

PREFACE TO THE EDITION

The study of culture, language, and knowledge systems offers profound insights into the ways societies construct, preserve, and transform their intellectual and social worlds across time. By engaging critically with literary traditions, linguistic practices, classical knowledge systems, and emerging digital cultures, contemporary scholarship continues to illuminate the dynamic interplay between tradition and modernity. It is within this broader intellectual framework that the ***International Journal of Indian Language Research Studies (IJILRS)*** presents this volume, bringing together a diverse collection of interdisciplinary contributions that explore key dimensions of cultural production, intellectual heritage, and social transformation.

The articles featured in this issue collectively reflect the richness and diversity of scholarly inquiry. One study examines the historical trajectory of Kerala's library movement, demonstrating how the expansion of reading spaces and access to knowledge played a pivotal role in shaping social awareness, democratic participation, and progressive reform. By situating reading practices within the broader context of social change, the study highlights the transformative power of knowledge dissemination in regional development.

Another contribution revisits the intellectual depth of Sanskrit literary traditions, with particular emphasis on the development of mathematical thought. This study underscores the sophistication of classical Indian knowledge systems and their enduring relevance, offering valuable insights into the continuity between ancient epistemologies and contemporary scientific understanding.

The preservation of cultural heritage is addressed through an analysis of Indian folk music in the digital age. This study critically engages with the opportunities presented by digital technologies for archiving and dissemination, while also addressing challenges related to authenticity, accessibility, and cultural ownership. It thus foregrounds the complexities involved in safeguarding intangible cultural traditions in an increasingly digitized world.

The volume further engages with contemporary literary discourse through an exploration of mythological retellings, focusing on the reclamation and rearticulation of feminine voices. By examining how modern narratives reinterpret traditional myths, this study highlights the ways in which literature can challenge entrenched patriarchal structures and offer alternative perspectives on gender and identity.

In addition, the evolving nature of language and communication is explored through an analysis of code-switching and the emergence of hybrid linguistic forms such as Hinglish in digital spaces. This contribution reflects on how language adapts to new media environments, reshaping identity, creativity, and everyday communication in modern India.

Collectively, the contributions in this volume underscore the importance of interdisciplinary approaches in understanding the complexities of cultural and intellectual transformations. By integrating perspectives from history, linguistics, literary studies, and digital humanities, the articles offer nuanced interpretations of how knowledge systems are preserved, reimagined, and transmitted across generations.

The Editorial Board extends its sincere appreciation to the authors for their valuable scholarly contributions, to the reviewers for their rigorous evaluations and constructive insights, and to the editorial team for their unwavering commitment to maintaining the academic standards of IJILRS. We also express our gratitude to our readers and the broader academic community for their continued support.

Dr. Sandhya E. N
Chief Editor

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കേരളത്തിലെ ഗ്രന്ഥശാലാ പ്രസ്ഥാനവും സാമൂഹിക നവോത്ഥാനവും: വായനയുടെയും സാമൂഹിക പരിവർത്തനത്തിന്റെയും ചരിത്രാഖ്യാനം

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സംഗ്രഹം

കേരളത്തിലെ ഗ്രന്ഥശാലാ പ്രസ്ഥാനത്തെ സാമൂഹിക നവോത്ഥാനത്തിന്റെയും ജനാധിപത്യ പരിവർത്തനത്തിന്റെയും ഒരു പ്രധാന ഉപാധിയായി ഈ പ്രബന്ധം പരിശോധിക്കുന്നു. ഇരുപതാം നൂറ്റാണ്ടിന്റെ ആരംഭത്തിൽ ഉടലെടുത്ത്, പി. എൻ. പണിക്കരുടെ നേതൃത്വത്തിലും 1945ലെ തിരുവിതാംകൂർ ഗ്രന്ഥശാലാ സംഘത്തിലൂടെയും ശക്തിപ്രാപിച്ച ഈ പ്രസ്ഥാനം വായനയെ ഒരു പൊതു ശീലമാക്കി മാറ്റുകയും സാക്ഷരതയെ സാമൂഹിക പരിഷ്കരണത്തോടും ആത്മാഭിമാനത്തോടും രാഷ്ട്രീയ അവബോധത്തോടും കൂട്ടിയിണക്കുകയും ചെയ്തു. പൊതുമണ്ഡലം, സാമൂഹിക മൂലധനം, അച്ചടി സംസ്കാരം എന്നീ സൈദ്ധാന്തിക ചട്ടക്കൂടുകൾ പ്രയോഗിച്ച്, ഗ്രാമീണ ഗ്രന്ഥശാലകളുടെ ശൃംഖല കേരള സമൂഹത്തെ എങ്ങനെ പുനഃക്രമീകരിച്ചു എന്ന് ഈ പഠനം വിശകലനം ചെയ്യുന്നു. ഉത്ഭവം മുതൽ 1990-91ലെ സമ്പൂർണ്ണ സാക്ഷരതാ യജ്ഞം വരെയുള്ള പ്രസ്ഥാനത്തിന്റെ വളർച്ച, സ്ത്രീ പങ്കാളിത്തം, പരിമിതികൾ, ഡിജിറ്റൽ യുഗത്തിലെ പ്രസക്തി എന്നിവ ഇത് വിലയിരുത്തുന്നു.

Abstract

This paper examines the library movement in Kerala as a major instrument of social awakening and democratic transformation. Emerging in the early twentieth century and consolidated through the leadership of P. N. Panicker and the Travancore Library Association of 1945, the movement spread reading as a public habit and connected literacy with social reform, self respect, and political consciousness. The study applies the frameworks of the public sphere, social capital, and print culture to analyse how a network of village libraries reshaped Kerala society. It traces the movement from its colonial background through the formation of the organised network, its links with the anti caste renaissance and the political mobilisation of the twentieth century, the participation of women, and the Total Literacy Campaign of 1990 and 1991. It evaluates the movement's limitations and assesses its relevance in the present digital age, arguing that the library movement was not merely an educational programme but a foundational force in the making of modern Kerala.

Keywords: - ഗ്രന്ഥശാലാ പ്രസ്ഥാനം, പി. എൻ. പണിക്കർ, വായന, സാമൂഹിക നവോത്ഥാനം, സാക്ഷരത, പൊതുമണ്ഡലം, അച്ചടി സംസ്കാരം

1. ആമുഖം

കേരളീയ നവോത്ഥാനത്തിന്റെ ചരിത്രം പലപ്പോഴും ജാതിവിരുദ്ധ പ്രസ്ഥാനങ്ങളുടെയും മത പരിഷ്കരണത്തിന്റെയും ചട്ടക്കൂടിലാണ് പറയപ്പെടാറുള്ളത്. ശ്രീനാരായണ ഗുരു, അയ്യങ്കാളി, ചട്ടമ്പി സ്വാമികൾ തുടങ്ങിയവരുടെ പ്രവർത്തനങ്ങൾ ഈ ആഖ്യാനത്തിന്റെ കേന്ദ്രമാണ്. എന്നാൽ ഈ പരിവർത്തനത്തിന് സമാന്തരമായി, അതിനെ നിലനിർത്തുകയും വ്യാപിപ്പിക്കുകയും ചെയ്ത മറ്റൊരു സാംസ്കാരിക പ്രസ്ഥാനം ഉണ്ടായിരുന്നു: ഗ്രന്ഥശാലാ പ്രസ്ഥാനം.^{1,5}

വായനയെ ഒരു വരേണ്യ വിനോദത്തിൽ നിന്ന് ഒരു ജനകീയ അവകാശമാക്കി മാറ്റിയ ഈ പ്രസ്ഥാനം, ആധുനിക കേരളത്തിന്റെ സാമൂഹിക മനസ്സിന്റെ രൂപീകരണത്തിൽ നിർണായക പങ്ക് വഹിച്ചു. ഗ്രാമങ്ങളിലെ വായനശാലകൾ കേവലം പുസ്തക സംഭരണ കേന്ദ്രങ്ങളായിരുന്നില്ല, മറിച്ച് അറിവിന്റെയും സംവാദത്തിന്റെയും ജനാധിപത്യ ഇടങ്ങളായിരുന്നു.^{1,5}

ഈ ഗവേഷണ പ്രബന്ധത്തിന്റെ പ്രധാന ലക്ഷ്യം ഗ്രന്ഥശാലാ പ്രസ്ഥാനത്തിന്റെ ഉത്ഭവം, വളർച്ച, പ്രത്യയശാസ്ത്രപരമായ അടിത്തറ, സാമൂഹിക സ്വാധീനം എന്നിവ സമഗ്രമായി വിശകലനം ചെയ്യുക എന്നതാണ്. വായനയും സാമൂഹിക നീതിയും തമ്മിലുള്ള ബന്ധം, രാഷ്ട്രീയ ബോധവുമായുള്ള കണ്ണി, സ്ത്രീകളുടെ പങ്കാളിത്തം, സാക്ഷരതാ പ്രസ്ഥാനവുമായുള്ള തുടർച്ച, ഡിജിറ്റൽ കാലത്തെ വെല്ലുവിളികൾ എന്നിവ ഇവിടെ പരിശോധിക്കപ്പെടുന്നു.

2. സൈദ്ധാന്തിക ചട്ടക്കൂട്

ഗ്രന്ഥശാലാ പ്രസ്ഥാനത്തെ മനസ്സിലാക്കാൻ മൂന്ന് സൈദ്ധാന്തിക സമീപനങ്ങൾ പ്രയോജനപ്പെടുത്താവുന്നതാണ്. യൂർഗൻ ഹേബർമാസിന്റെ പൊതുമണ്ഡലം (Public Sphere) എന്ന ആശയം, വായനശാലകൾ എങ്ങനെ സ്വതന്ത്ര ചർച്ചയുടെയും അഭിപ്രായ രൂപീകരണത്തിന്റെയും ഇടങ്ങളായി മാറി എന്ന് വിശദീകരിക്കാൻ സഹായിക്കുന്നു. വായനശാല ഗ്രാമീണർ ഒത്തുകൂടി പത്രങ്ങൾ വായിക്കുകയും പൊതുകാര്യങ്ങൾ ചർച്ച ചെയ്യുകയും ചെയ്യുന്ന ഒരു ജനാധിപത്യ ഇടമായിരുന്നു.²

റോബർട്ട് പുട്നാമിന്റെ സാമൂഹിക മൂലധനം (Social Capital) എന്ന സങ്കല്പം, വായനശാലകൾ സൃഷ്ടിച്ച പരസ്പര വിശ്വാസത്തിന്റെയും കൂട്ടായ്മയുടെയും ശൃംഖലയെ വിശദീകരിക്കുന്നു. സന്നദ്ധ പ്രവർത്തനത്തിലൂടെ കെട്ടിപ്പടുത്ത ഈ സാമൂഹിക മൂലധനം പിന്നീട് കേരളത്തിന്റെ ജനാധിപത്യ പ്രവർത്തനത്തിന്റെ അടിത്തറയായി മാറി.^{3,7}

ബെനഡിക്ട് ആൻഡ്രൂസന്റെ അച്ചടി മുതലാളിത്തം (Print Capitalism) എന്ന ആശയം, അച്ചടി മാധ്യമം എങ്ങനെ ഒരു പൊതു സാംസ്കാരിക സ്വത്വം രൂപപ്പെടുത്തി എന്ന് മനസ്സിലാക്കാൻ ഉപകരിക്കുന്നു. മലയാള പുസ്തകങ്ങളും ആനുകാലികങ്ങളും ഒരു പൊതു വായനാ സമൂഹത്തെ സൃഷ്ടിച്ചു. ഇത് ഭാഷാടിസ്ഥാനത്തിലുള്ള ഒരു സാമൂഹിക ഐക്യബോധത്തിന് വഴിയൊരുക്കി.⁴

3. ഉത്ഭവം: ചരിത്ര പശ്ചാത്തലം

പത്തൊൻപതാം നൂറ്റാണ്ടിന്റെ അവസാനത്തിലും ഇരുപതാം നൂറ്റാണ്ടിന്റെ ആരംഭത്തിലും കേരളത്തിൽ വായനയ്ക്ക് അനുകൂലമായ ഒരു അന്തരീക്ഷം രൂപപ്പെട്ടു. ക്രിസ്ത്യൻ മിഷനറിമാർ സ്ഥാപിച്ച അച്ചടിശാലകൾ മലയാള പുസ്തക പ്രസിദ്ധീകരണത്തിന് തുടക്കം കുറിച്ചു. ബെഞ്ചമിൻ ബെയ്ലിയുടെ നേതൃത്വത്തിലുള്ള സി.എം.എസ്. പ്രസ്സ് മലയാള അച്ചടിയുടെ വികാസത്തിൽ പ്രധാന പങ്ക് വഹിച്ചു.^{4,6}

വർത്തമാന പത്രങ്ങളുടെ ആവിർഭാവം, ആധുനിക വിദ്യാഭ്യാസത്തിന്റെ വ്യാപനം, സാമൂഹിക പരിഷ്കരണ പ്രസ്ഥാനങ്ങളുടെ ഉണർവ് എന്നിവ വായനയ്ക്ക് ഒരു സാമൂഹിക മാനം നൽകി. അറിവ് ഒരു വിമോചന ഉപാധിയാണ് എന്ന ബോധം ഈ കാലഘട്ടത്തിൽ ശക്തിപ്പെട്ടു. ഈ പശ്ചാത്തലത്തിലാണ് സംഘടിത ഗ്രന്ഥശാലാ പ്രസ്ഥാനം ഉടലെടുത്തത്.^{1,6}

4. പി. എൻ. പണിക്കരും ആദ്യകാല വായനശാലകളും

ഈ പ്രസ്ഥാനത്തിന്റെ ഏറ്റവും പ്രധാന നായകൻ പി. എൻ. പണിക്കർ (1909-1995) ആയിരുന്നു. 1926ൽ തന്റെ ഗ്രാമമായ നീലംപേരൂരിൽ അദ്ദേഹം "സനാതന ധർമ്മ വായനശാല" സ്ഥാപിച്ചു. ഒരു അധ്യാപകൻ കൂടിയിരുന്ന അദ്ദേഹം, വായന ഒരു വ്യക്തിയുടെ മാത്രമല്ല ഒരു സമൂഹത്തിന്റെ മുഴുവൻ വളർച്ചയ്ക്ക് ആവശ്യമാണ് എന്ന് വിശ്വസിച്ചു.¹

"വായിച്ചു വളരുക" എന്ന അദ്ദേഹത്തിന്റെ മുദ്രാവാക്യം പിന്നീട് ഒരു ജനകീയ പ്രസ്ഥാനത്തിന്റെ ആപ്തവാക്യമായി മാറി. ഈ മുദ്രാവാക്യം വായനയെ വ്യക്തിഗത വളർച്ചയുമായും സാമൂഹിക പുരോഗതിയുമായും ബന്ധിപ്പിച്ചു. വായനശാല സ്ഥാപിക്കാനും നടത്താനും ഗ്രാമീണരെ പ്രേരിപ്പിച്ചുകൊണ്ട് അദ്ദേഹം കേരളമെമ്പാടും സഞ്ചരിച്ചു.¹

ആദ്യകാല വായനശാലകൾ ലളിതമായ സംവിധാനങ്ങളായിരുന്നു, പലപ്പോഴും ഒരു മുറിയും കുറച്ച് പുസ്തകങ്ങളും മാത്രം. എന്നാൽ അവ ഗ്രാമീണ ജീവിതത്തിന്റെ കേന്ദ്രബിന്ദുക്കളായി മാറി. ഇവിടെ ആളുകൾ പത്രം വായിക്കാനും വാർത്തകൾ ചർച്ച ചെയ്യാനും ഒത്തുകൂടി.¹

5. തിരുവിതാംകൂർ ഗ്രന്ഥശാലാ സംഘവും സംഘടനാ വളർച്ചയും

1945ൽ പി. എൻ. പണിക്കരുടെ നേതൃത്വത്തിൽ 47 വായനശാലകൾ ചേർന്ന് "തിരുവിതാംകൂർ ഗ്രന്ഥശാലാ സംഘം" രൂപീകരിക്കപ്പെട്ടു. ഇത് ചിതറിക്കിടന്ന വായനശാലകളെ ഒരു സംഘടിത ശൃംഖലയാക്കി മാറ്റിയ നിർണായക സംഭവമായിരുന്നു. 1956ലെ സംസ്ഥാന പുനഃസംഘടനയ്ക്ക് ശേഷം ഇത് "കേരള ഗ്രന്ഥശാലാ സംഘം" ആയി വികസിച്ചു, ഐക്യ കേരളത്തിലെ വായനശാലകളെ ഒന്നിപ്പിച്ചു.¹

സംഘത്തിന്റെ പ്രവർത്തനങ്ങൾ പുസ്തക വിതരണത്തിൽ ഒരുങ്ങിയില്ല. വായനശാലകൾ കേന്ദ്രീകരിച്ച് സാക്ഷരതാ ക്ലാസുകൾ, ചർച്ചാ വേദികൾ, പ്രഭാഷണങ്ങൾ, സാംസ്കാരിക പരിപാടികൾ എന്നിവ സംഘടിപ്പിക്കപ്പെട്ടു. പുസ്തക വിതരണ സംവിധാനവും ലൈബ്രറിയൻമാർക്കുള്ള പരിശീലനവും സംഘം ഏർപ്പെടുത്തി.¹

ഈ പ്രവർത്തനങ്ങളെ മാനിച്ച് 1975ൽ യൂനെസ്കോയുടെ നദേഷ്ഠ ക്രൂപ്സ്കായ പുരസ്കാരം കേരള ഗ്രന്ഥശാലാ സംഘത്തിന് ലഭിച്ചു, ഇത് ഈ പ്രസ്ഥാനത്തിന് അന്താരാഷ്ട്ര അംഗീകാരം നൽകി. പിന്നീട് 1989ലെ കേരള പബ്ലിക് ലൈബ്രറിസ് ആക്ട് വഴി കേരള സ്റ്റേറ്റ് ലൈബ്രറി കൗൺസിൽ രൂപീകരിക്കപ്പെട്ടു, ഇത് പ്രസ്ഥാനത്തിന് നിയമപരവും സ്ഥാപനപരവുമായ അടിത്തറ നൽകി.¹

6. വായനശാലയും പൊതുമണ്ഡലവും

വായനശാല കേരളീയ ഗ്രാമങ്ങളിൽ ഒരു പുതിയ പൊതു ഇടം സൃഷ്ടിച്ചു. ജാതി-മത-വർഗ ഭേദമന്യേ ആളുകൾക്ക് ഒത്തുകൂടാനും ആശയങ്ങൾ കൈമാറാനും കഴിയുന്ന ഈ ഇടം, പരമ്പരാഗത സാമൂഹിക ശ്രേണികളെ വെല്ലുവിളിച്ചു. ഇവിടെ വായനയും ചർച്ചയും ഒരു സാമൂഹിക പ്രവർത്തനമായി മാറി.²

