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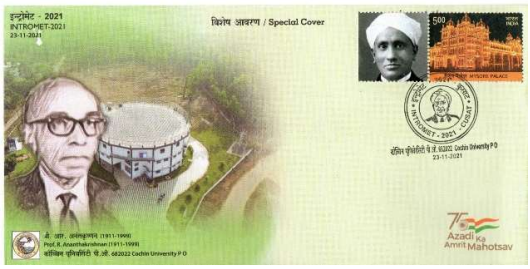
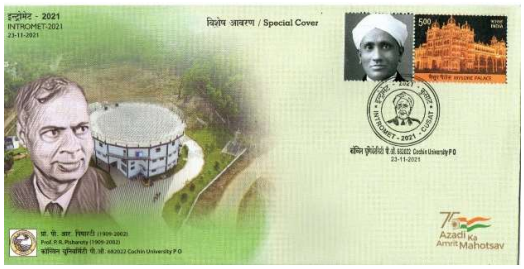
इंटरनेट - विज्ञान और प्रौद्योगिकी की संयुक्त रचना

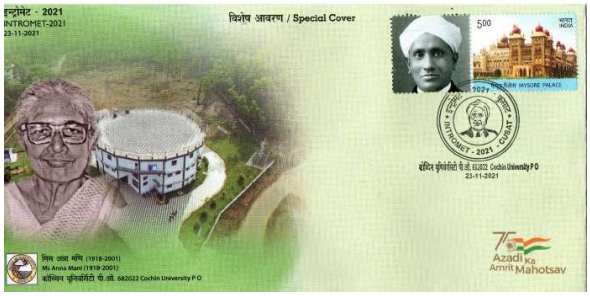
Programming Languages

A Philatelic Tribute to the Doyens of Indian Meteorology





Special covers on Prof. R. Ananthakrishnan, Prof. P. R. Pisharoty (above) and Ms. Anna Mani (below), along with Mystamps of Sir C. V. Raman



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The Indian Meteorological Society was established in 1956 and was registered on 26 May 1972 under the societies Registration act of 1860 as amended by Punjab Amendment Act 1957 applicable to Delhi. Registration No. of the society is 5403. The Society's headquarter is located at Delhi and its local chapters are functional at various places of India. The Society is a non-profit making organization and none of its income or assets accrues to the benefit of its members.

Objectives of the Society:

1. Advancement of Meteorological and allied sciences in all their aspects
2. Dissemination of the knowledge of such sciences both among the scientific workers and among the public and
3. Promotion of application of Meteorology and allied sciences to various constructive human activities

Any person, who is interested in above objectives of the society, is eligible to become a Life member.
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"Bulletin of IMSP" is generally published quarterly. Correspondence and contributions to the bulletin may be sent to Editorial Board (**jrksup@tropmet.res.in** OR **mahap@tropmet.res.in**) with copy (**Cc**) to the Chairman (**seelan@tropmet.res.in**) OR **pune_ims@rediffmail.com**. The manuscript should be typed at 1.15 space using Times New Roman font size 12, in MS-Word file. The author's name should be typed on the line below the title, the affiliation and email ID should follow on next line.

The Managing Editor/Editorial Board and the Society are not responsible for the views expressed by any author in his/her contribution(s) published in Bulletin of IMSP.

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इंटरनेट – विज्ञान और प्रौद्योगिकी की एक अनोखी संयुक्त रचना

मनोज कुमार टंडन [१,२,३]

