Rediscovering Gandhi as a Grassroots Satyagrahi Scientist

By Gita Dharampal

Mahatma Gandhi is rarely described as a scientist. He is remembered, with good reason, as a political leader, an apostle of nonviolence, a moral philosopher and social reformer, and as the leader who transformed India's struggle for independence. Even when his economic thought is discussed, Gandhi is more often presented as a critic of industrial civilisation than as someone deeply concerned with technology, production and scientific knowledge.

Yet this familiar portrait leaves out an important dimension of his life and work. From the 1920s, and with increasing intensity from the mid-1930s, Gandhi (after his resignation from the Congress in 1934) developed a remarkable programme of rural reconstruction based on observation, investigation, documentation, experimentation and the practical application of knowledge. His workers travelled through villages, recorded artisanal practices and agricultural techniques, examined tools and implements, studied local economies, documented indigenous medicine and investigated processes of production. Surveys, questionnaires, reports, demonstrations, exhibitions, training programmes, research centres and publications became part of this extensive enterprise. The creation of the Magan Sangrahalaya (in 1938, in Wardha) as a museum of rural science and technology was perhaps its most visible institutional expression.

It is in this sense that Gandhi may fruitfully be described as a grassroots scientist. The term does not imply that Gandhi was a laboratory scientist in the conventional sense. Rather, it draws attention to a scientific temperament: close observation of reality, learning from experience, testing assumptions against consequences, respecting empirical knowledge, encouraging experimentation and remaining willing to revise one's own ideas.

This neglected aspect of Gandhi has considerable significance today. At a time when questions of sustainability, appropriate technology, indigenous knowledge, local production and community participation have returned to the centre of public discussion, Gandhi's work offers an important alternative to the familiar opposition between 'modern science' and 'traditional knowledge'. His practice suggests that scientific enquiry can begin not only in laboratories and universities but also in the farmer's field, the artisan's workshop and the everyday experience of communities.

Beyond the image of Gandhi as anti-modern

The history of the Constructive Programme complicates such an interpretation. It is also worth recalling that the familiar enumeration of eighteen items in the Constructive Programme should not be taken as an exhaustive account of Gandhi's constructive work. His concern with the revival, investigation and development of village industries through the Gandhi Seva Sangh (GSS) and the All India Village Industries Association (AIVIA) formed an important and integral part of this wider programme.

The establishment of the All India Village Industries Association (AIVIA) in 1934 is particularly revealing. Gandhi became its founding chairperson, with J. C. Kumarappa as organiser and secretary. Its advisory committee included scientists and intellectuals such as Jagdish Chandra Bose, P. C. Ray, C. V.

Raman and B. C. Roy, as well as Rabindranath Tagore and others. Maganwadi developed into a centre for research, manufacturing, training, extension, organisational development and publication.

Gandhi also used the annual conferences of the Gandhi Seva Sangh and the AIVIA as occasions for bringing this enquiry into direct contact with rural life. These gatherings were often held in village locations rather than in urban centres, and they included exhibitions and practical demonstrations of village industries. The demonstrations were not confined to familiar crafts such as spinning and weaving; they could extend to technologies with a much longer history in India, including traditional methods of steel production. Such occasions brought together the practical knowledge of artisans and village producers with the questions posed by scientists, technicians and organisers. They made the conference itself a kind of travelling laboratory in which knowledge could be displayed, examined and discussed.

The question Gandhi was asking was, therefore, not whether science and technology were good or bad. His more fundamental question was: What kinds of science and technology are appropriate to the lives and needs of India's people?

This distinction is crucial. Gandhi did not judge a technology by its technical sophistication. He was much more concerned with its consequences for livelihoods, communities, ecological relationships, human dignity and autonomy. A technically impressive innovation could be socially destructive; conversely, a modest technology could become transformative if it strengthened people's productive capacities and control over their own lives.

This explains the importance he attached to the village artisan. The artisan was not simply a passive recipient waiting for an external expert to bring 'improved' technology. Artisans possessed empirical knowledge accumulated through generations of practical experience: knowledge of materials, tools, seasons, processes and local conditions. Gandhi's approach was neither to romanticise inherited practices nor to reject them as backward. It was to observe, understand, test and improve. That approach remains strikingly relevant in an age when technological solutions are frequently designed far removed from the people who are expected to use them.

The village as a laboratory

Gandhi's grassroots science involved a radical shift in the location of knowledge. Instead of assuming that knowledge flowed in one direction—from the laboratory, university or industrial centre to the village—this extension of the Constructive Programme proceeded from the recognition that villages themselves contained a vast reservoir of knowledge requiring systematic study.

The field reports generated by Gandhi's workers contain information about artisanal practices, agricultural techniques, specialised tools and implements, socio-economic organisation, indigenous medicine and other dimensions of village life. Taken together, these records constitute an unusually rich body of ethnographical and historical material.