പത്രങ്ങളും ആനുകാലികങ്ങളും വായനശാലയിലൂടെ സാധാരണക്കാരിലേക്ക് എത്തി. ഇത് രാഷ്ട്രീയവും സാമൂഹികവുമായ വിഷയങ്ങളെക്കുറിച്ച് ഒരു പൊതു അവബോധം സൃഷ്ടിച്ചു. വായനശാല അങ്ങനെ ഒരു ജനാധിപത്യ വിദ്യാലയമായി പ്രവർത്തിച്ചു, അവിടെ പൗരബോധവും വിമർശനാത്മക ചിന്തയും വളർന്നു.²

7. വായനയും ജാതിവിരുദ്ധ നവോത്ഥാനവും

ഗ്രന്ഥശാലാ പ്രസ്ഥാനവും ജാതിവിരുദ്ധ നവോത്ഥാന പ്രസ്ഥാനങ്ങളും തമ്മിൽ അഗാധമായ ബന്ധമുണ്ടായിരുന്നു. ശ്രീനാരായണ ഗുരുവിന്റെയും അയ്യങ്കാളിയുടെയും ആശയങ്ങൾ വായനശാലകളിലൂടെ സാധാരണക്കാരിലേക്ക് എത്തി. വായന അവർണ്ണ വിഭാഗങ്ങൾക്ക് അറിവിന്റെ പുതിയ വാതിലുകൾ തുറന്നു, പരമ്പരാഗത വിജ്ഞാന കുത്തകയെ വെല്ലുവിളിച്ചു.^{1,5}

വിജ്ഞാനം ഒരു സമുദായത്തിന്റെയും കുത്തകയല്ല എന്ന ആശയം ഈ പ്രസ്ഥാനം പ്രയോഗത്തിൽ വരുത്തി. വായനശാലകൾ എല്ലാവർക്കും തുറന്നുകൊടുത്തത് സ്വയം ഒരു സാമൂഹിക പ്രസ്താവനയായിരുന്നു. അങ്ങനെ വായന ആത്മാഭിമാനത്തിന്റെയും സാമൂഹിക ഉന്നമനത്തിന്റെയും ഉപകരണമായി മാറി, നവോത്ഥാന മൂല്യങ്ങളെ ഗ്രാമതലത്തിൽ ഉറപ്പിച്ചു.^{1,5}

8. വായനയും രാഷ്ട്രീയ ബോധവും

വായനശാലകൾ കേരളത്തിന്റെ രാഷ്ട്രീയ അവബോധത്തിന്റെ വളർച്ചയിലും നിർണായക പങ്ക് വഹിച്ചു. ദേശീയ സ്വാതന്ത്ര്യ സമരത്തിന്റെയും പിന്നീട് ഇടതുപക്ഷ പ്രസ്ഥാനങ്ങളുടെയും ആശയങ്ങൾ വായനയിലൂടെ പ്രചരിച്ചു. വായനശാല രാഷ്ട്രീയ വിദ്യാഭ്യാസത്തിന്റെ കേന്ദ്രമായി പ്രവർത്തിച്ചു.⁹

പിൽക്കാലത്ത് കേരള ശാസ്ത്രസാഹിത്യ പരിഷത്ത് പോലുള്ള ജനകീയ ശാസ്ത്ര പ്രസ്ഥാനങ്ങൾ വായനാ സംസ്കാരത്തെ ശാസ്ത്രബോധവുമായി ബന്ധിപ്പിച്ചു. ഉയർന്ന രാഷ്ട്രീയ പങ്കാളിത്തവും ശക്തമായ സിവിൽ സമൂഹവുമുള്ള കേരളത്തിന്റെ സവിശേഷ രാഷ്ട്രീയ സംസ്കാരത്തിന്റെ വേരുകൾ ഈ വായനാ പ്രസ്ഥാനത്തിൽ കണ്ടെത്താനാകും.^{7,8}

9. സ്ത്രീകളും വായനയും

ആദ്യകാലത്ത് വായനശാലകൾ പ്രധാനമായും പുരുഷ കേന്ദ്രീകൃതമായിരുന്നുവെങ്കിലും, ക്രമേണ സ്ത്രീകളും വായനയുടെ ലോകത്തേക്ക് കടന്നുവന്നു. സ്ത്രീ വിദ്യാഭ്യാസത്തിന്റെ വ്യാപനവും വനിതാ എഴുത്തുകാരുടെ ഉയർച്ചയും ഈ മാറ്റത്തിന് ആക്കം കൂട്ടി.⁵

വായന സ്ത്രീകൾക്ക് സ്വന്തം അനുഭവങ്ങളെ പ്രകടിപ്പിക്കാനും പൊതുമണ്ഡലത്തിൽ ഇടം നേടാനുമുള്ള ഒരു ഉപാധിയായി. വനിതാ വായനശാലകളും വനിതാ കൂട്ടായ്മകളും പിന്നീട് സ്ത്രീ ശാക്തീകരണത്തിന്റെ വേദികളായി മാറി. ഇത് കേരളത്തിലെ സ്ത്രീകളുടെ താരതമ്യേന ഉയർന്ന സാമൂഹിക പദവിക്ക് സംഭാവന നൽകി.⁵

10. സാക്ഷരതാ പ്രസ്ഥാനവും സമ്പൂർണ്ണ സാക്ഷരതയും

ഗ്രന്ഥശാലാ പ്രസ്ഥാനത്തിന്റെ സ്വാഭാവിക തുടർച്ചയായിരുന്നു സാക്ഷരതാ പ്രസ്ഥാനം. വായനശാലകൾ വർഷങ്ങളായി സൃഷ്ടിച്ച അടിസ്ഥാന സൗകര്യങ്ങളും സന്നദ്ധ പ്രവർത്തക ശൃംഖലയും 1990കളിലെ സമ്പൂർണ്ണ സാക്ഷരതാ യജ്ഞത്തിന് ശക്തമായ അടിത്തറയായി. വായന അറിയുന്നതും വായനാ ശീലവും തമ്മിലുള്ള ബന്ധം ഈ പ്രസ്ഥാനം തിരിച്ചറിഞ്ഞു.¹⁰

1990 ഏപ്രിലിൽ എറണാകുളം ജില്ല ഇന്ത്യയിലെ ആദ്യത്തെ സമ്പൂർണ്ണ സാക്ഷരതാ ജില്ലയായി പ്രഖ്യാപിക്കപ്പെട്ടു. 1991 ഏപ്രിൽ 18ന് കേരളം ഇന്ത്യയിലെ ആദ്യത്തെ സമ്പൂർണ്ണ സാക്ഷരതാ സംസ്ഥാനമായി. ഇത് ഗ്രന്ഥശാലാ പ്രസ്ഥാനം പതിറ്റാണ്ടുകളായി നട്ടുവളർത്തിയ വായനാ സംസ്കാരത്തിന്റെ പരിണതഫലമായിരുന്നു.¹⁰

പി. എൻ. പണിക്കരുടെ ചരമദിനമായ ജൂൺ 19 കേരളത്തിൽ വായനാദിനമായി ആചരിക്കപ്പെടുന്നു. ഈ ദിനാചരണം വായനയുടെ സാമൂഹിക പ്രാധാന്യത്തെ ഓരോ തലമുറയ്ക്കും ഓർമ്മിപ്പിക്കുന്നു.¹

11. പ്രധാന നാഴികക്കല്ലുകൾ

ഗ്രന്ഥശാലാ പ്രസ്ഥാനത്തിന്റെ ചരിത്രത്തിലെ പ്രധാന സംഭവങ്ങൾ ചുവടെ പട്ടികയിൽ സംഗ്രഹിക്കുന്നു.¹

പട്ടിക 1: ഗ്രന്ഥശാലാ പ്രസ്ഥാനത്തിന്റെ പ്രധാന നാഴികക്കല്ലുകൾ

വർഷം	സംഭവം	പ്രാധാന്യം
1926	സനാതന ധർമ്മ വായനശാല സ്ഥാപനം	പണിക്കരുടെ ആദ്യ വായനശാല
1945	തിരുവിതാംകൂർ ഗ്രന്ഥശാലാ സംഘം	സംഘടിത ശൃംഖലയുടെ തുടക്കം
1956	കേരള ഗ്രന്ഥശാലാ സംഘം	ഐക്യ കേരള ശൃംഖല
1975	ക്രൂപ്സ്കായ പുരസ്കാരം	യുനെസ്കോ അന്താരാഷ്ട്ര അംഗീകാരം
1989	കേരള പബ്ലിക് ലൈബ്രറിസ് ആക്ട്	നിയമപരമായ അടിത്തറ
1991	സമ്പൂർണ്ണ സാക്ഷരതാ പ്രഖ്യാപനം	കേരളം ആദ്യ സാക്ഷര സംസ്ഥാനം

12. വിമർശനവും പരിമിതികളും

ഗ്രന്ഥശാലാ പ്രസ്ഥാനത്തിന് ചില പരിമിതികളും ഉണ്ടായിരുന്നു. ആദ്യകാലത്ത് വായനശാലകൾ പ്രധാനമായും പുരുഷ കേന്ദ്രീകൃതമായിരുന്നു, സ്ത്രീകളുടെ പങ്കാളിത്തം പരിമിതമായിരുന്നു. കൂടാതെ, പുസ്തക തിരഞ്ഞെടുപ്പിലും പ്രവർത്തനങ്ങളിലും ചില പ്രത്യയശാസ്ത്രപരമായ പക്ഷപാതങ്ങൾ ഉണ്ടായിരുന്നു എന്ന വിമർശനവും നിലനിൽക്കുന്നു.^{5,7}

നഗര-ഗ്രാമ അന്തരം, വിഭവങ്ങളുടെ അസമമായ വിതരണം, സർക്കാർ ഏറ്റെടുക്കലിന് ശേഷമുള്ള ഉദ്യോഗസ്ഥവൽക്കരണം എന്നിവയും വെല്ലുവിളികളായിരുന്നു. എങ്കിലും, സമഗ്രമായി പരിശോധിച്ചാൽ, ഈ പ്രസ്ഥാനം കേരള സമൂഹത്തിന്റെ ജനാധിപത്യവൽക്കരണത്തിന് നൽകിയ സംഭാവന അനിഷേധ്യമാണ്.^{7,10}

13. സമകാലിക പ്രസക്തി

ഡിജിറ്റൽ യുഗത്തിൽ വായനയുടെ സ്വഭാവം മാറിക്കൊണ്ടിരിക്കുന്നു. സ്മാർട്ട്ഫോണുകളും സാമൂഹിക മാധ്യമങ്ങളും അച്ചടി പുസ്തകങ്ങളുടെ സ്ഥാനത്തെ വെല്ലുവിളിക്കുന്നു. ഈ സാഹചര്യത്തിൽ പരമ്പരാഗത വായനശാലകൾ പ്രസക്തി നിലനിർത്താൻ ഇ-ലൈബ്രറികൾ, ഡിജിറ്റൽ വിഭവങ്ങൾ, ഇന്റർനെറ്റ് സൗകര്യങ്ങൾ എന്നിവയിലേക്ക് മാറേണ്ടതുണ്ട്.

പല വായനശാലകളും ഇപ്പോൾ കമ്പ്യൂട്ടർ പരിശീലനം, മത്സര പരീക്ഷാ പരിശീലനം, ഡിജിറ്റൽ സാക്ഷരത എന്നിവയിലേക്ക് പ്രവർത്തനം വ്യാപിപ്പിച്ചിട്ടുണ്ട്. ഇത് മാറുന്ന കാലത്തിനനുസരിച്ച് പ്രസ്ഥാനത്തിന്റെ പൊരുത്തപ്പെടലിനെ കാണിക്കുന്നു.

എന്നാൽ വായനശാല സൃഷ്ടിച്ച പൊതു ഇടം എന്ന ആശയം ഇന്നും പ്രസക്തമാണ്. ഏകാന്തമായ ഡിജിറ്റൽ ഉപഭോഗത്തിന്റെ കാലത്ത്, കൂട്ടായ്മയുടെയും സംവാദത്തിന്റെയും ഇടങ്ങൾ എന്ന നിലയിൽ ഗ്രന്ഥശാലകൾക്ക് പുതിയ ദൗത്യം ഏറ്റെടുക്കാൻ കഴിയും.²

14. ഉപസംഹാരം

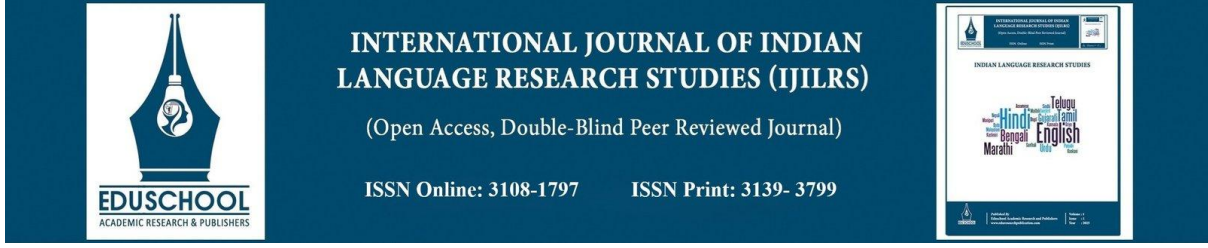
കേരളത്തിലെ ഗ്രന്ഥശാലാ പ്രസ്ഥാനം കേവലം ഒരു വിദ്യാഭ്യാസ പദ്ധതിയായിരുന്നില്ല, മറിച്ച് ആധുനിക കേരളത്തിന്റെ നിർമ്മിതിയിലെ ഒരു അടിസ്ഥാന ശക്തിയായിരുന്നു. വായനയെ ജനകീയമാക്കിയും അറിവിനെ

ജനാധിപത്യവൽക്കരിച്ചും ഈ പ്രസ്ഥാനം സാമൂഹിക നവോത്ഥാനത്തെയും രാഷ്ട്രീയ അവബോധത്തെയും പിന്തുണച്ചു.

പി. എൻ. പണിക്കരെപ്പോലുള്ള പ്രവർത്തകരുടെ ദീർഘവീക്ഷണവും സന്നദ്ധ പ്രവർത്തകരുടെ കൂട്ടായ്മയും ചേർന്ന് സൃഷ്ടിച്ച ഈ പാരമ്പര്യം, ഡിജിറ്റൽ കാലത്തും പുതിയ രൂപങ്ങളിൽ നിലനിർത്തേണ്ടത് നമ്മുടെ കൂട്ടായ ഉത്തരവാദിത്തമാണ്. വായനയുടെ വിമോചന ശക്തിയിലുള്ള വിശ്വാസമാണ് ഈ പ്രസ്ഥാനത്തിന്റെ ശാശ്വത സന്ദേശം.

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संस्कृतवाङ्मये गणितशास्त्रस्य योगदानम्

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सारांशः

भारतीयसभ्यतायां गणितशास्त्रस्य दीर्घा समृद्धा च परम्परा वर्तते, या वैदिककालादारभ्य मध्यकालपर्यन्तं सहस्रत्रयाधिकवर्षाणि यावत् विस्तृता अस्ति। संस्कृतभाषायां रचिताः गणितग्रन्थाः विश्वगणितस्य विकासे अत्यन्तं महत्त्वपूर्णं योगदानम् अकुर्वन्। शुल्बसूत्रेषु ज्यामितिविद्यायाः प्राचीनतमं व्यावहारिकं स्वरूपं प्राप्यते, यत्र वेदिनिर्माणार्थं विविधानि ज्यामितीयसूत्राणि सप्रमाणं प्रतिपादितानि। शून्यस्य आविष्कारः, दशमानस्थानकपद्धतेः विकासः, त्रिकोणमितिसिद्धान्तानां प्रतिष्ठापनम्, अनिर्धार्यसमीकरणानां समाधानविधयः, कलनगणितस्य आधारभूतावधारणानां प्रतिपादनम्, अनन्तश्रेणीनां सिद्धान्ताश्च भारतीयगणितज्ञानां मुख्यानि योगदानानि सन्ति। आर्यभटः, ब्रह्मगुप्तः, भास्कराचार्यः, सङ्ग्रामग्रामस्य माधवः इत्यादयः गणितज्ञाः संस्कृतभाषायां पद्यरूपेण गणितसूत्राणि रचयित्वा अद्वितीयां ज्ञानपरम्पराम् अस्थापयन्। अस्मिन् शोधपत्रे संस्कृतवाङ्मये गणितशास्त्रस्य सम्पूर्णस्य योगदानस्य समग्रं विस्तृतं च मूल्याङ्कनं क्रियते, वैदिककालतः आरभ्य केरलीयगणितपरम्परापर्यन्तं विविधानि प्रमुखानि योगदानानि सविस्तरं विश्लेष्यन्ते, तथा च विश्वगणिते भारतीयगणितस्य दूरगामी प्रभावः सम्यक् समीक्ष्यते। अयं शोधलेखः प्राथमिकस्रोतसां द्वितीयकस्रोतसां च विश्लेषणे आधारितः अस्ति।

Abstract

Indian civilization has a long and rich tradition of mathematics, spanning more than three thousand years from the Vedic period to the Middle Ages. The mathematical texts written in Sanskrit made a very important contribution to the development of world mathematics. The Shulba Sutras contain the oldest practical form of geometry, where various geometric formulas for the construction of altars are proved. The discovery of zero, the development of the decimal place method, the establishment of the theories of trigonometry, the methods of solving indeterminate equations, the presentation of the basic concepts of calculus, and the theories of infinite series are the main contributions of Indian mathematicians. Mathematicians like Aryabhatta, Brahmagupta, Bhaskaracharya, Madhava of Sangamgram etc. established a unique tradition of knowledge by composing mathematical formulas in verse form in Sanskrit. This paper makes a comprehensive and detailed assessment of the entire contribution of mathematics to Sanskrit literature, analyzes in detail various major contributions from Vedic times to the Kerala mathematical tradition, and thoroughly reviews the far-reaching impact of Indian mathematics on world mathematics. This research article is based on the analysis of primary sources and secondary sources.

