that ‘genetic engineering substantially increased the probability of transgene escape, even in a self-pollinating species’. They found that genetically engineered Arabidopsis thaliana having resistance to the herbicide chlorosulphuron had much higher chances of fertilizing a wild-type plant than the mutant A. thaliana carrying and expressing the same mutant gene Cur1 as the transgenic plant.

In this regard, the commentary by Bhatia and Mitra made interesting reading while raising several hitherto poorly discussed but relevant and serious issues concerning the commercial use of transgenic crops. It has been rightly pointed out that gene flow can potentially become a serious concern associated with the field release of transgenic crops. However, lately a very genuine interest has been growing among an ever-increasing scientific community in a special type of transgenics, wherein the transgene is placed not in nucleus but in another DNA-harbouiring organelle of the cell, viz. the chloroplasts, in general called plastids. Such transgenics are referred to as transplastomics or those carrying the transgenic plastids. Since chloroplasts are almost always materially transferred to the next progeny, there is little risk of any transgene flow from transplastomic plants to the neighbouring weedy or wild relatives. Therefore, genes introduced into the chloroplast genomes can move only through seed, whereas the genes introduced into the nuclear genome can move through seed as well as pollen.

The other advantages of chloroplast transformation technology in addition to the containment of the transgene, include possibility of expressing multiple genes in operons, high expression levels, possibility of expressing unmodified bacterial genes and human cDNA, and lack of gene silencing and position effects. The technology as such has numerous potent applications in developing plants resistant to biotic and abiotic stresses, and for production of therapeutics and vaccines, which has already been demonstrated in the model plant system of tobacco, potato and tomato. Technical limitations, however, have hampered its extension to other crops of agricultural importance. Nevertheless, numerous laboratories around the globe including the author’s laboratory are engaged in developing transplastomics in rice, maize, wheat, soybean, mustard and cotton. More importantly, as pointed out by Bhatia and Mitra, there are many crops, which grow along with their weedy or wild relatives in the same geographical region. For this reason, it becomes important that chloroplast transformation be a method of choice for generating improved transgenics in crops such as rice, sorghum, cucurbits, solanaceous crops, Vigna spp., Cajanus spp. and Brassica spp.


K. C. Bansal*  
R. K. Sharma

National Research Centre on Plant Biotechnology,  
Division of Genetics,  
Indian Agricultural Research Institute,  
New Delhi 110 012, India  
*For correspondence.  
e-mail: kailashbansal@hotmail.com

NEWS

Indian National Academy of Engineering operationally poised for a new phase

Taking over the gauntlet of the post of President of the Indian National Academy of Engineering (INAE) on 1 January 2003 is Anumolu Ramakrishna, Larsen & Toubro Limited, Chennai. This is significant in the history of this Academy as for the first time the President comes with a background from industry. A. Ramakrishna takes over from distinguished academician Palle Rama Rao, who in 1999 was the Chairman, PG Review Committee that submitted its Report on ‘Reshaping Postgraduate Education and Research in Engineering and Technology’ to the All India Council for Technical Education (AICTE), New Delhi.

During the Fifth Annual Function of the Academy in December 2002, Ramakrishna, then President-Elect, when asked about his plans for INAE stressed the need for a ‘mission approach’ with which INAE would formulate action plans. There would be, he said, more interaction with politicians and policy makers invited to INAE meetings, on topics such as rural roads, connectivity between urban and rural areas, urban sanitary systems and telemedicine. This approach could help mend the prevailing disconnect between rural folk and the rest of India with regard to science and technology advancements. When posed with the question about the relevance of engineering education as it exists today with the needs of Indian industry, he replied that fresh entrants to industry had absolutely no idea of the applications of engineering to industrial problems and management. For this, he suggested ‘user-oriented projects’ and post-graduate training that would comprise the following essential components: practicals (6 months), managerial training specific to industry (6 months), industry projects and submission of project thesis. It is here he believes that Indian industry could fund individual training for skill improvement by supporting stipends. This would ensure that new entrants to industrial climes are better equipped to
begin their careers efficiently. Rama-
krishna also felt that engineering faculty
should be attracted to spend stints in an
industry environment that would mould
their research and development into a
‘more industry-relevant’ activity. Accor-
ding to Ramakrishna, Indian industry was
playing a key role in providing consul-
tancy, for example to the Public Works
Department. This was because private
industry in his opinion had better engi-
neering practices, shorter implementation
times and providing better turnkey solu-
tions for design and installation of struc-
tures. India, he said, needs a ‘Corps of
Engineering’ cadre that would have a
physical presence within State Govern-
ments to provide correct solutions to en-
gineering problems of all types. He cited
the achievements of several private in-
dustries whose involvement had led to
the construction of the Narmada Bridge,
cement plants, rebuilding blast furnaces
with higher capacity, installing efficient
coil rolling mills and refineries in rela-
tively short time scales than previously
executed. These were possible because
confidence was reposed in private indus-
try to deliver with a free hand although
to begin with the economics of it would
appear expensive. The real change, he
felt, would be when Government Labour
policy would accommodate the possi-
bility of dismissing non-performing em-
ployees.