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कंप्यूटर (संगणक) का आविष्कार दूसरे विश्व युध् के बाद १९५० के दशक के शुरू में हुआ। आज का युग संगणक का युग है। आज संगणक किसी ना किसी रूप में हमारे जीवन से जुड़ा हुआ है। इंटरनेट (अंतरजाल) एक दूसरे से जुड़े संगणकों का एक विश्व व्यापी नेटवर्क है। इंटरनेट शब्द का वास्तविक तकनीकी अर्थ है "नेटवर्क्स का नेटवर्क"। इंटरनेट का अविष्कार १९६९ में अमेरिका में हुआ। भारत में इंटरनेट १९८० के दशक में आया। अमेरिका के वैज्ञानिकों बॉब ग्रे सर्फ, बॉब कहन और डोनाल्ड देवीएस ने इंटरनेट का अविष्कार किया| इंटरनेट विज्ञान की एक ऐसी उपलब्धि है जिस ने सूचना तकनीकी के क्षेत्र में असीमित संभावनाओं के द्वार खोल दिये हैं। इंटरनेट की संकल्पना ने "गागर में सागर" को चरितार्थ कर दिया है। ज्ञान के क्षेत्र में मानवता की सबसे बड़ी उपलब्धि इंटरनेट है। इंटरनेट के लाभ और नुकसान दोनों हैं। यह इस बात पर निर्भर करता है की आप इंटरनेट को किस रूप में अपनाते हैं। इंटरनेट ने संगणक नेटवर्क के क्षेत्र में एक बहुत बड़ी क्रांति लायी है। इंटरनेट (अंतरजाल) से जुड़े संगणक आपस में अंतरजाल नियमावली (इंटरनेट प्रोटोकॉल) के जरिये सूचना का आदान प्रदान करते हैं। इंट्रानेट (अंतथजाल) संगणकों का निजी नेटवर्क होता है जो इंटरनेट प्रोटोकोल तकनिकी का उपयोग करता है। इंटरनेट विभिन्न संस्थाओं के बीच का संगणक नेटवर्क है ज़ब कि इंट्रानेट किसी संगठन के अंधर का संगणक नेटवर्क है। इंटरनेट और इंट्रानेट (अंतरजाल और अंतथजाल) के नाम मिलते जुलते हैं मगर इनका प्रयोग अलग अलग कामों के लिये किया जाता है। इंटरनेट आधुनिक जीवन का एक महत्वपूर्ण हिस्सा बन गया है। इंटरनेट ने सूचना और ज्ञान पर कुछ विशिष्ट लोगों के एकाधिकार को तोड़ा और विकेंद्रित किया है और जनसाधारण के लिए ज्ञान की नई दुनिया के द्वार खोले। इंटरनेट एक जादुई चिराग की तरह जनसाधारण में उत्सुकता पैदा कर उन्हें इंटरनेट के विष्य में और अधिक जानने के लिये

प्रोत्साहित और प्रेरित करता है। इंटरनेट ने सूचना के क्षेत्र में एक अदभुत क्रांति लाई है। आज के प्रगतीशील, वैज्ञानिक और एलेक्ट्रॉनिक युग में इंटरनेट शिक्षण को बहुत महत्व पूर्ण और आधुनिकता की निशानी माना जाता है। आज के युग में इंटरनेट शिक्षण को योग्यता का एक नया मापदंड माना जाता है। अन्य विषयों की तरह इंटरनेट की भी अपनी शब्दावली और शब्दकोश हैं। इंटरनेट की शब्दावली के कुछ बहुप्रचलित शब्द हैं :- ब्राउज़र, अटॅचमेंट, ई-मेल, बँडविड्थ, डाउनलोड, सर्च इंजन, होम-पेज, ट्वीटर, ट्वीट, वर्ल्ड वाइड वेब, डाइयल उप कनेक्षन, ई-शिक्षा (ई-लर्निंग), विडियो कॉनफेरेंसिंग, फेस बुक और सर्फिंग। वर्ल्ड वाइड वेब की रचना १९९० के दशक में टिम बनर्स-ली ने की। आज विश्व की ७ बिलियन से अधिक की जनसंख्या में से लगभग २.४ बिलियन लोग इंटरनेट का प्रयोग करते हैं और इनमें से २०० मिलियन भारतीय हैं। आज इंटरनेट की ९६० मिलियन वेब साइट्स हैं। "गंगनम् स्टाइल" इंटरनेट की आज तक की सबसे अधिक देखी गई यू-ट्यूब वीडियो है और इसे २ बिलियन से अधिक इंटरनेट प्रेमियों ने देखा। विश्व की सबसे पहली वेबसाइट आज भी इंटरनेट पर उपलब्ध है। आज के इंटरनेट प्रधान युग में इंटरनेट का प्रयोग करने वाले नागरिक को नेटीज़ेन भी कहा जाता है। इंटरनेट की निरंतर बड़ती हुई लोकप्रियता और क्षमता को देखते हुए यह कहना गलत ना होगा की चारों धाम इंटरनेट के नाम। इंटरनेट क़ी अदभुत और अभूतपूर्व लोकप्रियता और सफलता के कारण कई बार ऐसा लगता है शायद आज संपूर्ण विश्व इंटरनॅट का परिवार और समाज बन गया है। इंटरनेट की शब्दावली ने प्रेमियों की शब्दावली को भी एक नया रूप दिया है जैसा की एक हास्यमय कविता की निम्नलिखित कुछ पंक्तियों में व्यक्त किया गया है।