मुख्यशब्दाः - गणितशास्त्रम्, संस्कृतम्, आर्यभटः, ब्रह्मगुप्तः, भास्कराचार्यः, शुल्बसूत्राणि, शून्यम्, दशमानपद्धतिः

1. प्रस्तावना

भारतीयज्ञानपरम्परायां गणितशास्त्रं सर्वदा सर्वोच्चं महत्त्वपूर्णं स्थानम् अधिगच्छति। प्राचीनभारते गणितं केवलं व्यावहारिकविद्या नासीत्, अपितु दार्शनिकचिन्तनेन आध्यात्मिकज्ञानेन च सह अन्विताय विद्यायै गण्यते स्म। वेदाङ्गज्योतिषे गणितस्य महत्त्वं स्पष्टतया प्रतिपादितम् 'यथा शिखा मयूराणां नागानां मणयो यथा। तद्वद् वेदाङ्गशास्त्राणां गणितं मूर्ध्नि वर्तते॥' इति।² अनेन सुप्रसिद्धेन श्लोकेन गणितस्य सर्वश्रेष्ठत्वं वेदाङ्गेषु सुस्पष्टतया प्रतिपाद्यते। यथा मयूरस्य शिखा सर्वाङ्गेषु श्रेष्ठा, तथैव वेदाङ्गशास्त्रेषु गणितं सर्वश्रेष्ठम् इति अस्य भावः। संस्कृतभाषा गणितज्ञानस्य संरक्षणे संवहने प्रसारणे च अद्वितीयं सशक्तं माध्यमम् अभवत्। अस्याः भाषायाः वैज्ञानिकसूक्ष्मता व्याकरणनियमबद्धता च गणितसूत्राणां यथार्थप्रतिपादने अत्यन्तम् उपयुक्ता आसीत्।¹⁴

संस्कृतवाङ्मये गणितग्रन्थानां रचनायाः एका अत्यन्तं विशिष्टा अद्वितीया च परम्परा वर्तते गणितसूत्राणां पद्यरूपेण छन्दोबद्धतया रचना। आर्यभट्टस्य आर्यभटीयम्, ब्रह्मगुप्तस्य ब्राह्मस्फुटसिद्धान्तः, भास्कराचार्यस्य सिद्धान्तशिरोमणिः इत्यादयः सर्वे प्रमुखग्रन्थाः आर्याच्छन्दसि श्लोकच्छन्दसि वा रचिताः सन्ति।¹ एतेषु ग्रन्थेषु गणितसूत्राणि सुगमतया कण्ठस्थीकरणयोग्यानि, मौखिकपरम्परायां दीर्घकालं यावत् संरक्षणयोग्यानि च भवन्ति। अयं पद्यरूपः गणितज्ञानस्य पीढीपरम्परया प्रसारणे अत्यन्तं सहायकः अभवत्, येन सहस्रवर्षाणि यावत् गणितपरम्परा अविच्छिन्नतया प्रवर्तमाना आसीत्। अस्याम् अद्भुतायां परम्परायां गणितस्य काव्यस्य च सुन्दरं सम्मेलनं दृश्यते, यत् विश्वस्य अन्यासु सभ्यतासु विरलम् एव प्राप्यते।¹⁴

भारतीयगणितपरम्परायाः कतिपयानि योगदानानि विश्वगणितस्य इतिहासे सत्यमेव युगान्तरकारिणि सन्ति। शून्यस्य सम्पूर्णा अवधारणा, दशमानस्थानकपद्धतिः (place-value decimal system), त्रिकोणमितिसारण्यः (trigonometric tables), अनन्तश्रेणीनां सिद्धान्ताः, अनिर्धार्यसमीकरणानां (indeterminate equations) व्यवस्थितं समाधानम् इत्यादीनि तादृशानि महत्तरानि योगदानानि सन्ति, यानि आधुनिकगणितस्य आधुनिकविज्ञानस्य च आधारशिलारूपाणि भवन्ति।⁶ एतानि सर्वाणि योगदानानि अरबविद्वद्भिः मध्यमेन पश्चिमएशियां ततः यूरोपदेशं प्राप्तानि, तत्र 'Hindu-Arabic numeral system' इति नाम्ना विश्वप्रसिद्धानि जातानि।¹⁷ आधुनिककाले गणितेतिहासकारैः भारतीयगणितस्य एतत् योगदानं पुनर्मूल्याङ्कितं भवति, तस्य विश्वगणिते प्रभावस्य वास्तविकं स्वरूपं प्रकाशितं भवति च।¹⁰ अस्मिन् शोधपत्रे एतेषां सर्वेषां योगदानानां विस्तृतं सुव्यवस्थितं च विवेचनं प्रस्तूयते।

2. वैदिककाले गणितम्

भारतीयगणितस्य प्राचीनतमं सुव्यवस्थितं स्वरूपं शुल्बसूत्रेषु प्राप्यते। शुल्बसूत्राणि कल्पसूत्राणाम् अन्तर्गतानां श्रौतसूत्राणाम् अंशरूपाणि सन्ति, यानि यज्ञवेदिनिर्माणार्थं विविधानि ज्यामितीयनियमान् सूत्ररूपेण प्रतिपादयन्ति। 'शुल्ब' इति शब्दस्य अर्थः 'रज्जुः' (rope/cord) इति अस्ति, यतः वेदिनिर्माणे रज्ज्वा मापनं क्रियते स्म।¹² बौधायनशुल्बसूत्रम् (अनुमानतः अष्टमशताब्दी ख्रीष्टपूर्वम्) सर्वाधिकं प्राचीनं विस्तृतं च शुल्बसूत्रम् अस्ति। आपस्तम्बशुल्बसूत्रम्, कात्यायनशुल्बसूत्रम्, मानवशुल्बसूत्रम् च अन्यानि प्रमुखानि शुल्बसूत्राणि सन्ति।¹⁵ एतेषु सूत्रेषु वर्गस्य, आयतस्य, वृत्तस्य, त्रिकोणस्य, समलम्बस्य च क्षेत्रफलगणनाविधयः सविस्तरं प्रतिपादिताः। एकस्य आकृतेः अन्याम् आकृतिं समानक्षेत्रफलेन परिवर्तनस्य विधयश्च प्रतिपादिताः यथा वर्गस्य वृत्तं, वृत्तस्य वर्गं, आयतस्य वर्गम् इत्यादि।¹²

बौधायनशुल्बसूत्रे एकं गणितेतिहासस्य सर्वाधिकं महत्त्वपूर्णं सूत्रं प्राप्यते 'दीर्घचतुरश्रस्याक्षयारज्जुः पार्श्वमानी तिर्यङ्गानी च यत् पृथग्भूते कुरुतस्तदुभयं करोति' इति।¹² अस्य सूत्रस्य स्पष्टः अर्थः अस्ति यत् आयतस्य (rectangle) विकर्णरज्जुः (hypotenuse) तत् क्षेत्रफलं करोति यत् दीर्घभुजया (length) क्षुद्रभुजया (breadth) च पृथक् पृथक् क्रियमाणं मिलित्वा भवति। अयं सिद्धान्तः पाइथागोरस-प्रमेयस्य (Pythagorean theorem) स्पष्टं पूर्वरूपम् अस्ति। बौधायनस्य कालः ग्रीकगणितज्ञस्य पाइथागोरसतः (c. 570-495 BCE) शताब्दीभिः पूर्वम् इति अनेके विद्वांसः स्वीकुर्वन्ति।¹⁵ फ्रिट्स स्ताल (Frits Staal) इत्यनेन वैदिकज्यामितेः ग्रीकज्यामितेः च तुलनात्मकम् अध्ययनं कृतम्, यत्र उभयोः परम्परयोः स्वतन्त्रविकासः प्रतिपादितः।¹⁵

बौधायनेन $\sqrt{2}$ (द्वयस्य वर्गमूलम्) इत्यस्य मूल्यम् अपि अत्यन्तं सूक्ष्मतया प्रदत्तम्। सः प्रतिपादयति 'प्रमाणं तृतीयेन वर्धयेत् तच्चतुर्थेनात्मचतुस्त्रिंशोनेन सविशेषः' इति।¹² अस्य सूत्रस्य गणितीयः अर्थः अस्ति $\sqrt{2} \approx 1 + 1/3$

$+ 1/(3 \times 4) - 1/(3 \times 4 \times 34) = 1.4142156...$ इति, यत् आधुनिकमूल्यात् (1.4142135...) केवलं 0.0000021 इत्यनेन भिन्नम् अस्ति। एतावती सूक्ष्मता प्राचीनकाले अत्यन्तम् आश्चर्यजनकी वर्तते। शुल्बसूत्रेषु अन्यानि अपि अनेकानि ज्यामितीयसूत्राणि प्राप्यन्ते यथा वर्गस्य विकर्णसूत्रम्, समद्विबाहुत्रिकोणस्य क्षेत्रफलसूत्रम्, वृत्तचतुर्भागसूत्रम् इत्यादीनि। एतानि सूत्राणि प्रत्यक्षतया वेदिनिर्माणार्थम् आसन्, किन्तु तेषु निहितं गणितीयज्ञानं सार्वभौमम् अस्ति।¹²

वैदिककाले संख्यापद्धतिः अपि अत्यन्तं विकसिता उन्नता च आसीत्। ऋग्वेदे दशसंख्यायाः गुणजानि (powers of ten) शतम् (10^2), सहस्रम् (10^3), अयुतम् (10^4), नियुतम् (10^5), प्रयुतम् (10^6) इत्यादीनि विशिष्टानि नामानि प्राप्यन्ते, यानि दशमानपद्धतेः अत्यन्तं प्राचीनत्वं सूचयन्ति।¹⁷ यजुर्वेदे तु परार्धपर्यन्तं (10^{12}) संख्यानामानि प्रयुक्तानि। बौद्धग्रन्थे ललितविस्तरे बुद्धस्य गणनासामर्थ्यवर्णने 10^{53} पर्यन्तं संख्यानामानि उपलभ्यन्ते। एषा दशगुणोत्तरसंख्यापद्धतिः भारतीयगणितस्य अद्वितीयं विशिष्टं वैशिष्ट्यम् अस्ति, या कालान्तरे स्थानकमानपद्धत्याः (place-value notation) सुदृढम् आधारम् अस्थापयत्।² प्राचीनविश्वस्य अन्यासु सभ्यतासु यथा बैबिलोनिया, ईजिप्, ग्रीस् इत्यादिषु एतावती विशाला व्यवस्थिता च संख्यापद्धतिः नोपलभ्यते।

पिङ्गलस्य छन्दःशास्त्रं (अनुमानतः तृतीयशताब्दी ख्रीष्टपूर्वम्) गणितेतिहासे अत्यन्तं महत्त्वपूर्णं अनन्यसाधारणं च योगदानम् अस्ति। पिङ्गलः छन्दसां गणनार्थम् एकां विशिष्टां सांख्यिकीयपद्धतिम् अविष्करोत्। सः लघुगुरुद्विमात्राणां (short-long binary syllables) विन्यासानां (combinations) गणनायाम् एकां क्रमबद्धां पद्धतिम् अस्थापयत्, या 'मेरुप्रस्तारः' इति नाम्ना प्रसिद्धा।⁶ अयं मेरुप्रस्तारः (Meru Prastāra) पास्कल-त्रिकोणस्य (Pascal's triangle) सुस्पष्टं पूर्वरूपम् अस्ति, यस्य रचना ब्लेज् पास्कलतः (1623-1662) सहस्राधिकवर्षपूर्वम् अभवत्। पिङ्गलस्य लघु-गुरुद्विमात्रापद्धतिः (laghu-guru binary system) आधुनिकद्विमानपद्धतेः (binary system) प्रत्यक्षं पूर्वरूपम् इति अनेके विद्वांसः सप्रमाणं प्रतिपादयन्ति।⁶ पिङ्गलः संयोज्यसंख्यानां (combination numbers) गणनार्थम् अपि सूत्रं प्रदत्तवान्, यत् आधुनिकसंयोज्यगणितस्य (combinatorics) आधारभूतम् अस्ति। एवं वैदिककालः भारतीयगणितस्य सुदृढं व्यापकं च आधारम् अस्थापयत्, यस्मिन् आधारे परवर्तिनः महान्तः गणितज्ञाः स्वकीयानि युगान्तरकारिणि कार्याणि सम्पन्नवन्तः।

वैदिककालस्य गणितस्य अन्यत् महत्त्वपूर्णम् अंशम् अस्ति जैनगणितपरम्परा। जैनगणितज्ञाः अनन्तस्य (infinity) विविधानि प्रकाराणि वर्गीकृतवन्तः एकतः अनन्तम्, द्वयतः अनन्तम्, बहुतः अनन्तम्, सर्वतः अनन्तम् इत्यादि भेदान् स्वीकृतवन्तः।¹¹ जैनगणिते बृहत्संख्यानां प्रति विशेषा रुचिः आकर्षणं च दृश्यते स्थानाङ्गसूत्रे (ख्रीष्टपूर्वं द्वितीयशताब्दी इति अनुमीयते) संख्यानां विभिन्नाः श्रेण्यः सविस्तरं वर्णिताः संख्येयम् (enumerable), असंख्येयम् (innumerable), अनन्तम् (infinite) इति त्रयः मुख्यभेदाः, तेषां प्रत्येकस्य पुनः उपभेदाः च विस्तरेण प्रतिपादिताः।⁶ जैनपरम्परायां लघुगणकस्य (logarithm) आधारभूता अवधारणा 'अर्धच्छेदम्' इति नाम्ना प्राप्यते, यत्र संख्यायाः पुनः पुनः द्विभाजनेन (repeated halving) प्राप्तसंख्या निर्दिश्यते। एवं जैनगणितम् अपि वैदिककालीनभारतीयगणितपरम्परायाः एकं महत्त्वपूर्णम् अविभाज्यम् अङ्गम् आसीत्, यस्य योगदानं गणितेतिहासे उचितमान्यतां प्राप्नोति।

वैदिककालीनगणितस्य अन्यत् उल्लेखनीयं वैशिष्ट्यम् अस्ति तस्य व्यावहारिकस्वरूपम्। शुल्बसूत्राणि केवलं सैद्धान्तिकानि नासन्, अपितु प्रत्यक्षतया वेदिनिर्माणे प्रयोजनीयानि आसन्। यज्ञवेदीनां विविधाः आकृतयः गरुडवेदी, श्येनचितिः, कूर्मचितिः इत्यादयः अत्यन्तं जटिलानि ज्यामितीयज्ञानम् अपेक्षन्ते स्म।¹² एतासां वेदीनां निर्माणे क्षेत्रफलसमीकरणम् (equating areas of different shapes), आकृतिपरिवर्तनम् (transformation of geometric shapes), तथा अपरिमेयसंख्यानां (irrational numbers) अनुमानं च आवश्यकम् आसीत्। अतः शुल्बसूत्राणि ज्यामितेः प्राचीनतमं व्यावहारिकं प्रयोगं दर्शयन्ति, यत्र सिद्धान्तः प्रयोगश्च अविभक्ततया मिलितौ स्तः।¹⁵ एवं वैदिककालस्य गणितं केवलं बौद्धिकव्यायामः नासीत्, अपितु धार्मिककर्मणां सम्पादनार्थम् अनिवार्यं साधनम् आसीत्, अतः तस्य विकासः सततं प्रेरितः पोषितश्च अभवत्।

3. शून्यस्य दशमानपद्धतेश्च आविष्कारः

शून्यस्य अवधारणा भारतीयसभ्यतायाः निर्विवादतया सर्वाधिकं महत्त्वपूर्णं सर्वाधिकं प्रभावशालि च गणितीययोगदानम् अस्ति। शून्यस्य दार्शनिकमूलानि भारतीयदर्शनस्य अनेकेषु सम्प्रदायेषु प्राप्यन्ते, विशेषतः बौद्धदर्शनस्य शून्यतावादे (śūnyatā doctrine) एषा अवधारणा गभीरतया विकसिता।¹⁸ नागार्जुनस्य (c. 150-250 CE) माध्यमकदर्शने शून्यता सर्वपदार्थानां स्वभावशून्यतारूपेण प्रतिपादिता, या दार्शनिकचिन्तनस्य गणितीयचिन्तनस्य च सम्बन्धं दर्शयति। गणितक्षेत्रे शून्यं केवलं रिक्तस्थानसूचकम् (placeholder) एव नासीत्,

अपितु एका पूर्णतया स्वतन्त्रा संख्या (a number in its own right) इति स्वीकृतम् अभवत्, यया सह गणितक्रियाः (arithmetic operations) कर्तुं शक्यन्ते।¹⁸ अन्यासु प्राचीनसभ्यतासु यथा बैबिलोनियायाम्, मायासभ्यतायां च रिक्तस्थानसूचकचिह्नानि आसन्, किन्तु शून्यं स्वतन्त्रसंख्यारूपेण केवलं भारते एव विकसितम् इति विद्वांसः एकमत्येन स्वीकुर्वन्ति।¹⁷

गणितशास्त्रे शून्यस्य प्रथमं स्पष्टं औपचारिकं च प्रतिपादनं ब्रह्मगुप्तस्य ब्राह्मस्फुटसिद्धान्ते (628 ख्रीष्टाब्दे) प्राप्यते, यत्र शून्येन सह गणितक्रियाणां नियमाः व्यवस्थितरूपेण सविस्तरं प्रतिपादिताः।⁴ ब्रह्मगुप्तः प्रतिपादयति शून्यस्य शून्येन योगे शून्यमेव भवति, धनसंख्यायाः शून्ययोगे धनसंख्या एव तिष्ठति, ऋणसंख्यायाः शून्ययोगे ऋणसंख्या एव तिष्ठति। शून्येन गुणने सर्वदा शून्यमेव फलं भवति। शून्येन भाजने (division by zero) तु ब्रह्मगुप्तः 'खछेदम्' (fraction with zero denominator) इति संज्ञां प्रयुक्तवान्, यस्य सम्पूर्णं समाधानं कालान्तरे भास्कराचार्येण प्रतिपादितम्।⁴ ग्वालियरशिलालेखे (876 ख्रीष्टाब्दे) शून्यसहिता संख्या 270 लिखिता अस्ति, यत् शून्यस्य व्यावहारिकप्रयोगस्य प्राचीनतमं शिलालेखीयं प्रमाणम् अस्ति।

दशमानस्थानकपद्धतिः (decimal place-value notation) भारतीयगणितस्य अन्यत् अत्यन्तं युगान्तरकारि विश्वपरिवर्तनकारि च योगदानम् अस्ति। अस्यां पद्धत्यां प्रत्येकस्य अङ्कस्य (digit) मूल्यं तस्य स्थानेन (positional value) निर्धार्यते एककस्थानम्, दशकस्थानम्, शतकस्थानम् इत्यादि।¹⁷ केवलं दशभिः अङ्कैः (0-9) विश्वस्य सर्वाः संख्याः लेखितुं शक्यन्ते एतत् अस्याः पद्धतेः अद्भुतं सामर्थ्यम् अस्ति। रोमन-संख्यापद्धत्यां (Roman numerals), ग्रीक-संख्यापद्धत्यां, ईजिप्शियन-संख्यापद्धत्यां च एतादृशी सरलता नास्ति। भारतीया पद्धतिः अरबव्यापारिणां विद्वांसं च माध्यमेन पश्चिमएशियां प्राप्तवती।¹⁹ अल्-ख्वारिज्मी (Al-Khwārizmī) नवमशताब्द्यां भारतीयसंख्यापद्धतिम् अरबभाषायां प्रतिपादितवान्। अल्-बीरूनी (Al-Bīrūnī) अपि स्वग्रन्थे भारतीयगणितस्य विस्तृतं विवरणम् अकरोत्। एवं भारतीयसंख्यापद्धतिः अरबदेशान् प्राप्य 'Hindu-Arabic numerals' इति नाम्ना सम्पूर्णे विश्वे प्रसृता, या अद्यापि समस्तविश्वे सर्वत्र प्रयुज्यते।⁶ फिबोनाच्ची (Fibonacci) स्वग्रन्थे Liber Abaci (1202 ख्रीष्टाब्दे) भारतीयसंख्यापद्धतिं यूरोपदेशे प्रथमवारं व्यवस्थितरूपेण प्रचारितवान्।

