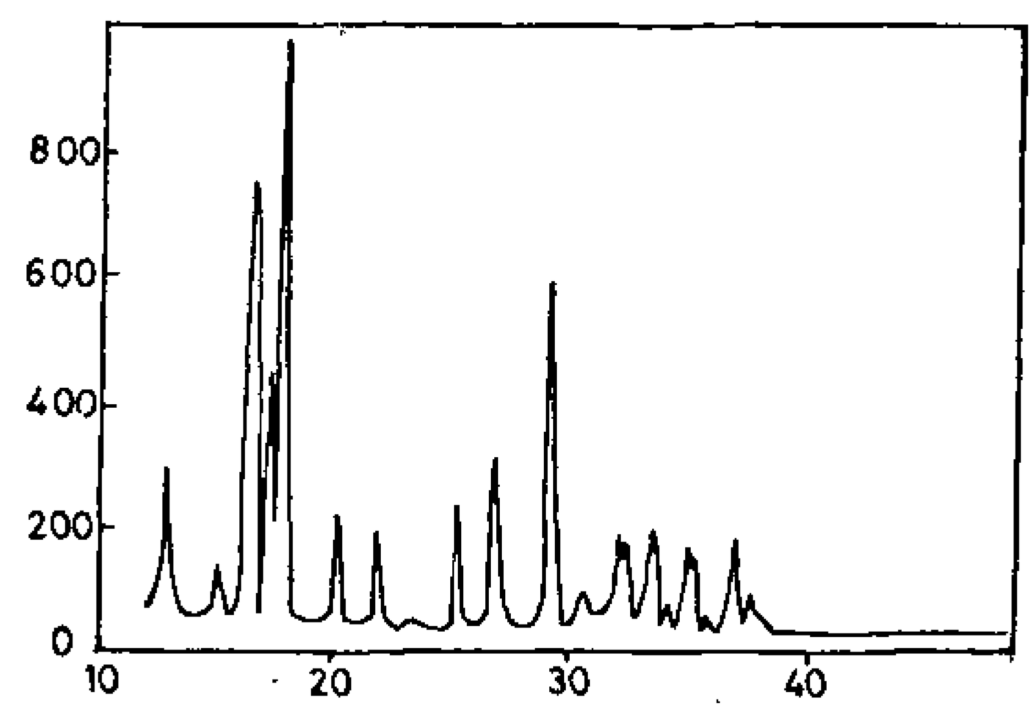
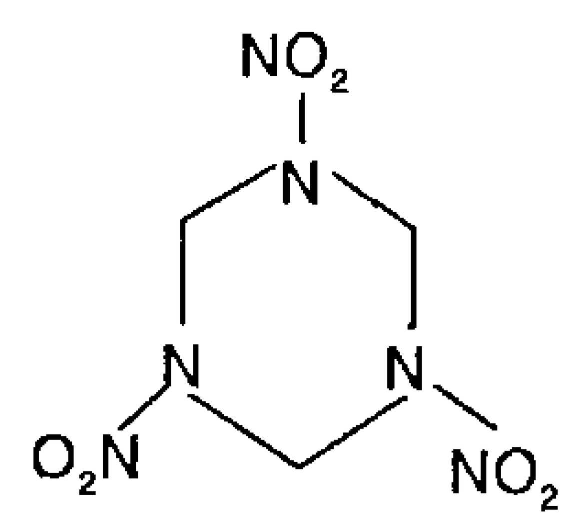


Figure 1. X-ray diffraction pattern of cyclonite.

temperature of 3380°C. It has been shown that breathing cyclonite dust gives rise to toxic spasms.

The chemical structure of cyclonite is as follows:



The oldest and simplest method of preparing cyclonite is based on treating hexamine with nitric acid. The following two possible reactions may produce cyclonite.

$$(CH_2)_6N_4 + 4HNO_3 \rightarrow (CH_2NNO_2)_3 + 3CH_2O + NH_4NO_3,$$

$$(CH_2)_6N_4 + 6HNO_3 \rightarrow (CH_2NNO_2)_3 + 6H_2O + 3CO_2 + N_2.$$

The crystal structure of cyclonite has been determined by Terpstra[2], Hultgren[3], Choi and Prince[4] and Sullenger *et al.*[5]. In this communication we report XRD analysis of cyclonite. The results of references 2, 4 and 5 and our analysis are given in Table 1.

We have used Philips X'Pert MPD system and software provided by Philips India Ltd. The cyclonite sample was obtained from TBRL Pune. The diffraction pattern of the sample has been recorded at 30 kV and 20 mA at a scanning rate of 0.8 degree per second (Figure 1).

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A report on polyembryony in *Commiphora wightii* from Thar Desert, India

The present paper deals with a new report on seed polyembryony in *Commiphora wightii* from the Thar Desert in India. In *C. wightii* two types of seeds, viz. black and white have been observed in mature fruits. The black ones are found to be viable. The seed produces more than one seedling (maximum four) due to its polyembryonic nature.

Commiphora wightii (Arnott) Bhandari is also known as Indian bdellium. The other names are guggulu, koushikaha and devadhupa in Sanskrit and guggal in most Indian languages[1]. The oleo-resin of guggal is an indigenous plant drug known to be highly effective in the treatment of obesity, arthritis and several other diseases in the Indian System of Medicine (Ayurveda)[2]. The plant belongs to family Burseraceae which is a large pan-tropical family, forming an important element of the flora of both rain forests and arid areas. The plant is dimorphic, one having bisexual and male flowers and the other having female flowers with staminodes[3,4]. A third category of plants with only male flowers has also been reported by Rao *et al.*[5]. Gupta *et al.*[6] have

Table 1. Morphological parameters of seeds in *C. wightii*

Seed colour	Length (cm)	Width (cm)	Thickness (cm)	Weight 100 seeds (g)	Maturity (%)	Viability (%)	Germination (%)
Black	0.69	0.48	0.33	4.678	45.93	70.0	36.25
White	0.70	0.50	0.31	3.768	54.05	*	*

*Non-viable.