फेसबुक सा फेस है तेरा, गूगल सी हैं आँखें,
एंटर करके सर्च करूँ तो, मुझको ही बस ताकें,
मैंने अपने प्यार का फ़ॉर्म, कर दिया है अपलोड,
लव का माउस क्लिक कर प्रिये, करले इसे डाउनलोड ।।

आज का युवा वर्ग इंटरनेट सरफिंग को इंटरनेट तीर्थयात्रा के समान मानता है। "मैं इंटरनेट का और इंटरनेट मेरा" आज के युवा वर्ग का अनकहा नारा बन गया है| आज के अधिकांश युवा वर्ग को शायद हिन्दू पौराण के सत युग, द्वापर युग, त्रेता युग और कल युग का इतना ज्ञान न हो जितना ज्ञान उनको इंटरनेट युग का है|हाल ही में इंटरनेट की शब्दावली ने बॉलीवुड के हिंदी चलचित्रों के गीतों में अपनी उपस्थिति दर्ज़ कर ली है| हाल ही में प्रदर्शित 'गुड्डू रंगीला' नामक एक हिंदी चलचित्र के दुर्गा माता सम्बंधित एक भक्ति गीत में इंटरनेट शब्दावली का मधुर और सुन्दर उपयोग देखने को मिला| इस भक्ति गीत की रचना ने यह सिद्ध कर दिया है की इंटरनेट की शब्दावली का भक्तिरस और इ-भजनों में अच्छा, मधुर, सुरीला और प्रभावशाली उपयोग किया जा सकता है|