4. आर्यभट्टस्य योगदानम्

आर्यभट्टः (476-550 ख्रीष्टाब्दः) भारतीयगणितस्य ज्योतिषशास्त्रस्य च इतिहासे एकः सर्वाधिकं प्रभावशाली सर्वाधिकम् आदरणीयश्च विद्वान् अस्ति। तस्य जन्मस्थानं कुसुमपुरम् (आधुनिकपाटलिपुत्रम्, पटना) इति अनुमीयते, यत्र सः नालन्दाविश्वविद्यालये अध्ययनम् अकरोत् इति केचन विद्वांसः मन्यन्ते। तस्य प्रमुखग्रन्थः आर्यभटीयं 499 ख्रीष्टाब्दे रचितम्, यत् 121 आर्याच्छन्दोबद्धश्लोकेषु चतुर्षु पादेषु विभक्तम् अस्ति। गीतिकापादः (दशगीतिकापादः, 13 श्लोकाः), गणितपादः (33 श्लोकाः), कालक्रियापादः (25 श्लोकाः), गोलपादश्च (50 श्लोकाः)।³ गीतिकापादे आर्यभट्टः ज्योतिषीयस्थिराङ्कानां (astronomical constants) संक्षिप्तं किन्तु अत्यन्तं सूक्ष्मं विवरणं ददाति, तथा च स्वकीयां विशिष्टां संख्यासंकेतपद्धतिं प्रतिपादयति। गणितपादे गणितसूत्राणि क्षेत्रफलगणना, घनफलगणना, वर्गमूलम्, घनमूलम्, श्रेणीगणितम् (arithmetic and geometric progressions) इत्यादीनि अत्यन्तं संक्षिप्तेषु 33 आर्याच्छन्दोबद्धसूत्रेषु प्रतिपादितानि।⁵

आर्यभट्टस्य π (पाई) इत्यस्य मूल्यानुमानं गणितेतिहासे अत्यन्तं विशेषतया उल्लेखनीयं प्रशंसनीयं च अस्ति। सः गणितपादे प्रतिपादयति 'चतुरधिकं शतमष्टगुणं द्वाषष्टिस्तथा सहस्राणाम्। अयुतद्वयविष्कम्भस्यासन्नो वृत्तपरिणाहः॥' इति।³ अस्य सूत्रस्य सुस्पष्टः अर्थः अस्ति चतुरधिकं शतम् (104), अष्टगुणम् ($\times 8 = 832$), द्वाषष्टिसहस्राणि (62000), तयोः योगः = 62832। अयुतद्वयविष्कम्भस्य = 20000 व्यासस्य वृत्तस्य परिधिः 62832 अस्ति, अर्थात् $\pi = 62832/20000 = 3.1416$ इति। अत्र 'आसन्नः' इति शब्दप्रयोगः अत्यन्तं महत्त्वपूर्णः अस्ति। आर्यभट्टः स्पष्टतया सूचयति यत् एतत् मूल्यम् अनुमानमात्रम् (approximation) अस्ति, यथार्थं (exact) नास्ति।⁹ एषा जागरूकता π इत्यस्य अपरिमेयत्वस्य (irrationality) सूचनां ददाति, यत् यूरोपे 18-शताब्द्यां लाम्बर्ट (Lambert, 1761) इत्यनेन प्रमाणितम्।

त्रिकोणमितिक्षेत्रे (trigonometry) आर्यभट्टस्य योगदानम् अत्यन्तं मौलिकं दूरगामि च अस्ति। सः ज्या (sine, यत् 'jyā' इति शब्दतः उद्भूतम्) इत्यस्य अर्धज्या (ardha-jyā, half-chord = sine) इत्यस्य च विस्तृतां सारणीं (table) प्रस्तुतवान्, या 24 मूल्यानि ($3^{\circ}45'$ इत्यस्य समानान्तरालेन) समाविशति।⁹ अस्याः सारण्याः मूल्यानि अत्यन्तं सूक्ष्माणि परिशुद्धानि च सन्ति, यानि ज्योतिषीयगणनासु अत्यन्तम् उपयोगीनि आसन्। विशेषतया उल्लेखनीयम् अस्ति यत् 'sine' इति आधुनिकः आङ्ग्लशब्दः मूलतः संस्कृतस्य 'jyā' शब्दात् उद्भूतः $jyā \rightarrow jiva$

(प्राकृतभाषायाम्) → jiba (अरबभाषायाम्) → jaib (अरबलिप्यन्तरणे) → sinus (लैटिनभाषायां अनुवादे) → sine (आङ्ग्लभाषायाम्) इति।¹ एवम् आर्यभट्टस्य प्रभावः आधुनिकगणितशब्दावल्यां (mathematical terminology) अपि सुस्पष्टम् अस्ति। तकाओ हयाशी (Takao Hayashi) इत्यनेन आर्यभट्टस्य ज्यासारण्याः सम्पूर्णं विश्लेषणम् कृतम्, यत्र तस्य पद्धतेः सूक्ष्मता गणितीयसामर्थ्यं च प्रतिपादितम्।⁹

आर्यभट्टस्य अन्यत् अत्यन्तं महत्त्वपूर्णं दूरगामिप्रभावयुक्तं च योगदानम् अस्ति कुट्टकविधिः (kuttaka method), या प्रथमकोटेः अनिर्धार्यसमीकरणानां (linear indeterminate equations) समाधानार्थम् उपयुज्यते।⁵ $ax + c = by$ इति रूपस्य समीकरणस्य पूर्णाङ्कसमाधानं (integer solution) प्राप्तुं कुट्टकविधिः क्रमशः भाजकप्रक्रियां (iterative division process) प्रयुज्य समाधानं व्यवस्थितरूपेण निर्गमयति। 'कुट्टक' इति शब्दस्य अर्थः 'कूटनं कर्ता' अथवा 'चूर्णनकर्ता' इति अस्ति, यतः अस्मिन् विधौ संख्याः क्रमशः लघुतराः क्रियन्ते। अयं विधिः यूरोपीयगणिते 'continued fraction algorithm' इति नाम्ना 17-शताब्द्यां प्रसिद्धस्य विधेः सुस्पष्टं पूर्वरूपम् अस्ति।¹ कुट्टकविधेः ज्योतिषशास्त्रे अत्यन्तम् उपयोगः आसीत् ग्रहस्थितिगणनायां, ग्रहणकालनिर्धारणे, कालगणनायां च।

आर्यभट्टः पृथिव्याः स्वाक्षभ्रमणम् (axial rotation) अपि सुस्पष्टतया प्रतिपादितवान्। गोलपादे सः लिखति 'अनुलोमगतिर्नैस्थः पश्यत्यचलं विलोमगम्। एवं लङ्कायां गतान् भान् पश्यत्युदयास्तमयान् सम्यक्' इति।³ अस्य सूत्रस्य अर्थः अस्ति यथा नौकायां तिष्ठन् व्यक्तिः स्थिरान् वृक्षान् विपरीतदिशि गच्छतः इव पश्यति, तथैव पृथिवी भ्रमति अतः नक्षत्राणि विपरीतदिशि गच्छन्ति इव दृश्यन्ते। अयं सिद्धान्तः कोपर्निकसतः (Copernicus, 1473-1543) सहस्रवर्षपूर्वम् प्रतिपादितः, यद्यपि अयं सिद्धान्तः तत्कालीनभारतीयपरम्परायां सर्वैः विद्वद्भिः न स्वीकृतः आसीत्। ब्रह्मगुप्तः स्वयमेव आर्यभट्टस्य अस्य सिद्धान्तस्य खण्डनं कृतवान्।¹

5. ब्रह्मगुप्तस्य योगदानम्

ब्रह्मगुप्तः (598-668 ख्रीष्टाब्दः) राजस्थानस्य भीनमालनगरे (आधुनिकभीनमाल) जन्म प्राप्तवान्, चापवंशस्य राज्ञः व्याघ्रमुखस्य राजज्योतिषी आसीत्। तस्य प्रमुखग्रन्थः ब्राह्मस्फुटसिद्धान्तः 628 ख्रीष्टाब्दे रचितः, यः 25 अध्यायेषु 1008 श्लोकेषु विभक्तः अस्ति।⁴ अस्य ग्रन्थस्य द्वादशः अध्यायः (गणिताध्यायः) तथा अष्टादशः अध्यायः (कुट्टकाध्यायः) गणितेतिहासे विशेषतया अत्यन्तं महत्त्वपूर्णौ स्तः, यतः एतयोः अध्याययोः अनेकानि नवीनानि गणितसूत्राणि प्रतिपादितानि, यानि पूर्वगणितज्ञैः न प्रतिपादितानि आसन्।¹

ब्रह्मगुप्तः प्रथमः गणितज्ञः अस्ति यः शून्येन (zero) ऋणसंख्याभिश्च (negative numbers) गणितक्रियाणां सम्पूर्णानि व्यवस्थितानि नियमानि प्रतिपादितवान्। सः ऋणसंख्याः 'ऋणम्' इति, धनसंख्याः 'धनम्' इति, शून्यं 'खम्' इति संज्ञाभिः व्यवहरति।⁴ ब्रह्मगुप्तस्य नियमाः अत्यन्तं व्यवस्थिताः सन्ति ऋणम् ऋणेन गुणिते धनं भवति (negative × negative = positive), धनम् ऋणेन गुणिते ऋणं भवति (positive × negative = negative), शून्यं केनापि गुणिते शून्यमेव भवति (zero × anything = zero)। एते नियमाः आधुनिकगणिते यथावत् स्वीकृताः सन्ति। तथापि शून्येन भाजने (division by zero) ब्रह्मगुप्तस्य प्रतिपादनम् आधुनिकदृष्ट्या सम्पूर्णतया शुद्धं नासीत् सः शून्यं शून्येन भक्ते शून्यम् इति प्रतिपादितवान्, यत् आधुनिकगणिते 'अपरिभाषित' (undefined) इति स्वीकृतम्।⁴

ज्यामितिक्षेत्रे ब्रह्मगुप्तस्य सर्वाधिकं प्रसिद्धं कालातीतं च योगदानम् अस्ति चक्रीयचतुर्भुजस्य (cyclic quadrilateral) क्षेत्रफलसूत्रम्। यदि चक्रीयचतुर्भुजस्य भुजाः a, b, c, d सन्ति, अर्धपरिमितिः $s = (a+b+c+d)/2$ अस्ति, तर्हि क्षेत्रफलम् $= \sqrt{[(s-a)(s-b)(s-c)(s-d)]}$ इति।¹ एतत् सूत्रं हेरोन-सूत्रस्य (Heron's formula for triangle area) प्रत्यक्षं सामान्यीकृतरूपम् (generalization) अस्ति यदि $d = 0$ इति कल्पयामः (अर्थात् चतुर्भुजः त्रिकोणः भवति), तर्हि ब्रह्मगुप्तस्य सूत्रं हेरोनसूत्रमेव भवति। ब्रह्मगुप्तेन चक्रीयचतुर्भुजस्य विकर्णानां (diagonals) दैर्घ्यस्य सूत्रम् अपि प्रदत्तम्, तथा च चक्रीयचतुर्भुजस्य अनेकानि अन्यानि गुणधर्माः (properties) प्रतिपादिताः।⁴ अपरं ब्रह्मगुप्तः 'ब्रह्मगुप्त-फिबोनाच्ची-सर्वसमिकाम्' (Brahmagupta-Fibonacci identity) अपि प्रतिपादितवान् $(a^2 + b^2)(c^2 + d^2) = (ac - bd)^2 + (ad + bc)^2$ इति। अस्याः सर्वसमिकायाः संख्यासिद्धान्ते (number theory) अत्यन्तम् उपयोगः वर्तते।

ब्रह्मगुप्तस्य अन्यत् अत्यन्तं महत्त्वपूर्णं योगदानम् अस्ति वर्गप्रकृतिसमीकरणानाम् (Pell's equation, $x^2 - Ny^2 = 1$) समाधानविधिः। सः 'भावना' (composition method) इति नामकेन विधिना एतादृशानां द्विघातअनिर्धार्यसमीकरणानां समाधानानि प्राप्तुम् उपायम् अदर्शयत्।¹ भावनाविधौ यदि $x^2 - Ny^2 = k_1$ तथा p^2

– $Nq^2 = k_2$ इत्येतयोः समीकरणयोः समाधानानि ज्ञातानि, तर्हि तयोः 'भावनया' (composition/combination) $x^2 - Ny^2 = k_1k_2$ इत्यस्य समीकरणस्य अपि समाधानं प्राप्तुं शक्यते। अयं विधिः अत्यन्तं शक्तिशाली अस्ति। उदाहरणार्थम्, $x^2 - 92y^2 = 1$ इत्यस्य समीकरणस्य समाधानं सः प्राप्तवान्, यस्य $x = 1151$, $y = 120$ इति मूल्ये स्तः।¹² एतत् समीकरणं यूरोपे 'Pell's equation' इति नाम्ना 17-शताब्द्यां प्रसिद्धम् अभवत् (यद्यपि 'Pell' इत्यस्य अस्मिन् समीकरणे कोऽपि विशेषः योगदानं नास्ति, ऑयलर् इत्यनेन भ्रमवशात् एतत् नाम दत्तम्), किन्तु वस्तुतः ब्रह्मगुप्तः सहस्रवर्षपूर्वमेव अस्य गहनम् अध्ययनम् आरभत। ब्राह्मस्फुटसिद्धान्तस्य अरबभाषायाम् अनुवादः 771 ख्रीष्टाब्दे अभवत्, यः अरबगणितस्य बीजगणितस्य च विकासे अत्यन्तं प्रभावशाली निर्णायकश्च अभवत्।¹⁹

6. भास्कराचार्यस्य योगदानम्

भास्कराचार्यः (भास्करः द्वितीयः, 1114-1185 ख्रीष्टाब्दः) महाराष्ट्रस्य विज्जडविडनगरे जातः, भारतीयगणितपरम्परायाः सर्वाधिकं प्रसिद्धः सर्वाधिकं बहुमुखप्रतिभाशाली च गणितज्ञः इति गण्यते। तस्य पिता महेश्वरः अपि विद्वान् ज्योतिषी आसीत्। भास्कराचार्यस्य प्रमुखग्रन्थः सिद्धान्तशिरोमणिः 1150 ख्रीष्टाब्दे रचितः, यः चतुर्षु विशालभागेषु विभक्तः अस्ति लीलावती (अङ्कगणितम्, arithmetic), बीजगणितम् (algebra), ग्रहगणितम् (planetary mathematics), गोलाध्यायः (spherical astronomy)।¹⁴ एषः ग्रन्थः भारतीयगणितस्य सर्वाधिकं विस्तृतः व्यापकः एकीकृतश्च (most comprehensive and unified) ग्रन्थः इति सर्वैः विद्वद्भिः स्वीकृतम्।¹

लीलावतीभागः भारतीयगणितग्रन्थेषु सर्वाधिकं लोकप्रियः विश्वप्रसिद्धश्च ग्रन्थः अस्ति, यतः अस्मिन् गणितसमस्याः कथारूपेण काव्यात्मकतया सरसतया च प्रस्तूयन्ते। परम्परानुसारं भास्कराचार्यः लीलावतीं स्वपुत्र्यै समर्पितवान्, तस्याः नाम्ना एव ग्रन्थं नामाङ्कितवान्। अस्मिन् ग्रन्थे अङ्कगणितम् (arithmetic), भिन्नसंख्यागणितम् (fractions), त्रैशिकम् (rule of three), पञ्चशिकम् (rule of five), क्रमचयसंचयौ (permutations and combinations), वर्गमूलम्, घनमूलम्, श्रेणीगणितम्, क्षेत्रगणितम् इत्यादीनि विषयाणि अत्यन्तं सुन्दरेषु मनोहरेषु पद्येषु प्रतिपादितानि।¹⁴ उदाहरणार्थम् 'बाले लीलावति मतिमति कहे एकपञ्चांशभागः हंसानाम् अम्बुनिलये...' इत्यादिषु समस्यासु हंसानां भ्रमराणां हस्तिनां च संख्यागणनार्थं काव्यात्मकसमस्याः प्रस्तुताः। एतादृशाः समस्याः गणितशिक्षणं सरसं रोचकं च कुर्वन्ति, अतः लीलावती शताब्दीभिः यावत् भारतस्य सर्वाधिकं लोकप्रियः गणितपाठ्यग्रन्थः आसीत्।

बीजगणितभागे भास्कराचार्यः बीजगणितस्य (algebra) अनेकानि उन्नतसूत्राणि प्रतिपादितवान्। सः चक्रवालविधिं (cyclic method) प्रतिपादितवान्, यया वर्गप्रकृतिसमीकरणानां (Pell's equation) सर्वसामान्यसमाधानं प्राप्तुं शक्यते।¹ ब्रह्मगुप्तस्य भावनाविधेः विस्तारेण भास्कराचार्यः चक्रवालविधिना $x^2 - 61y^2 = 1$ इत्यस्य समीकरणस्य समाधानं प्राप्तवान्, यस्य $x = 1766319049$, $y = 226153980$ इति। एतत् अत्यन्तं विशालसंख्यात्मकं समाधानम् अस्ति, यत् यूरोपे फर्मा (Fermat) इत्यनेन 1657 ख्रीष्टाब्दे प्रश्नरूपेण प्रस्तुतम्, ऑयलर् (Euler) इत्यनेन लाग्राञ्ज (Lagrange) इत्यनेन च सम्पूर्णतया समाधितम्।² किन्तु भास्कराचार्यः एतत् पञ्चशताब्दीभिः पूर्वमेव समाधितवान् इति अत्यन्तम् आश्चर्यजनकम्।

भास्कराचार्यस्य सर्वाधिकम् अद्भुतं युगान्तरकारि च योगदानम् अस्ति कलनगणितस्य (calculus) आधारभूतानां अवधारणानां प्रतिपादनम्। सः 'तात्कालिकगतिः' (tātkalika-gati, instantaneous velocity) इत्यस्य अवधारणां सिद्धान्तशिरोमण्याम् सुस्पष्टतया प्रतिपादितवान्।¹³ ग्रहगणिते सः प्रदर्शयति यत् ग्रहस्य उच्चस्थाने (apogee) अधःस्थाने (perigee) च गतिपरिवर्तनस्य दरः (rate of change of velocity) शून्यः भवति यत् आधुनिककलनगणिते 'the derivative at a maximum or minimum is zero' इति मूलभूतसिद्धान्तस्य सुस्पष्टं पूर्वरूपम् अस्ति।¹ भास्कराचार्यः $\sin(x)$ इत्यस्य अवकलनम् (differentiation) अपि अपरोक्षतया प्रतिपादितवान् $d(\sin x)/dx \approx \cos x$ इति तस्य गणनायाः परिणामः दर्शयति।¹³ तथा च सः अनन्तस्य (infinity) अवधारणां गणितीयरूपेण विवेचितवान् शून्येन भाजने अनन्तम् उत्पद्यते इति, तथा अनन्ते कस्यचित् संख्यायाः योगे अनन्तमेव तिष्ठति इति।¹⁴ एतानि सर्वाणि योगदानानि न्यूटन-लैब्रिज् (Newton-Leibniz) इत्येतयोः औपचारिककलनगणितविकासात् पञ्चशताब्दीभिः पूर्वम् अभवन्।