The *Gramudyog* collection (belonging to the Gandhi Seva Sangh) reveals the breadth of this enquiry. Its publications deal with cottage industries, village hardware manufacture, oil pressing, ghee production, tanning, paper-making, palm-gur, soap-making, beekeeping, rice processing, ink manufacture and many other activities. A survey of cottage industries in the Kistna and West Godavari districts, for example, documented hand-spinning, handloom weaving, dyeing, printing, woollen carpets, metalwork, glass bangles, oil pressing, palmyra industries and coconut-coir manufacture, while also recording the communities involved.

This was more than an attempt to describe village life. It was an effort to understand how things actually worked: how a tool was made, how a material was processed, what resources were locally available, what skills were required, what the costs were and which communities participated in a particular occupation. In other words, everyday productive activity became a legitimate subject of systematic enquiry.

This is one of the most important aspects of Gandhi's grassroots science. He expanded the boundaries of what counted as knowledge.

From observation to experimentation

The word experiment has a special significance in understanding Gandhi. His famous idea of 'experiments with truth' was not confined to personal morality. The same experimental disposition increasingly informed his social, economic and technological work.

Experiment, for Gandhi, did not necessarily mean a controlled laboratory experiment. It meant entering into reality, trying something, observing the consequences and being prepared to change one's assumptions. Knowledge was, therefore, provisional and experiential rather than merely theoretical.

The organisations associated with the Constructive Programme (namely the Gandhi Seva Sangh [GSS] and the All India Village Industries Association [AIVIA]] were consequently not simply agencies for implementing predetermined schemes. They were intended to become centres of enquiry. In 1940, Gandhi envisaged the Gandhi Seva Sangh as being transformed into something resembling a postgraduate institution in which its members would become not merely skilled workers but 'expert craftsmen and scientific researchers'. He wanted research to be conducted across the different organisations associated with constructive work.

The charkha provides an especially revealing example. Gandhi's interest in spinning was not a matter of restoring an old object as a museum piece. The technology itself evolved. The Magan Sangrahalaya collection traces different hand-operated forms through the box or Yerwada charkha and later forms of mechanisation; the museum displays numerous kinds of charkha, making visible a process of technological development.

The lesson is important: Gandhi's interest was not in preserving a technology unchanged but in preserving the human purposes it served while allowing the technology to evolve. This is precisely what distinguishes a living knowledge tradition from an antiquarian attachment to the past.

The artisan as a knowledge-holder

Perhaps the most radical aspect of Gandhi's grassroots science was his revaluation of the artisan.

Colonial representations frequently portrayed India's rural population as backward, unproductive or lacking in technical skill. Gandhi challenged this assumption by placing the knowledge of artisans at the centre of national reconstruction. His call to 'turn every village hut into a workshop' expressed a larger technological and economic imagination in which productive capacity would not be concentrated exclusively in distant factories but would remain distributed among households and communities.

This was not merely an economic proposition. It was an epistemological one. The underlying question is simple but profound: who possesses knowledge?

Modern systems of knowledge often create a hierarchy in which the scientist stands at the top, followed by the engineer and trained technician, while the manual worker is treated primarily as someone who applies knowledge produced elsewhere. Gandhi's approach disrupted this hierarchy. The artisan's embodied knowledge—of materials, seasons, tools, processes and local circumstances—was itself a form of expertise. The task of the scientifically trained person was, therefore, not simply to replace that knowledge but to enter into dialogue with it.

The AIVIA brought together scientists, economists, technicians, artisans and field workers. The resulting knowledge system was neither simply 'traditional' nor simply 'modern'. It was interactive. This principle deserves renewed attention today. As India seeks to document and revitalise its Indian Knowledge Systems, the challenge is to avoid turning IKS into either a romantic celebration of the past or a collection of isolated 'traditional' practices. Gandhi's example suggests a more demanding approach: recover knowledge, investigate it critically, test it, improve it and place it in dialogue with contemporary scientific enquiry.

Magan Sangrahalaya: a museum that was also a laboratory

The creation of the Magan Sangrahalaya in 1938 provides perhaps the clearest institutional expression of Gandhi's scientific imagination.

Gandhi conceived it as an *Udyog Bhavan*, a museum of rural science and technology dedicated to the memory of Maganlal Gandhi, whom the catalogue describes as an exemplary rural scientist. Its purpose was not antiquarian. It was intended to make improved forms of production available to farmers and artisans and to demonstrate skills that were being rediscovered or developed through the work of the AIVIA. Its activities extended across paddy husking, flour grinding, oil pressing, beekeeping, palm-gur, handmade paper, soap, ceramics, paints, inks and other rural industries.