इस भक्ति गीत की कुछ पंक्तियाँ निम्नलिखित हैं|

कल रात माता का मुझे ई-मेल आया है,
माता ने मुझको फेसबुक पे बुलाया है ।।

वर्ल्ड वाइड वेब (डब्लयू डब्लयू डब्लयू) के द्वारा इंटरनेट ने विश्व को घर घर पहुँचाया। इंटरनेट की रचना में बहुगिनित व्यक्तियों ने कई वर्ष काम किया। वर्ल्ड वाइड वेब के अविष्कारक टिम बरनेर्स-ली को इंग्लेंड की महारानी ने २००४ में सर की उपाधी से सम्मानित किया। वर्ल्ड वाइड वेब के ज़रिये इंटरनेट ने मानवता को जोड़ा है। इंटरनेट से संबंधित हर व्यक्ति को यह सुनिश्चित करना चाहिये की क्या इंटरनेट वास्तव में मानवता की जरूरतों को पूरा करता है की नहीं। आज विश्व की जनसंख्या का एक तिहाई भाग वर्ल्ड वाइड वेब का प्रयोग करता है। अश्लील साहित्य के विश्व व्यापी फैलाव में इंटरनेट ने बहुत महत्व पूर्ण भूमिका निभाई है और यह शायद इंटरनेट की एक बुराई है। वर्तमान को इंटरनेट का युग भी कहा जाता है। आज के इंटरनेट युग में अमीर और गरीब के बीच की दूरी और ज्यादा हो गयी है क्योंकि इस दूरी में अब सूचना-अमीर और सूचना-गरीब की दूरी भी शामिल हो गयी है। आज इस की कोशिश की जा रही है की वर्ल्ड वाइड वेब की पहुंच ग्रामीण समुदाय, शहरी गरीब समुदाय और अशिक्षित लोगों तक हो। हैकिंग और इंटरनेट स्कैम को भी इंटरनेट की बुराइयों में माना जाता है। ई-लर्निंग और क्लाउड कंप्यूटिंग के द्वारा अशिक्षित लोगों को शिक्षित करने में इंटरनेट एक प्रमुख और प्रभावशाली भूमिका निभा सकता है। जिस तरह हम किसी पुस्तकाल्य में पुस्तक को ढूंढने अर्थात ब्राउज़ करने के लिये जाते है ठीक उसी तरह इंटरनेट पर ढूंढने के लिये एक सॉफ़्टवेयर का प्रयोग होता है जिसे इंटरनेट ब्राउज़र कहते है। इंटरनेट ब्राउज़र इंटरनेट पर उपलब्ध सारी जानकारी हासिल करने में हमारी मदद करता है| इंटरनेट ब्राउज़र को वेब ब्राउज़र भी कहा जाता है। वेब ब्राउज़र को इंटरनेट का प्रवेश द्वार माना जाता है। गूग्ल क्रोम इंटरनेट का एक बहुप्रचलित वेब ब्राउज़र है। इंटरनेट के विकास में असंख्य लोगों ने कई वर्षों तक योगदान दिया। इंटरनेट के उपयोग से जियोग्रॅफिक पोज़िशनिंग सिस्टम की रचना हुई और इंटरनेट की इस एप्लीकेशन ने समाज में बहुत लोकप्रियता पायी। इंटरनेट को ऑनलाइन संसार भी कहा जाता है। ऑनलाइन संसार (इंटरनेट) के बारे में विशेष ज्ञान रखने वाले को साइबरनॉट भी कहा जाता है। इंटरनॉट एक विशेषण है जो इंटरनेट के संसार से जुड़े लोगों को दिया जाता है। कोई भी इंटरनॉट वर्षों के अनुभव और तकनीकी रूप से दक्ष व्यक्ति इंटरनेट के टूल्स के प्रयोग में विशेष रूप से पारंगत होते हैं। इंटरनेट के मुक्त ज्ञानकोष को विकीपेडिया कहते हैं। विकीपेडिया को निशुल्क विश्वकोश भी कहा जाता है। विकीपेडिया को शब्दकोशों का शब्कोश भी कहा जाता है | इंटरनेट को तरह तरह के चित्रों द्वारा भी दर्शाया जाता है| इंटरनेट ने विश्व में जैसा क्रन्तिकारी परिवर्तन किया, वैसा किसी भी दूसरी तकनीक ने नहीं किया| इ-मेल या इलेक्ट्रॉनिक मेल आज तक का सबसे लोकप्रिय उपयोग है जिसने संचार के क्षेत्र में क्रांति ला दी है| इंटरनेट ने मानव के कार्यों को अदभुत गति प्रदान की है| आगामी दिनों में इंटरनेट आज के आधार पर कहीं अधिक प्रगतिशील सेवायें प्रधान करने वाला होगा |

