Remembering Satish Dhawan

Satish Dhawan's death was unexpected because he seemed to have bounced back to reasonable health after hospitalization three months ago. Then, without fuss, in a manner so characteristic of his life, he slipped away on 3 January 2002, 'to cease upon the midnight with no pain'. A peaceful and dignified death in his own home was a truly fitting and just reward for this exceptional man.

In the days that followed, hundreds came from all walks of life and from his many associations to pay their homage. There was Ramu, his trusted 'Jeeves' whom he employed, befriended and encouraged. The President of India issued a condolence statement as a former colleague. The newspapers had many eulogies praising this or that aspect of the man. There were facts galore about his illustrious career. Interesting anecdotes were revealed. But sincere as all these were, the tributes could not describe the complete man. The problem was that Satish Dhawan had so many dimensions. He was a leader of missions, inspirer of subordinates, excellent teacher, genuine patriot, visionary, builder of institutions, designer of engineering facilities, experimenter par excellence, loyal and helpful friend, counsellor to the troubled, lover of children, gifted storyteller, friend of the underprivileged, supporter of radical causes, a highly ethical person who never sacrificed principle for expediency, and a man of impeccable integrity. And of course he was dearly loved within his immediate and extended family, as well as by his large circle of friends.

All these dimensions flowed from two fundamental qualities of the man – he was a *humanist* and he was a quintessential *engineer-craftsman* a la Leonardo da Vinci.

My wife and I first met him over 50 years ago when I was 21 years old and recently out of college. He had just joined the Aeronautics Department of the Indian Institute of Science (IISc) after a brilliant record at the California Institute of Technology. He was a handsome man with style, driving around in an attractive red sports car. He could have been a flamboyant show-off, but he was not. Instead, he was courteous, charming and gentle. Our shared social concerns and mutual personal regard and respect were the cement of our friendship, which grew over the years, as we became comrades, colleagues and finally neighbours. Our homes were separated by a common wall, but in spirit there was no wall between us. During the half century that we knew him, he rose from a Senior Scientific Officer to Director of the prestigious IISc, Secretary, Department of Space, and Chairman, Space Commission. But his friendship towards us, his affection for my children and grandchildren, and his attitude towards his friends, were unaffected by the positions that he held. He had a stature that was independent of his status.

Left to himself, he would have loved to continue teaching and doing experiments, but he could not escape greatness being thrust on him. Whereas others would have sold their souls for the jobs that he was offered, Satish Dhawan went through a great deal of soul-searching before he accepted these positions. Apparently, his close friends persuaded him to accept the Directorship of IISc, and his brother-in-law Satish Loomba talked him into the Chairmanship of ISRO.

Homi Bhabha, J. R. D. Tata, P. N. Haksar and Indira Gandhi played crucial roles in singling him out, not merely because he was exceedingly competent. Any number of his colleagues were as brilliant, but Satish towered above them with regard to his unwavering commitment to the country and to Indian science and technology. Also, unlike most of his contemporaries, he was above caste, language, religious and provincial considerations. His own personal life was proof of his secular outlook. He was an emotionally secure person and having known his wonderful parents and siblings, this strength is easy to understand.

His unselfishness enabled him to avoid self-promotion. He was devoid of jealousy and envy. He obtained great satisfaction and joy from the achievements of others, particularly his students and subordinates. And they responded to his faith and trust by achieving more than they would have otherwise. It was this confidence in those to whom he delegated responsibility that was the secret of his success in institution-building, both at IISc and ISRO.

Satish Dhawan had a deep respect for institutions and he always played by the rules, even when they were perhaps irksome. I surmise that he suffered under the restrictions of being a government official. But I cannot imagine Satish would have had many significant things to say had he written his memoirs.

His genuine concern for people led him to be an unwavering friend of the poor, the underprivileged and the deprived. No wonder, he sympathized with movements such as the Narmada Bachao Andolan that championed the downtrodden. He took special care to protect the interest of tribals when the Sriharikota Launch Facility was established. He wanted science and technology to benefit the poor. And since the poor never benefit from war, he stood for the peaceful application of science and technology. He steadfastly guided the space programme along peaceful lines.

Since India's poor live largely in its villages, he was a supporter of ASTRA, a programme of IISc for the Application of Science and Technology to Rural Areas. I can testify to this support when I decided to shift from electrochemistry to rural problems. It was not easy be-

cause many colleagues disapproved and criticized this shift, but Satish Dhawan remained a consistent champion of the programme and a constant source of encouragement to me. He was also founder Vice-Chairman and strong supporter of the Karnataka State Council for Science and Technology, which was created for the application of science and technology to the developmental problems of the state.

Alongside his humanism, Satish Dhawan was a true engineer in the strict dictionary sense of one who designs and constructs. He also loved to work with his hands, whether it was tinkering with his car, fabricating furniture, making toys or maintaining his bulletin board with elegantly listed telephone numbers. This love of craftsmanship enabled him to relate effortlessly and cordially with mechanics and craftsman. Das and Noronha, his assistants in building wind tunnels, cherish even now the memory of their association with Satish.

Satish Dhawan was the embodiment of the fusion of science and human values. His humanity is what lifted him above the ordinary, and made him a giant among pygmies and a prince among men. Whereas his talents as an engineer and craftsman were a gift of nature, his human values are within our reach to emulate. If we do so, that will be a real tribute.