What is particularly striking is Gandhi's insistence that the museum should not become a mausoleum of 'traditional technology'. When he visited the Magan Sangrahalaya in 1944, he emphasised that it should present not a static picture of inherited techniques but a dynamic account of rural industrialisation, continually changing in response to new needs. This is an extraordinarily modern conception of a museum. A museum, in this understanding, does not merely preserve the past. It can become a place where knowledge is observed, compared, demonstrated, tested and renewed.

The extensive Gramudyog archive reinforces this point. Publications on hardware manufacture, rural economic conditions, tanning, paper-making, palm-gur, oil extraction, beekeeping and rice processing transformed seemingly ordinary activities into legitimate subjects of systematic investigation. Together they reveal an attempt to create a genuine knowledge infrastructure for rural India.

Science, technology and Swaraj

Why did Gandhi devote so much attention to matters that might appear mundane—oil extraction, paper-making, spinning, village tools, beekeeping or rice processing? The answer lies in his understanding of Swaraj.

For Gandhi, political independence without productive autonomy would remain incomplete. A population might possess political rights and yet remain dependent upon distant economic centres for employment, food, clothing, tools and essential goods. Such dependence would limit the substance of self-rule. This explains why Gandhi refused to separate the Constructive Programme from politics. In

1936 he explicitly rejected the distinction between the political and constructive programmes, describing both as branches of Satyagraha. He later described the Constructive Programme as the construction of *Poorna Swaraj* through truthful and nonviolent means.

The village was, therefore, not merely the setting for constructive work. It was a site where the capacities necessary for Swaraj could be developed. Science and technology were part of that political project because they determined who possessed productive capacity, who possessed knowledge and who had the ability to shape the conditions of everyday life. Gandhi's grassroots science was, thus, science in the service of human autonomy.

Tradition and modernity: a false choice?

Perhaps the most fruitful contemporary implication of this rediscovery is that Gandhi's practice unsettles the conventional binary between tradition and modernity.

Gandhi certainly sought to recover traditions, but he did not assume that everything inherited from the past was automatically desirable. Nor did he accept the opposite assumption that everything modern was necessarily superior. His method was more demanding: Examine. Understand. Experiment. Compare. Judge by consequences. Improve.

This explains how the Constructive Programme could be simultaneously rooted in indigenous practices and animated by a scientific spirit of enquiry. In this way, the Constructive Programme became a bridge between traditional praxis and modern scientific investigation.

The implications for the present are considerable. A technology developed in a metropolitan laboratory may be technically sophisticated yet prove inappropriate when transplanted into a village without attention to local materials, skills, costs, ecological conditions and cultural practices. Conversely, a traditional technique may contain valuable knowledge but require modification to meet contemporary needs.

The meaningful questions are, therefore, not simply whether something is traditional or modern, or indigenous or Western. Rather, we must ask: Does it work? For whom? Under what conditions? At what social and ecological cost? Can it be improved, and can the people who use it participate in improving it? These are scientific questions, but they are also ethical and democratic questions.

From grassroots science to appropriate technology

The continuing history of the Magan Sangrahalaya illustrates the potential of this approach. Under Dr. Devendra Kumar Gupta, appointed director in 1978, the Gandhian approach was carried further into the field of appropriate technology. The Centre of Science for Villages in Wardha sought to connect indigenous craft skills with modern scientific and technological knowledge. Experiments included low-cost mud houses, sanitary toilets, biogas plants, nonviolent honey extraction, tree-gum collection and agricultural implements adapted to rural needs.

The continuity is significant. Gandhi's underlying question remained alive: How can scientific knowledge strengthen the capabilities of rural people rather than displace them? This question has acquired a new urgency in the twenty-first century. Rapid technological change, artificial intelligence, ecological stress, resource depletion, increasing economic concentration and technological dependence raise questions not only about what technology can do but also about who controls it, whose knowledge counts and whose capacities it strengthens or weakens.

Gandhi's answer was not to reject technology but to place it within a larger framework of human purposes.

What makes Gandhi a grassroots satyagrahi scientist?

The designation 'grassroots satyagrahi scientist' can, therefore, be justified not by claiming that Gandhi practised science in the conventional institutional sense, but by examining the method embedded in his work.

There are eight defining characteristics of this method, each of which can be stated as a complete aspect of Gandhi's practice.

1. Observation was fundamental: Gandhi insisted on encountering actual conditions rather than relying on abstract assumptions.
2. Documentation followed from observation: his workers recorded technologies, practices, social organisation and economic conditions, creating an extensive documentary archive.
3. Experimentation meant that techniques were not simply preserved; they were tested, modified and improved.
4. Collaboration brought artisans, farmers, scientists, economists, technicians and social workers into a common field of enquiry.
5. Dissemination ensured that knowledge was circulated through publications, exhibitions, demonstrations, training programmes and museums.
6. Iteration was built into institutions such as the Magan Sangrahalaya, which were conceived as places where techniques would continue to evolve.
7. Social accountability meant that the ultimate measure was not technological novelty but its contribution to livelihood, dignity, autonomy and nonviolent social relations.
8. Reflexivity meant that Gandhi was prepared to regard even his own formulations as provisional. The Constructive Programme was not presented as a closed system; he invited others to add to it.