आज का युग विज्ञान और प्रौद्योगिकी का युग है| वैज्ञानिक उपलब्धियों ने मनुष्य के जीवन को नई दिशा प्रधान की है| इंटरनेट की खोज विज्ञान की एक ऐसी असाधारण सफलता है जिसने मनुष्य की कल्पनाओं की उड़ान को मानो पंख प्रधान कर दिए हैं| लोगों की सफलता में आज इंटरनेट का बहुत बड़ा हाथ है। इंटरनेट आधुनिक और उच्च तकनीकी विज्ञान का अदभुत आविष्कार है। इंटरनेट ने जादुई चिराग की कल्पना को चरितार्थ किया है| इंटरनेट एक वैश्विक नेटवर्क है जो पूरी दुनिया के कम्प्यूटरों को एक साथ जोड़ता है। ये किसी के भी द्वारा दुनिया के किसी भी कोने से जानकारी प्राप्त करने की आश्चर्यजनक सुविधा उपलब्ध कराता है। इसके माध्यम से हम आसानी से किसी एक जगह रखे कम्प्यूटर को किसी भी एक या एक से अधिक कम्प्यूटरों से जोड़कर जानकारी का आदान प्रदान कर सकते है। इंटरनेट के द्वारा हम कुछ सेकेंडों में ही बड़ा या छोटा संदेश, अथवा किसी प्रकार की जानकारी किसी भी कम्प्यूटर या डिजिटल डिवाइस (यंत्र) जैसे टैबलेट, मोबाईल, पीसी पर भेज सकते है। ये जानकारीयों का वैश्विक संग्रह है जिसमें लाखों वेबसाइट है। इसे नेटवर्कों का नेटवर्क कहते है। नेटवर्कों का बड़ा नेटवर्क है इंटरनेट, जिसका इस्तेमाल कर हम दुनिया के किसी भी कोने में मौजूद कोई भी जानकारी पता कर सकते है। दूरसंचार लाइन और मौड्यूलेट् - डीमौड्यूलेट् के माध्यम से इसकी पहुँच कहीं भी हो सकती है साथ ही ये हमारे कम्प्यूटर में एनालॉग सिग्नल को डिजिटल सिग्नल में परिवर्तित कर भेजता है। इंटरनेट की खोज हमारे लिये असंख्य फायदे ले आयी है, जबकि हम इसके नुकसान से भी नहीं बच सकते। इसका उपयोग हम लोग बहुत तरीके से करते है जैसे - ईमेल, संदेश, ऑनलाइन बात करने के लिये, फाइल स्थानांतरण करने के लिये तथा वर्ल्ड वाइड वेब के द्वारा वेब पेजों और दूसरे दस्तावेजों की प्राप्ति के लिये करते है। इंटरनेट कनेक्शन से जुड़ते ही हमारी पहुँच वर्ल्ड वाइड वेब तक हो जाती है। वेब पेजों को खोलते ही हम किसी भी प्रकार की जानकारी प्राप्त कर सकते है और अपने उद्देश्य की प्राप्ती कर सकते हैं। वेब पेजों को खोलने की कोई समय सीमा नहीं है, हम इसे एक मिनट या एक घंटा या उससे ज्यादा समय के लिये भी खोल सकते है साथ ही अपने मतलब के किसी भी पेज को हम अपने कम्प्यूटर में सुरक्षित कर सकते है। इंटरनेट आज के समय में हमारे जीवन का एक अभिन्न अंग बन गया है| पूरी

दुनिया आज इंटरनेट के माध्यम से आपस में जुडी हुई है| अक्सर यह कहा जाता है कि वर्तमान दुनिया इंटरनेट नामक सूचना महामार्ग पर स्थित है| इंटरनेट ने आधुनिक विश्व समुदाय में एक नविन सांस्कृतिक चेतना का संचार किया है| इंटरनेट ने "दुनिया को मुट्ठी" में कर लेने के स्वप्न को साकार सा कर दिया है| इंटरनेट विज्ञान की एक ऐसी उपलब्धि है जिसने सूचना तकनिकी के क्षेत्र में असीमित संभावनाओं के द्वार खोल दिए हैं|