7. केरलीयगणितपरम्परा

केरलीयगणितपरम्परा (चतुर्दश-षोडशशताब्दी ख्रीष्टाब्दः) भारतीयगणितस्य सर्वाधिकम् उन्नतं सर्वाधिकं परिष्कृतं च अध्यायम् अस्ति, या विश्वगणितेतिहासे अत्यन्तं महत्त्वपूर्णा अद्वितीया च वर्तते। अस्याः परम्परायाः संस्थापकः आद्यप्रवर्तकश्च सङ्गमग्रामस्य माधवः (Mādhava of Saṅgamagrāma, अनुमानतः 1350-1425

ख्रीष्टाब्दः) अस्ति, यः अनन्तश्रेणीनां (infinite series) विकासे अभूतपूर्वम् अद्वितीयं च योगदानम् अकरोत्।⁷ माधवः π इत्यस्य अनन्तश्रेणीं प्रतिपादितवान् $\pi/4 = 1 - 1/3 + 1/5 - 1/7 + \dots$ इति, या यूरोपे 'लैब्रिज-श्रेणी' (Leibniz series) इति नाम्ना प्रसिद्धा अस्ति। किन्तु माधवः गॉटफ्रीड विल्हेल्म लैब्रिजतः (Leibniz, 1646-1716) लगभु त्रिशताब्दीभिः पूर्वम् एतां श्रेणीम् आविष्करोत् इति ऐतिहासिकतथ्यम्।¹⁶ अपरं माधवः π इत्यस्य तीव्रतरसंकोचनं (faster convergence) प्रदातुम् संशोधनपदानि (correction terms) अपि प्रतिपादितवान्, यानि मूलश्रेण्याः सूक्ष्मतां बहुगुणीकुर्वन्ति।²⁰

माधवः त्रिकोणमितीयफलनानाम् (trigonometric functions) अनन्तश्रेणीम् अपि प्रतिपादितवान्, याः विश्वगणितेतिहासे अत्यन्तं महत्त्वपूर्णाः सन्ति। $\sin(x) = x - x^3/3! + x^5/5! - x^7/7! + \dots$ तथा $\cos(x) = 1 - x^2/2! + x^4/4! - x^6/6! + \dots$ इत्येते श्रेणी यूरोपे 'न्यूटन-श्रेणी' (Newton series) अथवा 'टेलर-श्रेणी' (Taylor series) इति नाम्ना ज्ञायते।²⁰ किन्तु माधवस्य पूर्वकार्यं ऐतिहासिकप्रमाणैः सुस्थापितम् अस्ति नीलकण्ठसोमयाजिनः, ज्येष्ठदेवस्य इत्यादीनां ग्रन्थेषु माधवस्य एतत् कार्यं स्पष्टतया उद्धृतम्।⁷ नीलकण्ठसोमयाजिनः (1444-1544) तन्त्रसङ्ग्रहः अस्याः परम्परायाः अन्यः अत्यन्तं महत्त्वपूर्णः प्रभावशाली च ग्रन्थः अस्ति। अस्मिन् ग्रन्थे माधवस्य श्रेणीणां विस्तृतं विवेचनम् उपलभ्यते, तथा च ग्रहगतिस्मबन्धिनः अनेके नवीनसिद्धान्ताः प्रतिपादिताः।⁷ नीलकण्ठः ग्रहगतेः एकं नवीनं प्रतिरूपं (model) प्रतिपादितवान्, यत्र बुधः शुक्रश्च सूर्यं परिभ्रमतः, सूर्यश्च पृथिवीं परिभ्रमति। एतत् प्रतिरूपं टाइको ब्राहे (Tycho Brahe) इत्यस्य प्रतिरूपस्य सदृशम् अस्ति, किन्तु नीलकण्ठः ब्राहेतः शताब्द्या पूर्वम् आसीत्।²⁰

ज्येष्ठदेवस्य युक्तिभाषा (षोडशशताब्दी, अनुमानतः 1530 ख्रीष्टाब्दे) केरलीयपरम्परायाः सर्वाधिकम् उल्लेखनीयः ऐतिहासिकदृष्ट्या सर्वाधिकं महत्त्वपूर्णश्च ग्रन्थः अस्ति। अयं ग्रन्थः मलयालभाषायां (केरलस्य भाषा) रचितः, यत्र माधवस्य नीलकण्ठस्य च गणितसिद्धान्तानां विस्तृताः तर्कबद्धाः उपपत्तयः (mathematical proofs) प्रदत्ताः सन्ति।¹³ युक्तिभाषा प्रथमः ज्ञातः ग्रन्थः अस्ति यत्र कलनगणितस्य (calculus) आधारभूतसिद्धान्तानां व्यवस्थितं प्रमाणबद्धं च प्रतिपादनं प्राप्यते यथा अनन्तश्रेणीनां अभिसरणम् (convergence of infinite series), समाकलनम् (integration), अवकलनम् (differentiation), तथा अनन्तसूक्ष्मराशीनां (infinitesimals) अवधारणा इत्यादीनि।¹⁶ पी. पी. दिवाकरन् (P. P. Divakaran) इत्यनेन केरलीयगणितपरम्परायाः सम्पूर्णं पुनर्मूल्याङ्कनं कृतम्, यत्र तस्याः विश्वगणिते स्थानं सुस्पष्टीकृतम्।¹³

केरलीयगणितपरम्परायाः आविष्काराणां यूरोपीयगणितज्ञानां समानान्तरआविष्काराणां तुलनार्थम् अधः सारणी प्रस्तूयते। एषा सारणी दर्शयति यत् केरलीयगणितज्ञाः अनेकेषु क्षेत्रेषु यूरोपीयगणितज्ञेभ्यः शताब्दीभिः पूर्वम् एव महत्त्वपूर्णान् आविष्कारान् कृतवन्तः।

सारणी १: केरलीयगणितपरम्परायाः प्रमुखआविष्काराणां यूरोपीयसमानान्तराणां च कालानुक्रमिकतुलना

आविष्कारः	केरलीयगणितज्ञः	कालः (केरल)	यूरोपीयगणितज्ञः / कालः
π इत्यस्य अनन्तश्रेणी	माधवः	c. 1400	Leibniz, 1676
$\sin/\cos$ इत्यस्य अनन्तश्रेणी	माधवः	c. 1400	Newton/Taylor, c. 1670-1715
π इत्यस्य तीव्रतरसंकोचनश्रेणी	माधवः	c. 1400	Euler, 18th century
कलनगणितस्य मूलतत्त्वानि	ज्येष्ठदेवः (युक्तिभाषा)	c. 1530	Newton/Leibniz, c. 1680
अनन्तश्रेणीसंशोधनपदानि	माधवः / नीलकण्ठः	c. 1400-1500	Euler, 18th century
ग्रहगतेः सूर्यकेन्द्रसूचनाः	नीलकण्ठः (तन्त्रसङ्ग्रहः)	c. 1500	Copernicus, 1543; Tycho, 1588
$\arctan$ इत्यस्य अनन्तश्रेणी	माधवः	c. 1400	Gregory, 1671

अतः केचन विद्वांसः सप्रमाणं प्रतिपादयन्ति यत् कलनगणितस्य वास्तविकः प्रारम्भिकः आविष्कारः केरले अभवत्, न तु यूरोपे।¹⁶ सी. के. राजू (C. K. Raju) इत्यनेन तु प्रतिपादितं यत् केरलीयकलनगणितं जेसुइट्-मिशनरीणां माध्यमेन 16-शताब्द्यां प्रत्यक्षतया यूरोपं प्रापितम्, यत्र न्यूटन्-लैब्रिज् इत्येतौ तस्य आधारेण स्वकीयं कार्यम् अकुर्वताम्। तथापि अस्य प्रत्यक्षसंचरणस्य निर्णायकं प्रमाणम् अद्यापि अनुपलब्धम् अस्ति, अतः बहवः विद्वांसः स्वतन्त्रआविष्कारसिद्धान्तम् (independent discovery theory) स्वीकुर्वन्ति।¹⁶ यत्किमपि भवतु, केरलीयपरम्परायाः गणितीयसामर्थ्यं निर्विवादम् अस्ति, तस्याः विश्वगणितेतिहासे स्थानं सर्वैः स्वीकृतम्।

8. गणितस्य सूत्ररूपम्

भारतीयगणितपरम्परायाः एकं सर्वाधिकं विशिष्टं अन्यत्र अनुपलभ्यमानं च वैशिष्ट्यम् अस्ति गणितसूत्राणां पद्यरूपेण छन्दोबद्धतया रचना। प्राचीनभारते ज्ञानस्य संरक्षणं मुख्यतया मौखिकपरम्पराया (oral tradition) क्रियते स्म, यतः लेखनसामग्रीणां (writing materials) दुर्लभता आसीत्, तथा च श्रुतिस्मृतिपरम्परायां मौखिकसंप्रेषणस्य

महत्त्वम् अधिकम् आसीत्।¹⁴ अतः गणितसूत्राणां श्लोकरूपेण छन्दोबद्धा रचना अत्यन्तम् आवश्यकी व्यावहारिकी च आसीत्। आर्याच्छन्दः, अनुष्टुप्छन्दः, वसन्ततिलकाच्छन्दः इत्यादिषु विविधेषु छन्दःसु रचितानि सूत्राणि सुगमतया कण्ठस्थीकरणयोग्यानि भवन्ति, गुरुशिष्यपरम्परया अविच्छिन्नतया प्रसरन्ति च। अस्याः पद्धतेः कारणेन सहस्रवर्षाणि यावत् गणितज्ञानं लिखितग्रन्थान् विना अपि जीवितम् अक्षुण्णम् अतिष्ठत्।¹⁴ किन्तु पद्यरूपस्य एकः सन्निहितः दोषः अपि स्वीकर्तव्यः छन्दसः आवश्यकतया सूत्राणि अतिसंक्षिप्तानि भवन्ति, अतः भाष्यं (commentary) विना तेषां पूर्णं बोधनं कठिनं दुष्करं च भवति। अस्य कारणेन प्रत्येकं प्रमुखगणितग्रन्थे भाष्यपरम्परा अपि विकसिता यथा भास्करप्रथमस्य आर्यभटीयभाष्यम्, सूर्यदेवस्य भाष्यम् इत्यादि।⁵

संस्कृतगणितग्रन्थेषु संख्यानां पद्येषु समावेशार्थं द्वे विशिष्टे सांकेतिकपद्धती प्रयुक्ते। प्रथमा भूतसङ्ख्यापद्धतिः (bhūtasāṅkhyā system), यस्यां परिचितशब्दाः संख्यानां स्थाने प्रयुज्यन्ते यथा 'शशि/चन्द्र/इन्दु' = 1 (एकः चन्द्रः), 'नेत्र/अक्षि/बाहु' = 2 (द्वे नेत्रे), 'अग्नि/लोक/गुण' = 3 (त्रयः अग्नयः), 'वेद/समुद्र/युग' = 4 (चत्वारः वेदाः), 'बाण/इन्द्रिय/भूत' = 5 (पञ्च बाणाः), 'रस/ऋतु' = 6, 'अश्व/स्वर/ऋषि' = 7 इत्यादि।⁸ एषा पद्धतिः छन्दसः आवश्यकतानुसारं संख्यानां पर्यायशब्दान् प्रयोक्तुं सौविध्यं ददाति।

द्वितीया कटपयादिपद्धतिः (Kāṭapayādi system), यस्यां व्यञ्जनाक्षराणि अङ्कानां स्थाने सुव्यवस्थितरूपेण प्रयुज्यन्ते।⁸ अस्यां पद्धत्यां क=1, ख=2, ग=3, ... ज्ञ=0; ट=1, ठ=2, ... न=0; प=1, फ=2, ... म=5; य=1, र=2, ल=3, व=4, श=5, ष=6, स=7, ह=8 इत्यादि नियमाः सन्ति (विभिन्नाः पाठभेदाः अपि उपलभ्यन्ते)। केरलीयपरम्परायाम् एषा पद्धतिः विशेषतया व्यापकतया प्रचलिता आसीत्।⁸ माधवस्य π इत्यस्य अत्यन्तं सूक्ष्मं मूल्यं 'विबुधनेत्रगजाहिहताशनत्रिगुणवेदभवारणबाहवः। नवनिखर्वमिते वृत्तिविस्तरे परिधिमानमिदं जगदुर्बुधाः॥' इति श्लोकेन कटपयादिपद्धत्या सङ्केतितम् अस्ति।⁸ अस्य श्लोकस्य कटपयादिविश्लेषणेन $\pi = 2827433388233/9 \times 10^{11} = 3.14159265358979...$ इत्येतत् 11 दशांशस्थानपर्यन्तं सूक्ष्मं मूल्यं प्राप्यते। एवं सांकेतिकपद्धतयः गणितस्य काव्यस्य च अद्भुतं सुन्दरं च सम्मेलनं कुर्वन्ति, यत् भारतीयगणितपरम्परायाः विशिष्टं सांस्कृतिकं वैशिष्ट्यम् अस्ति।

9. ज्योतिषशास्त्रे गणितस्य उपयोगः

भारतीयज्ञानपरम्परायां गणितं ज्योतिषशास्त्रं च परस्परम् अन्योन्याश्रिते विद्ये आस्ताम्, ययोः विकासः सह एव अभवत्। प्रायः सर्वे प्रमुखभारतीयगणितज्ञाः ज्योतिषशास्त्रज्ञाः अपि आसन्, तेषां ग्रन्थाः 'सिद्धान्तः' इति नाम्ना ज्ञायन्ते, यत्र गणितं ज्योतिषं च अविभक्ततया सह प्रतिपाद्यते।¹ सूर्यसिद्धान्तः (अनुमानतः चतुर्थ-पञ्चमशताब्दी ख्रीष्टाब्दः, परवर्तिपरिष्कारैः सह) भारतीयज्योतिषसिद्धान्तपरम्परायाः सर्वाधिकं प्रभावशाली उपलब्धग्रन्थः अस्ति, यत्र त्रिकोणमितीयसूत्राणि, ग्रहगतिसमीकरणानि, ग्रहणगणनाविधयः, तथा च खगोलीयस्थिराङ्काश्च विस्तरेण प्रतिपादिताः।¹¹ वराहमिहिरस्य पञ्चसिद्धान्तिका पञ्चानां प्राचीनसिद्धान्तानां सारसङ्ग्रहः अस्ति, या भारतीयज्योतिषपरम्परायाः विकासं सुस्पष्टतया दर्शयति।

गोलीयत्रिकोणमितिः (spherical trigonometry) भारतीयज्योतिषगणितस्य अत्यन्तं महत्त्वपूर्णः केन्द्रीयश्च अंशः अस्ति। खगोलीयपिण्डानां (celestial bodies) स्थितिनिर्धारणार्थं, सूर्योदयसूर्यास्तमयकालगणनार्थम्, नक्षत्राणां उदयास्तमयनिर्धारणार्थम्, दक्षिणोत्तरांशयोः (latitude-longitude) परिशुद्धगणनार्थं च गोलीयत्रिकोणमितिः विशेषज्ञानस्य प्रयोगः अनिवार्यः आसीत्।¹ आर्यभटः ज्यासारणीम् (sine table) प्रस्तुत्य अस्य क्षेत्रस्य सुदृढम् आधारम् अस्थापयत्। ततः परं वराहमिहिरः, ब्रह्मगुप्तः, भास्कराचार्यश्च ज्यासारण्याः विस्तारं परिष्कारं च अकुर्वन्, कोज्या (cosine), उत्क्रमज्या (versed sine) इत्यादीनां फलनानां सारण्यः अपि निर्मितवन्तः।⁹ ग्रहणगणना (eclipse calculation) भारतीयज्योतिषगणितस्य एका अत्यन्तं प्रमुखा व्यावहारिकदृष्ट्या अत्यन्तं महत्त्वपूर्णा च उपलब्धिः आसीत्। आर्यभटः ग्रहणस्य वैज्ञानिकं कारणं पृथिव्याः छायाया चन्द्रग्रहणम्, चन्द्रस्य सूर्यस्य पुरतः आगमनेन सूर्यग्रहणं च सुस्पष्टतया प्रतिपादितवान्।³

पञ्चाङ्गगणना (calendar computation, pañcāṅga) भारतीयसमाजे गणितस्य सर्वाधिकं व्यापकः प्रत्यक्षः व्यावहारिकः च प्रयोगः आसीत्। पञ्चाङ्गे पञ्च अङ्गानि सन्ति तिथिः (lunar day), वारः (weekday), नक्षत्रम् (lunar mansion), योगः (sun-moon angular relationship), करणम् (half-tithi) च। एतेषां पञ्चानाम् अङ्गानां प्रतिदिनं परिशुद्धा गणना उन्नतगणितसूत्राणां ज्ञानम् अपेक्षते।¹¹ प्रतिदिनं सूर्यचन्द्रयोः सर्वेषां ग्रहाणां च स्थितिगणना करणीया, तिथ्यादीनां निर्णयः कर्तव्यः, उत्सवमुहूर्तादीनां निर्धारणं कर्तव्यम्, विवाहादिशुभकार्याणां मुहूर्तनिर्णयः कर्तव्यः एतत् सर्वं गणितमूलकम् आसीत्। एवं ज्योतिषशास्त्रस्य सामाजिकधार्मिकआवश्यकता भारते

गणितविद्यायाः निरन्तरं प्रगतिशीलं विकासम् अप्रेरयत् अपोषयत् च। सिद्धान्तपरम्परायाः ग्रन्थाः केवलं ज्योतिषग्रन्थाः नासन्, अपितु गणितशास्त्रस्य सम्पूर्णकोशग्रन्थाः (encyclopedias of mathematics) अपि आसन्, येषु अनेकविधानि विविधानि गणितसूत्राणि सुव्यवस्थिततया संगृहीतानि।¹

ज्योतिषशास्त्रे गणितस्य उपयोगस्य अन्यत् महत्त्वपूर्णम् उदाहरणम् अस्ति ग्रहमध्यमस्थितिगणना (mean planetary position calculation) तथा ग्रहस्पष्टस्थितिगणना (true planetary position calculation)। भारतीयज्योतिषगणितज्ञाः ग्रहाणां मध्यमगतिं (mean motion) ज्ञात्वा मन्दफलम् (equation of center) शीघ्रफलं (equation of conjunction) च योजयित्वा ग्रहस्य वास्तविकस्थितिं गणयन्ति स्म।¹¹ अस्मिन् कार्ये त्रिकोणमितीयसूत्राणां ज्यासारण्याश्च प्रयोगः अनिवार्यः आसीत्। आर्यभटः 'मन्दसमीकरणम्' (manda equation) प्रतिपादितवान्, यत्र epicyclic model इत्यस्य प्रयोगेण ग्रहस्य अनियमितगतिः (anomalous motion) गणिता भवति। ब्रह्मगुप्तः भास्कराचार्यश्च एतेषां गणनाविधीनां परिष्कारं विस्तारं च कृतवन्तौ, येन ग्रहणकालस्य पूर्वानुमानं अत्यन्तं सूक्ष्मतया कर्तुं शक्यम् अभवत्।³ एवं ज्योतिषगणितं भारतीयगणितस्य सर्वाधिकं व्यापकः सर्वाधिकं दीर्घकालीनश्च अनुप्रयोगः (application) आसीत्।