Taken together, these characteristics reveal a distinctive epistemic practice.

Why Gandhi's grassroots science matters today

The value of rediscovering Gandhi as a grassroots scientist does not lie in claiming that every experiment associated with the Constructive Programme was successful, nor in turning Gandhi into a prophet of every contemporary concern—from sustainability to appropriate technology. The value lies in recovering a **method of enquiry**.

Today, enormous investments are made in technological innovation, yet questions about social appropriateness, ecological consequences and local participation are often treated as secondary. At the same time, there is growing interest in indigenous and community knowledge, but this can easily become either romantic or ideological if inherited practices are accepted without critical examination.

Gandhi offers a third possibility: bringing different forms of knowledge into conversation without assuming beforehand that one must simply replace the other. The laboratory can learn from the field; the

scientist can learn from the artisan; inherited knowledge can be tested rather than merely celebrated; modern technology can be adapted rather than simply imposed.

Most importantly, Gandhi asks us to reconsider where science begins. It need not begin in a laboratory; it can emerge from a field, an artisan's workshop or the practical experience of a community. It need not depend upon sophisticated scientific instruments; an artisan's tool can be equally capable of generating questions and knowledge. Nor does enquiry always start with a theoretical hypothesis: it can begin with a farmer asking why a familiar process no longer works. Scientific knowledge fulfils its fullest social purpose not when it is accumulated by specialists alone, but when it enables people to understand and transform the conditions of their own lives.

This was at the heart of Gandhi's Constructive Programme, understood not merely as the familiar list of eighteen items, but as a wider programme of constructive work that also encompassed the investigation, revival and development of village industries.

An unfinished experiment

To rediscover Gandhi as a grassroots scientist is, therefore, not to impose a fashionable modern label upon a historical figure. It is to recognise something already implicit in his practice: that the regeneration of society requires research, experimentation, learning from experience and learning from below.

His laboratory was not bounded by four walls. It extended into India's villages. Its instruments included the charkha, the ghani, the plough, the loom, the kiln, the beehive and countless other implements of everyday life. Its researchers included artisans, farmers, technicians, social workers and scientists. Its method was observation joined to experiment. Its objective was Swaraj.

The unfinished question that remains with us is this: can scientific knowledge become an instrument not merely for producing more, but for enabling people to live with greater autonomy, dignity and responsibility within their communities and environments?

That question is particularly important today. The challenge before us is not whether to choose science or tradition, technology or human values, local knowledge or modern research. The more difficult challenge is to create forms of knowledge in which these can meet critically and creatively.

Perhaps that is the most important aspect of Gandhi still waiting to be rediscovered: not a fixed body of answers, but a way of asking questions—beginning from lived reality, testing ideas in practice, learning from those who possess practical knowledge, and continually asking whether what we call progress actually enlarges human freedom.

In that sense, Gandhi's Constructive Programme was itself an unfinished experiment. The experiment, therefore, remains open.

References and Source Material

1. ICSSR Research Project, Redressing the Balance: Mahatma Gandhi's Experiments with Constructing an Alternative Society (2020-2022). The project and its primary material research provide the principal basis for the discussion of Gandhi's Constructive Programme, village investigations, research activities and the concept of Gandhi as a grassroots scientist.

2. Magan Sangrahalaya, Wardha, including its catalogue and material relating to Gandhi's conception of the museum as a centre of rural science and technology, and to the development of village technologies.

3. Gramudyog Collection / Gandhi Seva Sangh, including the annotated catalogue of publications on village industries, technologies, production processes, rural economy and occupational practices.

4. Gandhi Seva Sangh materials, particularly Gandhi's statements concerning research, experimentation, the development of a 'science of nonviolence', and the role of expert craftsmen and scientific researchers.

5. Mahatma Gandhi, *Hind Swaraj* (1909), for Gandhi's critique of industrial civilisation and the larger philosophical context of his thinking on modernity, technology and civilisation.

6. J. C. Kumarappa, writings and organisational work associated with the All India Village Industries Association and the Constructive Programme.

7. Richard Gregg, writings on nonviolence and Gandhian social thought, relevant to the wider intellectual context of Gandhi's experimental approach to nonviolence.

8. Centre of Science for Villages, Wardha, and subsequent work associated with appropriate technology, particularly the effort to bring scientific and technological knowledge into dialogue with rural skills and local conditions.