इंटरनेट के माध्यम से आम जन का जीवन आसान हो गया है। अब ये हमारे जीवन का एक खास हिस्सा बन चुका है| इसकी सुगमता और उपयोगिता की वजह से, ये हर जगह इस्तेमाल होता है जैसे - कार्यस्थल, स्कूल, कॉलेज, बैंक, शिक्षण संस्थान, प्रशिक्षण केन्द्रों पर, दुकान, रेलवे स्टेशन, एयरपोर्ट, रेस्टोरेंट, मॉल और खास तौर से अपने घर पर हर एक सदस्य के द्वारा अलग अलग उद्देश्यों के लिये। जैसे ही हम अपने इंटरनेट सेवा प्रदाता को इसके कनेक्शन के लिये पैसे देते है उसी समय से हम इसका प्रयोग दुनिया के किसी भी कोने से एक हफ्ते या उससे ज्यादा समय के लिये कर सकते है। ये हमारे इंटरनेट प्लान पर निर्भर करता है। इंटरनेट के हमारे जीवन में प्रवेश के साथ ही, हमारी दुनिया बड़े पैमाने पर बदल गई है - कुछ सकारात्मक तो कुछ नकारात्मक रुप में। इंटरनेट विद्यार्थी, व्यापारी, सरकारी एजेंसी, शोध संस्थान आदि के लिये बहुत फायदेमंद है। इंटरनेट से विद्यार्थी अपनी पढ़ाई से संबंधित जानकारी प्राप्त कर सकते थे, व्यापारी एक जगह से ही अपनी गतिविधियों को अंजाम दे सकता है, इससे सरकारी एजेंसी अपने काम को समय पर पूरा कर सकती है तथा शोध संस्थान और शोध करने के साथ ही उत्कृष्ट परिणाम दे सकती है। इंटरनेट के माध्यम से इंसान के काम करने के तरीके और जीवन में क्रांतिकारी बदलाव आया है। इसने व्यक्ति के समय और मेहनत की बचत की इसलिये ये जानकारी पाने के लिये बहुत फायदेमंद है। ये नगण्य समय लेते हुये जानकारी को आपके घर तक पहुँचाने की दक्षता रखता है। मूलत: इंटरनेट नेटवर्कों का नेटवर्क है जो एक जगह से नियंत्रण के लिये कई सारे कम्प्यूटरों को जोड़ता है। आज इसका प्रभाव दुनिया के हर कोने में देखा जा सकता है। इंटरनेट से जुड़ने के लिये एक टेलिफोन (डाइयल उप कनेक्षन), एक कम्प्यूटर और एक मॉडेम की जरुरत होती है। ये दुनिया के किसी भी जगह से पूरे विश्वभर की जानकारी ऑनलाइन प्राप्त करने में हमारी मदद करता है। इसके द्वारा हम वेबसाइट से कुछ सेकेंडों में ही जानकारी को जमा, इकट्ठा और भविष्य के लिये सुरक्षित कर सकते है। इससे ऑनलाइन संपर्क तेज और आसान हो गया है जिससे ई-मेल या विडियो कॉनफेरेंसिंग के द्वारा दुनिया में कहीं भी मौजुद लोग एक-दूसरे से जुड़ सकते है। इसकी सहायता से हम लोग विश्व में कुछ भी जानकारी प्राप्त कर सकते है जैसे कहीं की यात्रा के लिये उसका पता तथा सटीक दूरी आदि जान सकते है। आधुनिक समय में, पूरी दुनिया में इंटरनेट एक बहुत ही शक्तिशाली और दिलचस्प माध्यम बनता जा रहा है। ये कई सारी सेवाओं तथा संसाधनों का समूह है जो हमें कई प्रकार से लाभ पहुँचाता है। इसके इस्तेमाल से हम कहीं से भी वर्ल्ड वाइड वेब तक पहुँच सकते है। ये

हमें बड़ी तादाद में सुविधा मुहैया कराता है जैसे ई-मेल, सर्फिंग सर्च इंजन, सोशल मीडिया के द्वारा बड़ी हस्तियों से जुड़ना, वेब पोर्टल तक पहुँच, शिक्षाप्रद वेबसाइटों को खोलना, रोजमर्रा की सूचनाओं से अवगत रहना, विडियो बातचीत आदि। ये सभी का सबसे अच्छा दोस्त बनता है। आधुनिक समय में लगभग हर कोई इंटरनेट का इस्तेमाल विभिन्न विभिन्न उद्देश्यों के लिये कर रहा है। इंटरनेट की बहुप्रचलित ई-मेल सुविधा ने डाकिये और डाकखाने के महत्व को बहुत कम कर दिया है। इंटरनेट एक वैश्विक पुस्तकालय और ज्ञानकोष है| इंटरनेट ने सम्पूर्ण विश्व को 'ग्लोबल गॉव' में परिवर्तित कर दिया है| निकट भविष्य में इंटरनेट शिक्षा के क्षेत्र में एक महत्वपूर्ण भूमिका निभायेगा| इंटरनेट ई-शिक्षा के क्षेत्र में शिक्षक की भूमिका और परिभाषा को एक नया रूप देगा| इंटरनेट के कुछ बहुप्रचलित उपयोग हैं :- (१) संचार (२) अनुसन्धान (३) शिक्षा (४) वित्तीय लेनदेन (५) ब्लॉगिंग (६) खरीदारी (७) ऑनलाइन बुकिंग (८) नौकरी ढूंढ़ना (९) वास्विक समय में अपडेट (१०) फुर्सत में मनोरंजन और (११) विवाह सम्बंधित |