भारतीयज्योतिषगणिते महावीराचार्यस्य (नवमशताब्दी ख्रीष्टाब्देः) योगदानम् अपि स्मरणीयम्। तस्य 'गणितसारसङ्ग्रहः' इति ग्रन्थः भारतीयगणितस्य सर्वाधिकं व्यवस्थितः पाठ्यग्रन्थसदृशः ग्रन्थः अस्ति, यत्र अङ्कगणितम्, ज्यामितिः, बीजगणितम् इत्यादीनि विषयाणि क्रमबद्धतया प्रतिपादितानि।¹¹ महावीरः जैनगणितपरम्परायाः प्रमुखः प्रतिनिधिः आसीत्। सः संचयगणितस्य (combinatorics) अनेकानि सूत्राणि प्रतिपादितवान्, तथा च ऋणसंख्यानां वर्गमूलस्य असम्भवंत्वं (non-existence of square root of negative numbers) प्रथमवारं स्पष्टतया प्रतिपादितवान्।² श्रीधराचार्यः (दशमशताब्दी) अपि पाटीगणिते (arithmetic) महत्त्वपूर्णं योगदानम् अकरोत् तस्य 'पाटीगणितम्' इति ग्रन्थे द्विघातसमीकरणानां (quadratic equations) सामान्यसमाधानसूत्रम् (general solution formula, quadratic formula) सुस्पष्टतया प्रतिपादितम् अस्ति।¹ एवं आर्यभट-ब्रह्मगुप्त-भास्कराचार्यातिरिक्तम् अपि अनेके गणितज्ञाः भारतीयगणितपरम्परायां महत्त्वपूर्णं योगदानम् अकुर्वन्।

10. विश्वगणिते भारतीययोगदानस्य प्रभावः

भारतीयगणितस्य विश्वगणिते सुदूरप्रसारी प्रभावः मुख्यतया अरबविद्वद्भिः अरबव्यापारिणां च माध्यमेन सञ्जातः। अष्टमशताब्द्यां ख्रीष्टाब्दे बगदादनगरे अब्बासीयखलीफायाः शासनकाले 'बैत-अल्-हिक्मा' (House of Wisdom) इति विद्याकेन्द्रे भारतीयग्रन्थानां ग्रीकग्रन्थानां च अरबभाषायाम् अनुवादः व्यवस्थितरूपेण आरब्धः।¹⁹ 771 ख्रीष्टाब्दे एकः भारतीयविद्वान् बगदादं गतवान्, तेन सह ब्राह्मस्फुटसिद्धान्तस्य प्रतिलिपिः आसीत्, या अरबभाषायाम् 'सिन्धिन्द्' इति नाम्ना अनूदिता। अल्-ख्वारिज्मी (Muhammad ibn Mūsā al-Khwārizmī, c. 780-850) भारतीयसंख्यापद्धतिं गणितविधींश्च अरबजगति सविस्तरं प्रचारितवान्।⁶ तस्य 'Kitāb al-Hisāb al-Hind' इति ग्रन्थः भारतीयदशमानपद्धतिम् अरबविश्वाय परिचितां कृतवान्, ततः 'algorithm' इति शब्दः अल्-ख्वारिज्मीनामतः उद्भूतः, तथा 'algebra' इति शब्दः तस्य अन्यस्य ग्रन्थस्य 'अल्-जब्र' इति नामतः उद्भूतः।

अल्-बीरूनी (Abū Rayhān al-Bīrūnī, 973-1048) मध्यकालस्य सर्वाधिकं विद्वान् बहुभाषाविद् (polymath) आसीत्, यः भारतम् आगत्य संस्कृतं शिक्षित्वा स्वकीये 'Kitāb al-Hind' (तारीख-अल्-हिन्द) इति विशालग्रन्थे भारतीयगणितस्य ज्योतिषशास्त्रस्य दर्शनस्य च विस्तृतं विवेचनम् अकरोत्।¹⁰ अल्-बीरूनी भारतीयगणितस्य सूक्ष्मतां प्रशंसितवान्, तथा च भारतीयगणितज्ञानां ऋणसंख्यापद्धतेः शून्यविद्यायाः च महत्त्वं प्रतिपादितवान्।¹⁹ भारतीयगणितस्य अरबजगति प्रभावः अत्यन्तं गहनः व्यापकश्च आसीत् अरबगणितज्ञाः भारतीयपद्धतीः स्वीकृत्य तासां विस्तारं परिष्कारं च अकुर्वन्।

भारतीयसंख्यापद्धतिः अरबदेशात् यूरोपं प्राप्य तत्र गणितस्य सम्पूर्णं कायाकल्पम् (revolution) अकरोत्। इटलीदेशीयः लियोनार्दो फिबोनाच्ची (Leonardo Fibonacci, c. 1170-1250) उत्तरआफ्रिकायां व्यापारार्थं गतवान्, तत्र अरबविद्वद्भिः भारतीय-अरबसंख्यापद्धतिम् अधीतवान्, ततः स्वग्रन्थे Liber Abaci (1202 ख्रीष्टाब्दे) एतां पद्धतिं यूरोपदेशे प्रथमतया व्यवस्थितरूपेण प्रचारितवान्।⁶ तत्पूर्वं यूरोपे रोमन-संख्यापद्धतिः (Roman numerals: I, V, X, L, C, D, M) प्रचलिता आसीत्, या गणनार्थम् गुणनार्थम् भाजनार्थं च अत्यन्तं कठिना दुष्करा च आसीत्। भारतीयपद्धत्याः स्वीकारेण गणना अत्यन्तं सरला सुगमा च सम्पन्ना, यद् वाणिज्ये वैज्ञानिकगवेषणे लेखाविद्यायां च महान् क्रान्तिकारी परिवर्तनम् आनयत्।¹⁷ 'Hindu-Arabic numerals' इति अद्यापि प्रचलितं

नामकरणम् भारतीयमूलस्य अरबमाध्यमस्य च उभयोः ऐतिहासिकयोगदानस्य स्वीकृतिं दर्शयति। अद्य विश्वस्य प्रत्येकं देशे प्रत्येकं भाषायां च एषा संख्यापद्धतिः प्रयुज्यते, या मूलतः भारतीयमानसस्य सृजनशीलतायाः फलम् अस्ति।

आधुनिककाले भारतीयगणितस्य ऐतिहासिकयोगदानस्य मान्यता सम्मानश्च क्रमशः निरन्तरं वर्धमानौ स्तः। किम् प्लोफ्कर (Kim Plofker) स्वग्रन्थे 'Mathematics in India' इत्यस्मिन् भारतीयगणितस्य सम्पूर्णम् इतिहासं सुव्यवस्थितरूपेण प्रतिपादितवती।¹ जॉर्ज घेवर्घेस जोसेफ (George Gheverghese Joseph) स्वग्रन्थे 'The Crest of the Peacock' इत्यस्मिन् गणितस्य यूरोपकेन्द्रितइतिहासलेखनस्य समीक्षां कृत्वा भारतस्य चीनस्य अन्येषां सभ्यतानां च योगदानं प्रकाशितवान्।⁶ पी. पी. दिवाकरन् (P. P. Divakaran) इत्यनेन भारतीयगणितस्य अवधारणानां विधीनां सम्बन्धानां च गहनं विश्लेषणं कृतम्।¹³ विशेषतः केरलीयपरम्परायाः कलनगणितसम्बन्धिनः आविष्काराः न्यूटन-लैब्रिज-पूर्वकार्यरूपेण विश्वस्य गणितेतिहासकारैः मान्यतां प्राप्नुवन्ति।¹⁶ तथापि भारतीयगणितस्य स्वतन्त्रः मौलिकः बहुमुखश्च विकासः सम्पूर्णतया निर्विवादः अस्ति, तथा च तस्य विश्वगणिते प्रत्यक्षः परोक्षश्च सुदूरप्रसारी प्रभावः आधुनिकविद्वद्भिः सर्वत्र सुस्पष्टतया स्वीकृतः अस्ति।

भारतीयगणितस्य विश्वप्रभावस्य एकं विशेषम् आयामं (dimension) अस्ति गणितशब्दावल्यां (mathematical terminology) भारतीयप्रभावः। 'sine' (jyā → jība → sinus) इत्यस्य अतिरिक्तम्, 'zero' (śūnya → şifr → zephirum → zero), 'cipher' (śūnya → şifr → cipher), 'algorithm' (al-Khwārizmī, यः भारतीयपद्धतिं प्रचारितवान्) इत्यादयः शब्दाः प्रत्यक्षतया परोक्षतया वा भारतीयगणितपरम्परायां मूलं धारयन्ति।¹⁷ अपरं भारतीयसंख्याचिह्नानि (numeral symbols) 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 यद्यपि कालक्रमेण रूपान्तरं प्राप्तवन्ति, मूलतः ब्राह्मीलिपेः संख्याचिह्नेभ्यः विकसितानि।¹⁷ एवं भारतीयगणितस्य प्रभावः केवलं सैद्धान्तिकक्षेत्रे न, अपितु गणितस्य भाषायां संकेतपद्धत्यां दैनन्दिनव्यवहारे च सर्वव्यापी अस्ति। अद्य विश्वस्य सर्वे वैज्ञानिकाः, अभियन्तारः, वणिजः, छात्राश्च प्रतिदिनं भारतीयमूलकसंख्यापद्धतिं प्रयुज्जते, यद्यपि बहवः अस्याः पद्धतेः भारतीयमूलं न जानन्ति।⁶ भारतीयगणितस्य एतत् सार्वभौमिकं योगदानं मानवसभ्यतायाः इतिहासे सर्वाधिकं प्रभावशालिषु बौद्धिकयोगदानेषु अन्यतमम् अस्ति इति निर्विवादम्।

11. उपसंहारः

संस्कृतवाङ्मये गणितशास्त्रस्य योगदानं अत्यन्तं विशालं गभीरं बहुआयामी च अस्ति। वैदिककालस्य शुल्बसूत्रेभ्यः आरभ्य मध्यकालस्य केरलीयगणितपरम्परापर्यन्तं सहस्रद्वयाधिककालं यावत् भारतीयगणितज्ञाः संस्कृतभाषायां पद्यरूपेण गणितज्ञानस्य अमूल्यं अतुलनीयं च भण्डारम् अरचयन्। शुल्बसूत्राणि ज्यामितेः आधारम् अस्थापयन्, बौधायनस्य प्रमेयः कर्णसम्बन्धं प्रथमतया दर्शितवान्, शून्यस्य आविष्कारः संख्यापद्धत्याः क्रान्तिकारी परिवर्तनम् आनयत्, दशमानस्थानकपद्धतिः गणनां सरलां सुगमां च कृतवती।^{1,6} आर्यभटः त्रिकोणमितेः कुट्टकविधेश्च माध्यमेन गणितज्योतिषयोः सम्बन्धम् अगाधीकरोत्, ब्रह्मगुप्तः शून्यऋणसंख्यागणितं चक्रीयचतुर्भुजसूत्रं च प्रतिपाद्य गणितं समृद्धीकरोत्, भास्कराचार्यः कलनगणितस्य बीजानि वपन् गणितं काव्येन सह मिश्रयित्वा गणितशिक्षणस्य नवीनं प्रतिमानम् अस्थापयत्।^{2,4} केरलीयपरम्परा अनन्तश्रेणीनां कलनगणितस्य च क्षेत्रे विश्वगणिते अग्रणी योगदानम् अकरोत्।¹⁶ एतानि सर्वाणि योगदानानि विश्वगणितस्य सम्पूर्णं विकासे आधारशिलारूपाणि दीपस्तम्भरूपाणि च अभवन्। भारतीयगणितं केवलं भारतस्य गौरवम् एव नास्ति, अपितु सम्पूर्णमानवसभ्यतायाः साझी बौद्धिकसम्पत्तिः विरासतिश्च अस्ति।

संस्कृतभाषा गणितज्ञानस्य वाहिकारूपेण संरक्षिकारूपेण च अद्वितीयां अनन्यसाधारणां भूमिकां निरवहत्। छन्दोबद्धसूत्राणि, भूतसङ्ख्यापद्धतिः, कटपयादिसंकेतपद्धतिश्च गणितस्य भाषायाश्च अद्भुतं सुन्दरं सर्जनात्मकं च सम्मेलनं प्रदर्शयन्ति यत् विश्वस्य अन्यासु गणितपरम्परासु विरलम् एव दृश्यते।¹⁴ अद्यापि संस्कृतगणितग्रन्थेषु अनेकानि सूत्राणि अनन्वेषितानि अनुद्घाटितानि च तिष्ठन्ति, अनेकानि भाष्याणि आधुनिकभाषासु अनूदितानि न सन्ति, अनेकाः मूल्यवत्यः पाण्डुलिप्यः अप्रकाशिताः ग्रन्थालयेषु वर्तन्ते।¹³ एतेषां ग्रन्थानां सम्यक् वैज्ञानिकम् अध्ययनं व्यवस्थितं संरक्षणं सुलभं प्रकाशनं च अत्यन्तम् आवश्यकम् अत्यावश्यकं च अस्ति, येन भारतीयगणितपरम्परायाः सम्पूर्णं वास्तविकं स्वरूपं विश्वसमक्षम् आगच्छेत्। संस्कृतगणितपरम्परायाः गहनम् अध्ययनम् न केवलं गणितेतिहासस्य दृष्ट्या, अपितु गणितशिक्षायाः गणितदर्शनस्य विज्ञानेतिहासस्य च दृष्ट्या अत्यन्तं लाभदायकं ज्ञानवर्धकं प्रेरणादायकं च भवेत्। यतः अस्याः परम्परायाः सम्यक् अध्ययनेन गणितस्य मानवसभ्यतायां केन्द्रीयभूमिकायाः विषये गभीरतरं ज्ञानं सम्भवति, गणितस्य सांस्कृतिकसन्दर्भस्य बोधः वर्धते, तथा च ज्ञानस्य सार्वभौमिकस्वरूपस्य अवबोधः सुदृढः भवति।

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भारतीय लोकसंगीत का डिजिटल संरक्षण: चुनौतियाँ और संभावनाएँ

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सारांश

यह शोध-पत्र भारतीय लोकसंगीत के डिजिटल संरक्षण से जुड़ी समकालीन चुनौतियों और संभावनाओं का विश्लेषण प्रस्तुत करता है। भारत के पास क्षेत्रीय भाषाओं, समुदायों और अनुष्ठानिक संदर्भों में निहित अत्यंत समृद्ध और विविध लोकसंगीत परंपरा है, किंतु वैश्वीकरण, शहरी पलायन और व्यावसायिक लोकप्रिय संगीत के प्रभुत्व के दबाव में इनमें से अनेक परंपराएँ तेजी से विलुप्त हो रही हैं। डिजिटल प्रौद्योगिकी दस्तावेजीकरण, पहुँच और पुनरुद्धार के सशक्त उपकरण प्रदान करती है, परंतु यह प्रामाणिकता, सांस्कृतिक संदर्भ, बौद्धिक संपदा और प्रस्तुतकर्ता समुदायों के अधिकारों से जुड़े गंभीर प्रश्न भी उठाती है। नृवंशसंगीतशास्त्र, अभिलेखागार सिद्धांत और यूनेस्को की अमूर्त सांस्कृतिक धरोहर की अवधारणा के आधार पर यह अध्ययन भारतीय लोकसंगीत की विविधता, उसके हास के कारण, वर्तमान संरक्षण प्रयास, तथा डिजिटल संग्रहण के अवसरों और खतरों का मूल्यांकन करता है, और एक समुदाय-केंद्रित नैतिक ढाँचा प्रस्तावित करता है।

Abstract

This research paper analyses the contemporary challenges and possibilities of the digital preservation of Indian folk music. India possesses an extraordinarily rich and diverse tradition of folk music rooted in regional languages, communities, and ritual contexts, yet under the pressures of globalization, urban migration, and the dominance of commercial popular music, many of these traditions are rapidly disappearing. Digital technology offers powerful tools for documentation, access, and revival, but it also raises serious questions of authenticity, cultural context, intellectual property, and the rights of performing communities. Applying frameworks from ethnomusicology, archival theory, and the UNESCO concept of intangible cultural heritage, the study surveys the diversity of Indian folk music, the causes of its decline, existing preservation efforts, and the opportunities and dangers of digital archiving. It proposes a methodological framework and argues that a community centred, ethically grounded, and multidisciplinary approach is essential if digital preservation is to serve the living traditions it seeks to protect rather than to freeze them into lifeless artefacts.