The INAE came into existence in
1987. Late Jai Krishna in his Presidential
Address at the Foundation Function had
said that the Academy had been estab-
lished with a mission to be a ‘peer’ or-
ganization composed of the best talent
from the entire spectrum of engineering
in the country and to provide a forum for
futuristic planning for the country’s de-
velopment requiring engineering and
technological inputs. This thought was
reiterated at the Fifth Annual Function of
the Academy presided over by Palle
Rama Rao, who in his 2002 Presidential
Address felt that it was necessary for the
Academy to build its own resource base
on the lines of a ‘blue-ribbon pattern’ by
drawing on the support of well-wishers
from around the globe as had been suc-
cessfully done by the IITs. The Academy
presently gets about Rs 40 lakhs from the
budget allocation of Rs 9.8 crores of the
Department of Science & Technology
under the head of ‘Other Professional
Bodies’ sharing this head with mainly
other science Academies in the country.
Rama Rao felt that it was difficult to
evaluate engineering. However, engi-
neering made a huge difference to the
country’s economy, stating that one of
the five pillars of the economic policy is
engineering education. The challenges
were, he said, the ‘great gap in graduate
engineering education’ with small
enrolments at the graduate level and even
fewer engineering doctorates. The stren-
ghth and distinguishing characteristic of
INAЕ was, he said, the composition of
Fellows, achievers from all sectors such
as government and academia and indu-
try, the latter constituting 20% of the
total number. To date, this Academy has
about four hundred Fellows and twenty-
two Foreign Fellows.

On the occasion of the Annual Func-
tion, the Life Time Contribution Award –
2002 was presented to Jamsheed Jiji Irani,
a geologist by training who led Tata
Steel until recently and is better known
for ‘changing Tata Steel from an effi-
ciently operated but ageing steel be-
emoth of the eighties to an ultra-modern
integrated steel plant comparable with
the best in the world’. Irani has always
believed that as Indians ‘we may be lim-
ited in our resources, but not in our
resourcefulness’ making his company the
only ISO 14001 certified steel producer in
India in 2000 and a global benchmark,
said Rama Rao while reading the cita-
tion. In his address, Irani laid out two
thought-provoking propositions, namely,
that we (Indians) should not wait for oth-
ers to solve our problems since ‘why
should anyone else be concerned enough
to solve it?’ The example he cited here
was the Tata Steel success of using poor
quality coke for steel manufacture
through in-house research and develop-
ment. The second proposition often
voiced is that of ‘industry–academic inter-
action’. This, he said, was a story of fail-
ure and that he had personally tried but
unsuccessfully. He spoke of a recent Sci-
entific Advisory Committee-Cabinet’s
(SAC-C) approach of bringing both par-
ties together where a common ground
could be found for both to have benefits
and co-operate at the same level. He
hoped for ‘success with this approach as
we had no choice but to see it work’. He

proposed ‘four-year postings’ of tech-
nologists with industry background to
spend time in an academic environment
and vice-versa.

Anand Swarup Arya, specialist in
earthquake engineering, also received the
Life Time Contribution Award – 2002 for
his ‘key role in experimental studies
and developing indigenous expertise
relating to earthquake disaster prevention
and mitigation for variety of structures
and his contribution in formulation of the
Codes of Practice and Guidelines for
earthquake-resistant design and construc-
tion of buildings’. Arya felt it necessary
to implement retrofitting strategy for
existing buildings. He stressed that non-
implementation of solutions available
were failing society and not the engineer-
ing fraternity, reiterating the important
role that INAE could play in this regard.

The Hyderabad function also saw the
presentation of thirty Young Engineer
Awards – 2002 by the Academy which
continues to support awardees in helping
them get grants for research and de-
velopment and if necessary, facilitates
either technology transfer or technology
improvement with industry. In the cate-
gory of ‘Innovative Potential of Students
Project Awards – 2002’, there were three
awards at Doctoral level, six at Master’s
and nine at Bachelor’s level. The three
topics that earned awards at the Doctoral
level were those concerning (1) use of
ion exchange resins in chemical industry
for separation processes in non-aqueous
medium (2) high efficiency multi-stage
bubble column for use in wet scrubbers,
waste water treatment, etc. (3) design of
a composite leaf spring with lightweight,
strength and corrosive resistance and low
production costs.

In the formative years of INAE, way
back in 1984, it was envisioned that there
was an urgent need for a coordinating
body at the highest level whom the Gov-
ernment can consult on all matters per-
taining to engineering. In 2003, this very
aspect of ‘being consulted’ or the lack of
it has to be introspected and a solution
found if INAE and engineers are to have
any ‘formal clout’ in shaping aspects of
engineering, engineering education or
policy.

Nirupa Sen