इंटरनेट का रचनात्मक पक्ष मानव समाज के बौद्धिक और नैतिक स्तरों पर उत्थान का पर्याय बनता जा रहा है परन्तु नकारात्मक और विकृत मानसिकता के पोषक तत्वों द्वारा इंटरनेट का दुरुपयोग भी बढ़ता जा रहा है| इंटरनेट ने विश्व में जैसा क्रन्तिकारी परिवर्तन किया, वैसा परिवर्तन किसी भी दूसरी तकनीक ने नहीं किया| आज के समय पूरी दुनिया सिमट कर हमारी उँगलियों पर आ गई है और यह संभव हो पाया है केवल सूचना प्रोद्योगिकी के कारण और इस सूचना प्रोद्योगिकी का सारा आधार है इंटरनेट| इंटरनेट ने रोज के कार्यों की प्राप्ति को बेहद आसान बनाया है जो कि एक समय कठिन लंबा और समय लेने वाला था। हम बिना इसके अपने जीवन की कल्पना भी नहीं कर सकते जिसको इंटरनेट कहा जाता है। जैसाकि इस धरती पर हर चीज का एक फायदा और एक नुकसान होता है उसी तरह इंटरनेट का भी हमारे जीवन पर अच्छा और बुरा प्रभाव है। इंटरनेट की वजह से ही ऑनलाइन संचार बहुत ही सरल और आसान हो गया है। इंटरनेट की संकल्पना ने "गागर में सागर" को चरितार्थ कर दिया है। इंटरनेट सब व्यवसायों सम्बंधित जानकारियों का एक वैश्विक मंथन है| आज के इंटरनेट प्रभावित और नियंत्रित समाज में इंटरनेट सम्बंधित शिक्षा को आधुनिकता की निशानी माना जाता है| विश्व में इंटरनेट के उपभोक्ताओं की संख्या दिन प्रति दिन बड़ती ही जा रही है| इंटरनेट की शब्दावली में इंटरनेट के उपभोक्ता को नेटीज़ेन कहते हैं| निकट भविष्य में इंटरनेट से शिक्षा और अनुसन्धान के क्षेत्रों में प्रबल और दूरगामी परिवर्तन लाने की आशा की जा रही है | शिक्षा और अनुसन्धान सम्बंधित परिवर्तनों के स्वरुप ई-शिक्षक और ई-वैज्ञानिक नामक नई श्रेणियों का जन्म होगा| इंटरनेट के उपभोक्ताओं को इस बात की आशा और विश्वास है की आगामी दिनों में इंटरनेट आज के आधार से कहीं अधिक प्रगतिशील, उपयोगी, क्रांतिकारी और प्रभावशाली सेवाएं प्रधान करने वाला होगा और इसके द्वारा भविष्य का वैश्विक समाज प्रगति के नये आयामों को स्थापित करेगा |

A Philatelic Tribute to the Doyens of Indian Meteorology

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National Science Day:

In 1928, an Indian scientist named **Sir Chandrasekhara Venkata Raman** discovered a phenomenon known as the **Raman Effect**. For his remarkable discovery, he received the **Nobel Prize in 1930**, and that was **the first Nobel Prize for India in the field of "Science"**. In 1986, the National Council for Science and Technology Communication (**NCSTC**) requested that **February 28 be designated as National Science Day** by the Government of India, and in every year, **on February 28**, "**National Science Day" be observed to celebrate this discovery**. The occasion is now held in schools, colleges, universities, and other science, engineering, medical, and research organizations throughout India. In honor of Sir C.V. Raman, Department of Posts, Govt of India issued a 20 paisa stamp on Sir Chandrasekhar Venkat Raman, way back in 1971 (**Figure 1**). The theme of **National Science Day 2022** (of this year) is **"Integrated Approach in Science and Technology for a Sustainable Future**".

Figure 1: A 20 paisa stamp on Sir C. V. Raman was issued by the Department of Posts, Govt of India way back in 1971.