Keywords: - लोकसंगीत, डिजिटल संरक्षण, अमूर्त सांस्कृतिक धरोहर, नृवंशसंगीतशास्त्र, सांस्कृतिक संवेदनशीलता, बौद्धिक संपदा

1. प्रस्तावना

भारत की सांस्कृतिक विरासत का एक अनमोल अंग उसकी विविध और जीवंत लोकसंगीत परंपराएँ हैं। बंगाल के बाउल गीतों से लेकर राजस्थान के मांड और मांगणियार संगीत तक, असम के बिहू से लेकर महाराष्ट्र की लावणी तक, और छत्तीसगढ़ के पंडवानी से लेकर हिमालयी क्षेत्रों के लोकगीतों तक, यह परंपरा भारत की भाषायी और सांस्कृतिक विविधता का दर्पण है।¹⁰

लोकसंगीत केवल मनोरंजन का साधन नहीं है, बल्कि यह सामूहिक स्मृति, अनुष्ठान, श्रम, ऋतुचक्र और सामाजिक पहचान से गहराई से जुड़ा हुआ है। यह मौखिक परंपरा का एक रूप है जो पीढ़ी-दर-पीढ़ी गुरु-शिष्य परंपरा और सामुदायिक प्रस्तुति के माध्यम से हस्तांतरित होती है।^{1,3}

किंतु आधुनिकीकरण, शहरीकरण और व्यावसायिक लोकप्रिय संगीत के बढ़ते प्रभुत्व के कारण ये परंपराएँ गंभीर संकट में हैं। ऐसी स्थिति में डिजिटल प्रौद्योगिकी संरक्षण का एक नया मार्ग प्रस्तुत करती है। यह शोध-पत्र भारतीय लोकसंगीत के डिजिटल संरक्षण की संभावनाओं और चुनौतियों का व्यवस्थित विश्लेषण प्रस्तुत करता है तथा एक नैतिक संरक्षण ढाँचे का प्रस्ताव करता है।

2. सैद्धांतिक आधार

इस अध्ययन का सैद्धांतिक आधार तीन क्षेत्रों से लिया गया है। पहला, नृवंशसंगीतशास्त्र (Ethnomusicology), जो संगीत को उसके सांस्कृतिक और सामाजिक संदर्भ में समझने पर बल देता है। ब्रूनो नेटल और चार्ल्स सीगर जैसे विद्वानों ने यह स्थापित किया कि संगीत को उसके परिवेश से अलग करके पूर्ण रूप से नहीं समझा जा सकता। संगीत एक सांस्कृतिक क्रिया है, केवल ध्वनियों का संग्रह नहीं।^{1,3}

दूसरा आधार यूनेस्को की अमूर्त सांस्कृतिक धरोहर (Intangible Cultural Heritage) की अवधारणा है। 2003 के कन्वेंशन के अनुसार, संगीत और उससे जुड़ी प्रस्तुति परंपराएँ अमूर्त सांस्कृतिक धरोहर का प्रमुख घटक हैं, जिनका संरक्षण केवल रिकॉर्डिंग नहीं बल्कि उन्हें जीवित रखना और समुदाय की सक्रिय भागीदारी सुनिश्चित करना है।²

तीसरा आधार अभिलेखागार सिद्धांत (Archival Theory) है, जो प्रामाणिकता, मेटाडेटा, अंतर-संचालनीयता और दीर्घकालिक पहुँच के सिद्धांतों को रेखांकित करता है। ये तीनों दृष्टिकोण मिलकर लोकसंगीत के डिजिटल संरक्षण के लिए एक समग्र वैचारिक ढाँचा प्रदान करते हैं।^{4,7}

3. भारतीय लोकसंगीत की विविधता

भारत में लोकसंगीत की परंपरा अत्यंत विशाल और बहुस्तरीय है। प्रत्येक क्षेत्र, समुदाय और ऋतु के अपने गीत हैं। उत्तर भारत में बिरहा, आल्हा, कजरी और चैती जैसी परंपराएँ प्रचलित हैं। राजस्थान में मांगणियार और लंगा समुदायों का संगीत विश्वप्रसिद्ध है। पंजाब में टप्पा और बोलियाँ, गुजरात में गरबा और भवाई की समृद्ध परंपरा है।¹⁰

पूर्वी भारत में बंगाल के बाउल फकीरों का रहस्यवादी संगीत और असम के बिहू गीत विशेष महत्व रखते हैं। दक्षिण भारत में विल्लुपाट्टु, सोपान संगीत और अनेक अनुष्ठानिक परंपराएँ हैं। मध्य भारत और आदिवासी क्षेत्रों में संथाली, गोंडी और भीली समुदायों का संगीत प्रकृति, श्रम और सामूहिक जीवन से जुड़ा हुआ है।^{8,10}

इस विविधता की एक प्रमुख विशेषता यह है कि अधिकांश परंपराओं में संगीत मौखिक रूप से हस्तांतरित होता है, जिसके लिए कोई मानक लिखित स्वरलिपि नहीं होती। यह मौखिकता ही इस परंपरा की जीवंतता का स्रोत है और साथ ही उसके संरक्षण की सबसे बड़ी चुनौती भी।¹

4. लोकसंगीत का सामाजिक-सांस्कृतिक महत्व

लोकसंगीत समुदाय के जीवन के साथ अभिन्न रूप से जुड़ा होता है। विवाह, जन्म, फसल कटाई, ऋतु परिवर्तन और धार्मिक अनुष्ठान सभी अवसरों के अपने विशिष्ट गीत होते हैं। ये गीत समुदाय की सामूहिक स्मृति, इतिहास और मूल्यों को संजोते हैं। श्रम गीत कार्य को सुगम बनाते हैं और सामूहिकता की भावना को मजबूत करते हैं।³

लोकसंगीत सामाजिक पहचान का भी प्रतीक है। एक विशिष्ट गीत शैली या वाद्य किसी समुदाय या क्षेत्र की पहचान बन जाता है। इस प्रकार लोकसंगीत केवल कला नहीं, बल्कि सांस्कृतिक पहचान, सामाजिक संगठन और सामूहिक ज्ञान का वाहक है। इसका हास केवल एक कला रूप का नहीं, बल्कि एक संपूर्ण जीवन-दृष्टि का हास है।³

5. विलुप्ति के कारण

वर्तमान में लोकसंगीत परंपरा कई कारणों से संकटग्रस्त है। सबसे प्रमुख कारण वृद्ध कलाकारों का निधन है, क्योंकि मौखिक परंपरा के वाहक मुख्यतः वृद्ध कलाकार होते हैं और उनके साथ अमूल्य ज्ञान भी समाप्त हो जाता है। युवा पीढ़ी का शहरों की ओर पलायन और पारंपरिक व्यवसायों का त्याग इस संकट को और गहरा करता है।²

व्यावसायिक लोकप्रिय संगीत और मीडिया का प्रभुत्व पारंपरिक प्रस्तुति के अवसरों और श्रोताओं को कम कर रहा है। कई कलाकार लोकसंगीत को आर्थिक रूप से अव्यवहार्य मानकर इसे त्याग रहे हैं। साथ ही, सांस्कृतिक आत्म-सम्मान की कमी के कारण कुछ समुदाय अपनी परंपरा को पिछड़ेपन का प्रतीक मानने लगे हैं, जिससे हस्तांतरण की श्रृंखला टूट रही है।

6. वर्तमान संरक्षण प्रयास

भारत में लोकसंगीत के संरक्षण के प्रयास औपनिवेशिक काल से ही होते रहे हैं। स्वतंत्रता के बाद संगीत नाटक अकादमी, अनेक राज्य लोक कला अकादमियाँ, और ऑल इंडिया रेडियो के अभिलेखागार ने महत्वपूर्ण रिकॉर्डिंग संग्रह तैयार किए। अमेरिकन इंस्टीट्यूट ऑफ इंडियन स्टडीज का अभिलेखागार भी इस दिशा में उल्लेखनीय कार्य है।

हाल के वर्षों में डिजिटल माध्यमों का उपयोग बढ़ा है। विक्रम संपत द्वारा स्थापित "आर्काइव ऑफ इंडियन म्यूज़िक" ने पुराने ग्रामोफोन रिकॉर्ड का डिजिटलीकरण करके दुर्लभ ध्वनियों को संरक्षित किया है। कुछ गैर-सरकारी संगठन और व्यक्तिगत शोधकर्ता क्षेत्रीय परंपराओं का डिजिटल दस्तावेजीकरण कर रहे हैं।⁵

अंतरराष्ट्रीय स्तर पर एलन लोमैक्स के अभिलेखागार जैसे प्रयास एक प्रेरक आदर्श प्रस्तुत करते हैं, जिन्होंने विश्व भर के लोकसंगीत का व्यवस्थित संग्रह किया। इन प्रयासों से यह स्पष्ट होता है कि व्यवस्थित और दीर्घकालिक संरक्षण संभव है, यदि उचित संसाधन और पद्धति उपलब्ध हो।⁹

7. डिजिटल संरक्षण: संभावनाएँ

डिजिटल प्रौद्योगिकी लोकसंगीत के संरक्षण में कई अभूतपूर्व अवसर प्रदान करती है। उच्च गुणवत्ता की ऑडियो और वीडियो रिकॉर्डिंग प्रस्तुति की संपूर्णता को संरक्षित कर सकती है, जिसमें स्वर, वाद्य, हाव-भाव, प्रस्तुति का संदर्भ और श्रोताओं की प्रतिक्रिया सभी सम्मिलित होते हैं। यह केवल ध्वनि नहीं बल्कि संपूर्ण सांस्कृतिक घटना को दस्तावेजित करता है।⁴

डिजिटल संग्रह इंटरनेट के माध्यम से वैश्विक पहुँच प्रदान करते हैं, जिससे शोधकर्ता, छात्र और प्रवासी समुदाय अपनी सांस्कृतिक जड़ों से जुड़े रह सकते हैं। मेटाडेटा और खोज तकनीकों के माध्यम से विशाल संग्रह को सुव्यवस्थित और सुलभ बनाया जा सकता है।^{4,7}

डिजिटल माध्यम बहुविषयक और सहयोगात्मक अनुसंधान को भी संभव बनाते हैं। मानवशास्त्र, भाषाविज्ञान, संगीतशास्त्र और इतिहास के शोधकर्ता एक साझा संसाधन का उपयोग कर सकते हैं। शैक्षणिक उपयोग के लिए ये संग्रह पाठ्यक्रम सामग्री के रूप में भी अमूल्य हैं, जिससे नई पीढ़ी अपनी विरासत से परिचित हो सकती है।⁷

8. डिजिटल संरक्षण की चुनौतियाँ

8.1. तकनीकी चुनौतियाँ

डिजिटल प्रौद्योगिकी तेजी से बदलती है। आज के फाइल फॉर्मेट और सॉफ्टवेयर कुछ वर्षों में अप्रचलित हो सकते हैं। डिजिटल सामग्री को नियमित रूप से नए प्रारूपों में स्थानांतरित करना (माइग्रेशन) महँगा और श्रमसाध्य है। उच्च गुणवत्ता की रिकॉर्डिंग और दीर्घकालिक भंडारण के लिए पर्याप्त संसाधनों की आवश्यकता होती है।⁴

8.2. भाषायी और स्वरलिपि संबंधी चुनौतियाँ

अनेक लोकसंगीत परंपराओं की भाषा या बोली की कोई मानक लिपि नहीं होती। गीतों के बोल का लिप्यंतरण और अनुवाद जटिल कार्य है। साथ ही, लोकसंगीत के सूक्ष्म स्वर और लय को पाश्चात्य या शास्त्रीय स्वरलिपि में पूर्ण रूप से अंकित करना कठिन है, जिससे ऑडियो-प्रथम दृष्टिकोण आवश्यक हो जाता है।¹

8.3. सांस्कृतिक और नैतिक चुनौतियाँ

लोकसंगीत अपने सांस्कृतिक और अनुष्ठानिक संदर्भ में ही पूर्ण अर्थ रखता है। कुछ गीत पवित्र, गुप्त या विशिष्ट अवसरों तक सीमित होते हैं। ऐसे संगीत को सार्वजनिक डिजिटल मंच पर रखना सांस्कृतिक मानदंडों का उल्लंघन हो सकता है। संदर्भ से अलग करके रिकॉर्ड किया गया संगीत अपना मूल अर्थ खो सकता है।^{3,6}

8.4. बौद्धिक संपदा और समुदाय के अधिकार

लोकसंगीत का स्वामित्व प्रायः सामूहिक होता है, किसी व्यक्ति का नहीं। ऐसे में स्वामित्व, सहमति और लाभ-वितरण के प्रश्न जटिल हो जाते हैं। डिजिटल सामग्री का व्यावसायिक दोहन हो सकता है, जिसका लाभ मूल समुदाय तक नहीं पहुँचता। सांस्कृतिक विनियोग का खतरा डिजिटल सुलभता के साथ बढ़ जाता है।⁶

8.5. संसाधन और बुनियादी ढाँचे की कमी

उच्च गुणवत्ता का डिजिटल संरक्षण महँगा है और इसके लिए तकनीकी, भाषायी तथा सांस्कृतिक विशेषज्ञता के संयोजन की आवश्यकता होती है। ग्रामीण और आदिवासी क्षेत्रों में इंटरनेट कनेक्टिविटी और डिजिटल साक्षरता की कमी एक अतिरिक्त बाधा है, जिससे डिजिटल विभाजन का खतरा उत्पन्न होता है।⁴

9. एक प्रस्तावित संरक्षण ढाँचा

इन चुनौतियों का समाधान एक सुविचारित पद्धति से ही संभव है। प्रस्तावित ढाँचे का केंद्रबिंदु समुदाय की सक्रिय भागीदारी है। संरक्षण प्रक्रिया के प्रत्येक चरण में, रिकॉर्डिंग से लेकर वितरण तक, समुदाय की सूचित सहमति और निर्णय-भागीदारी आवश्यक है। स्तरीय पहुँच (tiered access) के माध्यम से पवित्र या संवेदनशील सामग्री को उचित सुरक्षा प्रदान की जा सकती है।⁶

तकनीकी स्तर पर ओपन स्टैंडर्ड, समृद्ध मेटाडेटा और नियमित माइग्रेशन की नीति अपनाई जानी चाहिए। बहुमाध्यमिक दस्तावेजीकरण से प्रस्तुति का संदर्भ संरक्षित किया जा सकता है। कानूनी स्तर पर सामुदायिक बौद्धिक संपदा अधिकारों को मान्यता देने वाले विशिष्ट ढाँचे विकसित करने होंगे।^{4,6}

10. चुनौतियाँ और समाधान

निम्नलिखित तालिका लोकसंगीत के डिजिटल संरक्षण की प्रमुख चुनौतियों और उनके प्रस्तावित समाधानों को संक्षेप में प्रस्तुत करती है।

तालिका 1. डिजिटल संरक्षण में प्रमुख चुनौतियाँ और समाधान

चुनौती क्षेत्र	प्रमुख समस्याएँ	प्रस्तावित समाधान
तकनीकी	फॉर्मेट अप्रचलन, डेटा हानि	ओपन स्टैंडर्ड, नियमित माइग्रेशन
भाषायी	लिप्यंतरण, स्वरलिपि	ऑडियो-प्रथम, यूनिकोड समर्थन
सांस्कृतिक	संदर्भ हानि, प्रामाणिकता	समृद्ध मेटाडेटा, समुदाय भागीदारी
नैतिक	सहमति, पवित्रता	सूचित सहमति, स्तरीय पहुँच
कानूनी	स्वामित्व, विनियोग	सामुदायिक अधिकार, विशिष्ट कानून
संसाधन	वित्त, विशेषज्ञता	सहयोग, प्रशिक्षण

11. निष्कर्ष

भारतीय लोकसंगीत का डिजिटल संरक्षण एक जटिल किंतु अत्यावश्यक कार्य है। डिजिटल प्रौद्योगिकी निस्संदेह विलुप्त होती परंपराओं को संरक्षित करने और व्यापक पहुँच सुनिश्चित करने की संभावनाएँ प्रदान करती है, किंतु यह केवल एक तकनीकी प्रक्रिया नहीं है, बल्कि सांस्कृतिक, नैतिक और सामाजिक आयामों वाला गहन हस्तक्षेप है।

इस शोध के प्रमुख निष्कर्ष हैं: समुदाय-केंद्रित दृष्टिकोण अनिवार्य है, क्योंकि बिना समुदाय की सक्रिय भागीदारी और सहमति के संरक्षण न प्रामाणिक होगा न नैतिक। प्रौद्योगिकी साधन है, साध्य नहीं; इसका उद्देश्य जीवित परंपरा का समर्थन करना है, उसका स्थान लेना नहीं। बहुविषयक सहयोग, दीर्घकालिक प्रतिबद्धता और नीतिगत सुधार आवश्यक हैं।

सबसे महत्वपूर्ण यह है कि लोकसंगीत की गतिशील और जीवंत प्रकृति को डिजिटल माध्यम में कैसे बनाए रखा जाए, यही इस क्षेत्र की मूलभूत चुनौती है। लोकसंगीत हमारी साझा मानवीय विरासत है, जो पहचान, मूल्य, ज्ञान और सौंदर्य का स्रोत है। उसे डिजिटल युग में बचाना और जीवंत रखना हम सबकी सामूहिक जिम्मेदारी है।

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Reclaiming the Feminine Voice in Mythological Retellings: A Comparative Study of Chitra Banerjee Divakaruni and Madeline Miller

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Abstract

This paper examines the feminist reimagination of mythology in contemporary fiction through a comparative analysis of Chitra Banerjee Divakaruni's *The Palace of Illusions* and *The Forest of Enchantments* and Madeline Miller's *Circe* and *The Song of Achilles*. Both authors recover marginalised female figures from canonical epic traditions and grant them narrative authority, yet their cultural positions and strategies differ in instructive ways. Divakaruni writes from within a living Hindu epic tradition, retelling the Mahabharata and the Ramayana through the voices of Draupadi and Sita while negotiating religious sensibility and diaspora identity. Miller approaches the Greek tradition as secularised classical heritage, free to subject its gods and heroes to psychological and feminist revision. Drawing on feminist revisionist mythmaking, narrative theory, postcolonial feminism, and adaptation studies, and through close reading of the principal texts, this study argues that both writers practise what Adrienne Rich called re-vision, the act of looking back at old texts with new eyes, but that the stakes and strategies of that act differ profoundly when the source is sacred scripture rather than secular myth.

Keywords: - Feminist Revisionist Mythology, Chitra Banerjee Divakaruni, Madeline Miller, Narrative Voice, Draupadi, Circe, Postcolonial Feminism, Re-vision.