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He left us quietly, with dignity, without any noise, without any fuss. Satish was a great man who always stood back when the floodlights were on. He was one of those who took on the blame when something went wrong and pushed forward his juniors when there was a big success. If I have to choose one word that would define his personality, it would be integrity. He was extremely competent; he was committed; he was brave; he knew how to choose people; he listened to advice and was ruthless when faced with phonies.

It was Satish Dhawan who gave the management sinews to the Indian Space Programme. While building technology, he never overlooked the importance of the applications programme. Even in terms of applications, the focus was on the real issues. Satish hated mere appearances. When he took over ISRO and the Department of Space, the organization was rather splintered and began to grow fast in response to the challenges of the profile chalked out during the time of Vikram Sarabhai. He had the difficult task of simultaneously expanding and consolidating. When things were stuck, quick decisions had to be taken, often requiring movement of senior people. I personally sought his help on several such matters. He did not hesitate, keeping in mind the goals of the programme while remaining conscious of the impact on the growth of individuals. There was no favouritism and no animosities. Solidity combined with human goals is a character that ISRO owes largely to Satish Dhawan. I do not know another example in the country that can match what this remarkable man gave to the country. Above all were his strength of character, probity, concern and honesty of purpose. Many of these qualities rubbed off on those who got to work with him.

Though in popular mind his name is primarily associated with the Indian space programme, his role in making the Indian Institute of Science a great centre of learning and research has been seminal. It is during his time that the Institute developed its unique personality and its breadth. Without his lateral vision the Institute would have been no more than an excellent institute of technology. He made it into a place that attracted talent of a wide range, where people might have been recognized in terms of the departments to which they belonged, but the boundaries were kept porous. Even deep social concerns soaked in as also imaginative programmes with industry. The cultural impact of Jawaharlal, Bhabha and Sarabhai and memories of the iconoclastic excellence of Raman can be all discerned. Satish made it happen.

I left ISRO twenty years ago, but a man like Satish Dhawan never goes away from your life. Whenever I got a chance, I dropped in to chat about my current enthusiasms, about his increasing involvement with grassroots movements and to listen to his perceptive comments on life and affairs of men. I did that with P. N. Haksar too. I was not surprised that these two remarkable men admired each other.

Satish is gone. It is a deep personal loss, for me and many others. But in some sense he would always remain with us. He was one of the most significant men of this country during the last century.

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The issues confronting today's policy makers are much more complex than ever before in history.

Of course, much remains the same. Many of the decisions society makes will never change: who gets what, how to maintain order, how to ensure equity and justice. And all of these decisions are fundamentally important.

But over the past hundred years, science has brought forth knowledge and technologies that are truly different – and neither nature nor human society has yet had time to evolve mechanisms to deal with them. Some of the impacts of these technologies are so great, as in the case of CFCs, fossil fuel-based energy systems and genetic engineering, that they now dominate much of the international agenda.

Such issues are rarely simple or one-dimensional. New technologies often offer huge potential benefits. It is because of technologies developed over the past hundred and fifty years that the world is so much smaller, safer, healthier, and generally better to live in for

more people than ever before. It is also the same technologies that pose threats to the very life support systems of our planet. And some of these threats, such as the depletion of the ozone layer or sea level rise could be quite immediate and cataclysmic.

Indeed, the real war of today and tomorrow is the invisible war between technology, global economics and dominance on one side and people, community, ecology and marginalization on the other.

While every individual has some opinion, whatever depth of knowledge it might be based on, concerning economic, social and political topics, the technology-related issues are largely left to 'experts'. And since most experts 'know more and more about less and less – until they know everything about nothing', this is quite a dangerous position for society to find itself in.

It is for this reason that we have a crucial need for scientists who have the deepest understanding of the technical details of these issues, not only for their intrinsic scientific interest but also for helping societal policy makers come to considered judgments on how they need to be dealt with. Above all, they must be available to identify the opportunities and benefits offered by the technologies and the dangers they could lead to. Such scientists must therefore be able to go beyond the detailed knowledge of the laboratory and into an understanding of the wider context within which the results of their science will operate. And they must have the courage to speak the truth as they see it, however inconvenient it may be for those who have to act on their advice.

Despite its huge size, the Indian scientific community has not produced or nurtured enough practitioners of this type – ones who fearlessly and objectively can provide the bridge between pure science and policy making. Such policy-science bridges are urgently needed.

It is doubly a tragedy, then, that one of India's foremost policy-science bridges passed away, leaving behind a major void in this fundamental, vital sphere of national concern.

Satish Dhawan brought India into the space age, creating one of the strongest and most successful ventures set up in independent India, the Indian Space Research Organization. An extraordinary scientist, researcher, teacher, manager and builder of leaders, his was the quiet and self-effacing route: it would be impossible to enumerate or even identify the full impact of this gentle intellectual giant on either science or policy in our country. Suffice it to say it was enormous, comparable to that of any scientist, past or present. Dhawan's intellectual interests ranged from rocket propulsion to the flight of birds, from efficient management systems to the process of learning. He was supremely a humanist–scientist, and even above that, a wonderful, generous human being.

He was a friend – a most supportive friend – who always made one feel bigger than one is. He was a fighter – a most valiant fighter – for a better world. We will miss him dearly.

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