1. Introduction

The early twenty first century has seen a remarkable flowering of mythological retellings that place women at the centre of stories from which they were once excluded or in which they appeared only as instruments of male destiny. This movement is not new in impulse, since feminist writers have long sought to recover silenced voices, but its scale and commercial reach are unprecedented. Bookshops now carry shelves of novels that hand the microphone to the women of ancient epic, and these books command large international readerships.⁵

Two authors illustrate the range of this enterprise with particular clarity. Chitra Banerjee Divakaruni, an Indian American writer, retells the great Sanskrit epics through the eyes of their central women, giving Draupadi and Sita the first person authority they were denied in the canonical versions.^{1,2} Madeline Miller, an American classicist, reanimates Greek myth by granting interior life to figures such as Circe and Patroclus, transforming marginal characters into protagonists of sustained psychological narrative.^{3,4}

This paper argues that Divakaruni and Miller represent two paradigms of feminist mythological retelling that are shaped less by gender alone than by the cultural status of the source material. Where Divakaruni works within a tradition that remains sacred and living for millions of readers, Miller works with a tradition that the modern West treats as cultural heritage rather than religious practice. This difference conditions how far each author can go in revising, criticising, or humanising the inherited story, and it shapes the very form their feminism takes.¹⁰

2. Theoretical Framework

The central theoretical reference for this study is Adrienne Rich's concept of re-vision, defined as the act of looking back, of seeing with fresh eyes, of entering an old text from a new critical direction. For Rich, this act is not merely literary but a matter of survival, a way for women to refuse the self images handed down by a male tradition. Both Divakaruni and Miller perform this re-vision, returning to canonical narratives and asking what they would sound like if told by the women within them.⁵

Alicia Ostriker's account of revisionist mythmaking extends Rich's insight, describing how women poets and novelists seize mythic figures and make them vehicles for new meanings, hijacking the authority of the old story for new ends. Elaine Showalter's gynocriticism provides a complementary frame, directing attention to women as producers of textual meaning rather than as objects of representation, and inviting us to read these novels as part of a distinct female literary tradition.^{6,7}

Postcolonial feminist theory, particularly Gayatri Spivak's question of whether the subaltern can speak, sharpens the analysis of Divakaruni, whose project of giving voice to Draupadi and Sita must contend with the double marginalisation of gender and colonial history. Finally, Linda Hutcheon's theory of adaptation reminds us that every retelling is also an interpretation, a creative act that carries the values of its own moment back into the ancient narrative. Together these frameworks allow us to read the two authors as engaged in a common project pursued under very different conditions.^{8,9}

3. The Epic Sources: Sacred and Secular

The difference between the two authors begins with the nature of their sources. Divakaruni draws on the Mahabharata and the Ramayana, texts classified in Indian tradition as itihasa and revered as scripture as much as literature. These narratives are recited in temples and homes, enacted in festivals, and woven into the moral imagination of millions. Their characters are objects of devotion, and any retelling enters a field charged with religious feeling.¹⁰

Miller draws on Homer and Ovid, texts that occupy the centre of the Western literary canon but no longer command religious belief. The Greek gods are studied in classrooms, not worshipped in temples. This secularisation, the product of two millennia of cultural change,

leaves the modern author free to treat the Olympians as material for unrestricted reinterpretation.^{3,4}

This contrast is not absolute, since the Sanskrit epics have their own long history of retelling and regional variation, and devotion does not preclude creativity. But the difference in the living religious charge of the two traditions sets the basic terms within which each author works, determining what counts as reverence and what as transgression.¹⁰

4. Cultural Positioning and the Sacred

Divakaruni retells stories that function simultaneously as literature and as scripture. This imposes a delicate constraint. She must humanise her heroines, give them desire, anger, and doubt, without appearing to profane them. Her Draupadi in *The Palace of Illusions* is proud, witty, ambitious, and politically astute, yet the novel never mocks the epic framework that contains her. Reverence and revision are held in careful balance.¹

Miller faces no comparable constraint. Greek religion is no longer practised as a living faith, and so the Olympian gods are available for unrestricted reinterpretation. Miller's gods can be petty, cruel, vain, or absurd without risking the offence that would attend a similar treatment of living deities. The freedom Miller enjoys is precisely the freedom that Divakaruni must handle with care, and this asymmetry runs through every aspect of their work.⁴

Divakaruni's position as a diaspora writer adds a further dimension. Writing in English for a global readership, she performs a double act of translation, carrying Hindu epic into a Western literary marketplace while reclaiming it for women. Her reverence is therefore strategic as well as sincere, a means of asserting the dignity of a tradition often exoticised by outside observers.⁸

5. Narrative Voice and Focalization

Both authors rely on first person narration to achieve their central effect, which is the transfer of authority from the epic narrator to the female character. The technique is deceptively simple but profoundly consequential, since it determines whose consciousness organises the story and whose suffering the reader is asked to inhabit.

The Palace of Illusions is narrated by Draupadi herself, who recounts the events of the Mahabharata as her own lived experience rather than as the deeds of the Pandava brothers. The great war becomes, in her telling, a tragedy she both shapes and suffers. *The Forest of Enchantments* performs the same operation for Sita, allowing her to speak the grief and dignity that the Valmiki Ramayana renders largely from the outside.^{1,2}

Miller likewise uses first person voice. Circe narrates her own centuries of exile, transforming a minor sorceress of the *Odyssey* into the protagonist of a sustained meditation on power, mortality, and self determination. *The Song of Achilles* is narrated not by Achilles but by Patroclus, a choice that re-centres the epic on love and loss rather than martial glory. In both writers the formal device is the same, but Divakaruni's narration carries the additional weight of speaking back to a tradition her readers may hold sacred.^{3,4}

6. The Palace of Illusions and The Forest of Enchantments

In *The Palace of Illusions*, Divakaruni reconstructs the Mahabharata around the inner life of Draupadi, here called Panchaali. The novel follows her from a mysterious birth from fire, through her marriage to five husbands, to the catastrophic war that her humiliation helps

precipitate. Throughout, Draupadi is presented as an intelligent and desiring subject whose choices matter, not as a passive prize won and lost by men.¹

The famous scene of her disrobing in the assembly hall becomes, in Divakaruni's hands, the moral centre of the book. Draupadi's question to the silent elders who permit her humiliation indicts an entire social order that subordinates women. Yet the novel also explores her flaws, her pride, her partiality, and her unspoken attachment to Karna, refusing to replace one flat portrait with another.¹

The Forest of Enchantments turns to Sita, the heroine of the Ramayana, and gives her a voice of quiet strength. Divakaruni reframes Sita's trials, her abduction, her ordeal by fire, and her final return to the earth, not as passive suffering but as a series of chosen acts of integrity. The novel honours the devotional image of Sita while insisting on her interiority and her right to judge the world that judges her.²

7. Circe and The Song of Achilles

Miller's Circe takes a figure who appears only briefly in the Odyssey, the witch who turns men into pigs, and gives her an entire life. Born a lesser divinity, scorned by her family, exiled to a solitary island, Circe discovers in her exile the power of witchcraft and, more importantly, the possibility of choosing her own existence. Her arc moves steadily away from the cruelty of the gods toward a hard won mortal humanity.⁴

The novel is unmistakably feminist in its concerns. Circe endures the contempt and violence of powerful males, divine and human alike, and slowly transforms her isolation into self possession. Her final choice, to renounce immortality in favour of a mortal life she has chosen, reads as a parable of female self determination achieved against a hostile order.⁴

The Song of Achilles retells the Iliad through the love between Achilles and Patroclus. Though its central figures are male, the novel shares the revisionist impulse, displacing martial glory with intimacy and grief and questioning the heroic code that the original celebrates. Together the two novels show Miller exercising a freedom of reinterpretation that the secular status of Greek myth makes possible.³

8. Reconfiguring the Mythic Heroine

A revealing contrast emerges in how each author resolves her heroine's story. Divakaruni's women find meaning by transforming their relationship to community and duty. They remain bound to the structures of family, dynasty, and dharma, but they reinterpret those structures from within, asserting dignity and judgement without abandoning the world that shaped them.^{1,2}

Miller's heroine moves instead toward individual liberation. Circe achieves selfhood by withdrawing from a corrupt divine order and choosing a separate, mortal life. The difference reflects, in part, the distinct cultural philosophies that inform each tradition, the Indian emphasis on the self realised within relationship and the Western emphasis on the autonomous individual.⁴

Neither resolution is presented as superior. Each answers to the values of its tradition and the needs of its readers. But the contrast shows that feminist retelling is not a single template applied uniformly; it takes the shape of the cultural soil in which it grows.

9. Comparative Framework

The following table summarises the principal points of comparison between the two authors.

Table 1: Comparative Framework

Dimension	Chitra Banerjee Divakaruni	Madeline Miller
Source tradition	Hindu epic, living scripture	Greek myth, secular heritage
Cultural position	Insider, diaspora perspective	Outsider, classicist perspective
Central figures	Draupadi, Sita	Circe, Patroclus
Constraint	Religious sensibility	Creative freedom
Narrative voice	First person heroine	First person heroine and lover
Heroine's arc	Agency within community	Liberation through withdrawal
Underlying ethic	Duty reinterpreted	Individual self determination

10. Reception, Reverence, and Controversy

The reception of the two bodies of work reflects the difference in their cultural stakes. Divakaruni's novels have been widely embraced but have also drawn debate about interpretive legitimacy, since any reworking of revered figures invites scrutiny from readers who hold them sacred. Her careful balance of reverence and revision is itself a response to this charged field of reception.^{1,2}

Miller's novels, by contrast, have been received largely as literary and commercial successes, free of religious controversy. The questions raised about her work concern craft and interpretation rather than profanation. This difference confirms the central argument of this study, that the meaning of feminist retelling depends heavily on whether the source remains an object of living faith.^{3,4}

11. Conclusion

This comparison shows that feminist mythological retelling is not a single practice but a family of practices conditioned by the cultural standing of the source. Divakaruni and Miller both enact Adrienne Rich's re-vision, returning to canonical stories to recover the women within them, yet the meaning of that return differs sharply. For Divakaruni, re-vision is an act of reverent reclamation, balancing innovation against the sacred and against the pressures of diaspora representation. For Miller, it is an act of secular liberation, free to dismantle a divine order that no longer commands belief.

Neither approach is superior. Each answers to the needs of its tradition and its readers, and each enlarges the possibilities of the form. Together they demonstrate the enduring capacity of myth to absorb new questions, and they confirm that the work of giving voice to the silenced is never finished but is taken up anew in every generation and in every cultural setting. As long as old stories continue to shape how societies imagine women, the work of re-vision will remain both necessary and unfinished.

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From the Minute to the Meme: Code-Switching, Hinglish, and the Digital Refashioning of Indian English

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Abstract

This paper traces the evolution of Indian English from the colonial classroom to the digital screen, focusing on the rise of Hinglish and habitual code-switching as defining features of contemporary urban Indian speech. It argues that if Macaulay's Minute of 1835 inaugurated English as an instrument of colonial administration, the digital age has completed a long process of appropriation in which English has become a flexible resource blended freely with Indian languages. Drawing on Braj Kachru's model of concentric circles, the scholarly tradition of code-switching research from Gumperz to Myers-Scotton, and recent work on language and the internet, the study analyses mixed speech across the domains of cinema, advertising, literature, and social media, and surveys the regional mixed codes that extend beyond Hindi. It contends that Hinglish is not a corruption of English but a creative and rule governed practice that expresses a distinctly Indian modern identity, even as it raises persistent questions of class, access, and linguistic justice.

Keywords: - Hinglish, Code-Switching, Indian English, Nativization, Sociolinguistics, Digital Communication, Language Identity, World Englishes.

1. Introduction

When Thomas Babington Macaulay argued in 1835 for an English education in India, he imagined producing a class of interpreters, Indian in blood but English in taste and intellect. He could not have foreseen the language that would actually emerge. Nearly two centuries later, the English spoken in Indian homes, offices, films, and phones bears little resemblance to the standard he envisioned. It is mixed, playful, and unmistakably Indian, woven together with Hindi and a dozen other languages in a continuous fabric of code-switching that this paper calls, following common usage, Hinglish.¹⁰

This study treats Hinglish not as a decline from a pure standard but as the natural endpoint of a long historical process of appropriation. If the colonial period gave India English, the postcolonial and digital periods have allowed Indians to remake it on their own terms. The aim here is to describe this remaking, to ground it in sociolinguistic theory, and to assess what it tells us about identity and inequality in contemporary India. The argument unfolds from the historical backdrop, through the scholarship and grammar of code-switching, across the major domains in which Hinglish lives, and into the debates it provokes.⁹

2. From Colonial Instrument to Indian Resource

The trajectory from Macaulay to the meme can be read as a slow transfer of ownership. Braj Kachru's influential model places India in the outer circle of World Englishes, where English is not a native tongue but a deeply institutionalised second language with its own norms. Kachru argued that Indian English had been nativized, developing distinctive features of pronunciation, grammar, and vocabulary that are not errors but established conventions of a legitimate variety.^{1,2}

Nativization adapted English to Indian phonology and syntax, producing retroflex consonants, characteristic intonation, and idioms shaped by Indian languages. It made English an Indian language in its own right, capable of carrying Indian experience. This was the achievement that the previous generation of writers and linguists documented and defended.^{2,8}

Hinglish represents the next stage of this process. Where nativization adapted English internally, code-switching dissolves the boundary between English and Indian languages altogether. The speaker no longer chooses one language over another but draws on both within a single utterance. This shift marks the point at which English ceases to be a foreign acquisition and becomes one resource among several in a flexible multilingual repertoire.⁷

3. A Brief History of Code-Switching Scholarship

The systematic study of code-switching began with the recognition that bilinguals do not simply confuse their languages but alternate between them in patterned ways. Uriel Weinreich's early work on languages in contact opened the field, and John Gumperz later distinguished situational switching, governed by setting and interlocutor, from metaphorical switching, used for rhetorical and expressive effect.³

Subsequent researchers sought the rules that govern where switching can occur. Shana Poplack proposed structural constraints that predict the permissible points of alternation, while Carol Myers-Scotton developed the matrix language frame model, which holds that in any mixed utterance one language supplies the grammatical frame and the other contributes embedded elements. These models established that code-switching is not random but rule governed.^{4,5}

This scholarship is indispensable for understanding Hinglish, which is among the most widespread and visible examples of sustained code-switching in the world. Far from being a careless mixture, Indian mixed speech displays exactly the structural regularities that decades of research have identified, marking it as a competence rather than a deficiency.^{7,8}

4. The Grammar of Code-Switching in Indian Speech

In much Hinglish speech Hindi provides the matrix language, supplying the verbs and the grammatical skeleton, while English contributes nouns, technical terms, and discourse

markers. The relationship can reverse depending on speaker and setting, with English supplying the frame and Hindi the colour, particularly among the urban professional class.^{5,8}

Sociolinguists distinguish code-switching, the alternation between languages across clauses, from code-mixing, the insertion of items from one language into the structure of another. Indian urban speech displays both abundantly, often within a single sentence. Speakers move fluidly between the languages according to topic, emotion, and audience, exploiting the connotations each language carries.⁸

The persistence of grammatical regularity across these mixed forms is the strongest evidence that Hinglish is a competence, a learned and rule governed practice, rather than a failure to master either language. Children acquire it naturally, adults deploy it strategically, and its patterns can be described with precision. To call it broken is to misunderstand its systematic nature.⁸

5. Hinglish in Cinema

Popular cinema has been a powerful engine of Hinglish. Bollywood dialogue and song lyrics have long blended Hindi and English for emotional and comic effect, and film titles themselves increasingly mix the two languages. The screen normalises code-switching as the natural idiom of the aspirational urban Indian, lending it glamour and reach far beyond the metropolitan elite who first practised it.⁷

Film captures the social meaning of switching with great precision. A character may switch to English to signal education or modernity, or to Hindi to signal sincerity or emotional depth. Comedy frequently exploits the gap between the two registers. In this way cinema both reflects and shapes the everyday practice of mixed speech, teaching audiences across the country how and when to switch.⁷

6. Hinglish in Advertising and Branding

Advertising has seized on the same resource. Marketers discovered that a Hinglish slogan can capture both the modern connotations of English and the emotional intimacy of the mother tongue. The result is a commercial language designed to flatter a consumer who is simultaneously global and local, modern and rooted.⁷

In this sphere Hinglish functions less as casual speech than as a carefully engineered tool of persuasion. Brand names, taglines, and campaigns are crafted to exploit the precise associations of each language, demonstrating that mixed speech has become a sophisticated instrument of public communication rather than a private habit.⁷

7. Hinglish in Indian English Literature

The literary dimension is equally striking. Indian writers in English have long drawn on the resources of their other languages, embedding Hindi, Urdu, and regional words and rhythms in their English prose. Salman Rushdie famously described this practice as chutnification, the spicing of English with Indian flavour, and his own exuberant, hybrid sentences exemplify it.⁷

Other writers extend the practice in their own ways. The mixing of registers and tongues allows literature to represent the actual texture of multilingual Indian life, in which speakers move between languages without friction. What in casual speech is spontaneous becomes, in literature, a deliberate aesthetic strategy.⁷

This literary code-switching carries political weight as well. By refusing to keep English pure, these writers assert the legitimacy of an Indian English shaped by Indian languages, continuing on the page the appropriation that began in speech. The novel becomes a site where the ownership of English is quietly but decisively claimed.⁹

8. The Digital Accelerant

The internet has accelerated and transformed the spread of Hinglish. David Crystal observed that digital communication occupies a space between speech and writing, informal and immediate yet textually recorded. In Indian usage this hybrid medium has become the natural home of Hinglish, which flourishes in text messages, social media posts, comment threads, and memes.⁶

Roman script Hindi, written phonetically using the English alphabet, has become a default mode of informal digital writing for millions. This practice frees writers from script barriers and allows seamless mixing of languages within a single line of text. It represents a genuinely new written form, born of the keyboard and the screen.⁶

The meme in particular fuses image, English, and transliterated Indian language into a compact unit of shared humour and identity. What was once a feature of intimate spoken exchange is now a public written practice, archived and circulated at scale. The digital age has thus given Hinglish a permanence and visibility that earlier oral code-switching never possessed, accelerating its spread and entrenching it as a marker of a connected generation.⁶

9. Beyond Hindi: Regional Mixed Codes

Hinglish is the most visible but by no means the only mixed code in India. Every major regional language has produced its own blend with English, popularly named in the same playful spirit. Speakers in the south mix Tamil and English in what is called Tanglish, Malayalam and English in Manglish, and Telugu and English in Tenglish, while Bengali speakers produce their own hybrid forms.⁸

These regional mixed codes follow the same structural principles as Hinglish and serve the same social functions, marking modernity, signalling group identity, and easing communication across language boundaries. Their proliferation shows that the appropriation of English is a pan Indian phenomenon, expressed through the particular resources of each linguistic region rather than through Hindi alone.⁸

10. Identity, Class, and Linguistic Justice

Hinglish is, for many speakers, a marker of a confident modern identity that refuses to choose between the global and the local. It signals belonging to a generation at ease in both worlds. Yet this fluency is unevenly distributed. Command of English, and therefore of the prestigious forms of code-switching, remains stratified by class, region, and access to quality schooling.⁹

The contemporary table below summarises the principal domains in which Hinglish operates and the function it serves in each.

Table 1. Domains and Functions of Hinglish

Domain	Typical Pattern	Primary Function
Cinema	Dialogue and lyric mixing	Aspirational identity
Advertising	Engineered slogans	Persuasion and appeal
Literature	Embedded words and rhythms	Aesthetic and political claim
Social media	Roman script mixing	Informal solidarity
Workplace	English frame, local insertion	Professional register
Education	Variable, contested	Access and mobility

The same ambivalence that the colonial encounter bequeathed to English persists here. Hinglish is at once a democratic, creative idiom and a subtle marker of privilege. Recent policy, including the emphasis on mother tongue instruction in the National Education Policy of 2020, attempts to rebalance the linguistic field, yet parental demand for English shows little sign of weakening. The tension between linguistic justice and economic aspiration remains unresolved.⁹

11. Prescriptivism and the Anxiety of Decay

Hinglish has its critics. Purists on both sides lament it, some fearing for the integrity of English, others for the survival of Indian languages threatened by constant borrowing. Such anxieties echo a long history of prescriptive resistance to language change, in which every new hybrid form is first denounced before being accepted.⁹

The linguistic evidence offers little support for the language of decay. Languages have always borrowed, mixed, and changed, and English itself is the product of centuries of such mixing. Hinglish is best understood not as the corruption of two languages but as the creative product of their contact, a living demonstration that linguistic vitality lies in use rather than in purity.⁸

12. Conclusion

The story that runs from Macaulay's Minute to the contemporary meme is not one of simple imposition or simple resistance. It is a story of appropriation, in which a language introduced as an instrument of control has been progressively reshaped into an instrument of self expression. Hinglish, together with its many regional cousins, is the most vivid evidence of this transformation, a living demonstration that languages belong, in the end, to those who use them.

To dismiss Hinglish as broken English is to misread it entirely. It is a rule governed, socially meaningful, and culturally productive practice that expresses the doubleness of modern Indian life. Macaulay set out to make Indians English. Two centuries later, Indians have instead made English their own, and the digital age has only confirmed the depth and permanence of that achievement.

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