In the present article, I am writing about **three eminent Meteorologists of the Indian Subcontinent**, **who were the students of Sir C. V. Raman**, namely, **Prof. R. Ananthakrishnan, Prof P. R. Pisharoty and Ms. Anna Mani.** A set of three special covers were released as a part of the **INTROMET 2021** which was hosted by the Advanced Centre for Atmospheric Radar Research (**ACARR**) of the Cochin University of Science and Technology (**CUSA**T), Kochi, Kerala from 23-26. November, 2021. Three Public Memorial Lectures in the name of these eminent Meteorologists were also held and they were delivered by eminent scientisst in their respective fields during the above seminar.

Prof. J. Srinivasan, Former, Director, Divecha Centre of Climate Change, IISc, Bangalore, delivered the **Prof. R. Ananthakrishnan Memorial Public Lecture** on the topic "**What can we learn from the simulation of the monsoons for the past 20,000 years by climate models?**" on 23rd November, 2021.

Dr. C. R. Sreedharan, Former, DDGM of IMD, Pune. delivered the **Ms. Anna Mani Memorial Public Lecture** on the topic "**Down the Memory lane with Ms. Anna Mani: The Passionate Perfectionist"** on 24th November, 2021.

Prof. B. N. Goswami, Former Director, Indian Institute of Tropical Meteorology, Pune, delivered the **Prof. P. R. Pisharoty Memorial Public Lecture** on the topic "**Advancing the Skill of Long-Range Forecasts of Indian Monsoon Rainfall: Prospects and Challenges**" on 25th November, 2021.

Meteorology

Meteorology is a branch of the atmospheric sciences, with a major focus on weather forecasting. The study of meteorology dates back millennia, though significant progress in meteorology did not begin until the 18th century. The 19th century saw modest progress in the field after weather observation networks were formed across broad regions. Prior attempts at prediction of weather depended on historical data.

Meteorology, as we perceive it now, may be said to have had its firm scientific foundation in the 17th century after the invention of the thermometer and the barometer and the formulation of laws governing the behavior of atmospheric gases. It was in 1636 that Halley, a British scientist, published his treatise on the Indian summer monsoon, which he attributed to a seasonal reversal of winds due to the differential heating of the Asian land mass and the Indian Ocean.

The Asiatic Society of Bengal, founded in 1784 at Calcutta, and in 1804 at Bombay (now Mumbai), promoted scientific studies in meteorology in India. In the year 1875, the Government of India established the India Meteorological Department, bringing all meteorological work in the country under a central authority.

Prof. R. Ananthakrishnan:

Late Prof. R. Ananthakrishnan (Ex-Director and Honorary Fellow of IITM, Pune) started his research carrier as a **research scholar** in the field of light scattering **under the guidance of Nobel laureate Prof. C. V. Raman** and awarded D. Sc. in 1937 from University of Madras. Then he joined IMD and occupied several positions up to DDG and then he worked as Director IITM during 1968-1971. **He was awarded Padmashree by President of India in 1969 and C.V. Raman Centenary Medal in 1988**. He was

elected as an **INSA Fellow** in 1961 and was also member of many learned and professional societies (like Indian Academy of Sciences, Maharashtra Academy of Sciences, etc.). He was associated with some technical committees and working groups of **WMO,** Geneva. He was editor of some national and international reputed journals in Meteorology. Prof. Ananthakrishnan was deeply associated in organizing and teaching M. Sc./M. Tech. courses in Meteorology in University of Cochin and University of Pune. Under his able guidance, 12 persons have been awarded Ph. D degree.

Research contribution of Prof. R. Ananthakrishnan includes various topics, viz. **Light scattering and Raman Effect, Solar Physics and Meteor Astronomy and Meteorology.** In the field of Meteorology, his work covers different topics: **Aerology, Dynamics, Thermodynamics, Errors in upper air data, monsoon circulation, Tracks of storms and depressions, Atmospheric pressure and oscillations, Indian rainfall and features associated with onset of southwest monsoon.**

In honor of Prof. R. Ananthakrishnan, a Special cover on Prof. R. Ananthakrishnan was released with a Mystamp of Sir C. V. Raman, on 23rd November, 2021 during the INTROMET 2021 at ACARR, CUSAT, Kochi, Kerala (**Figure 2**).

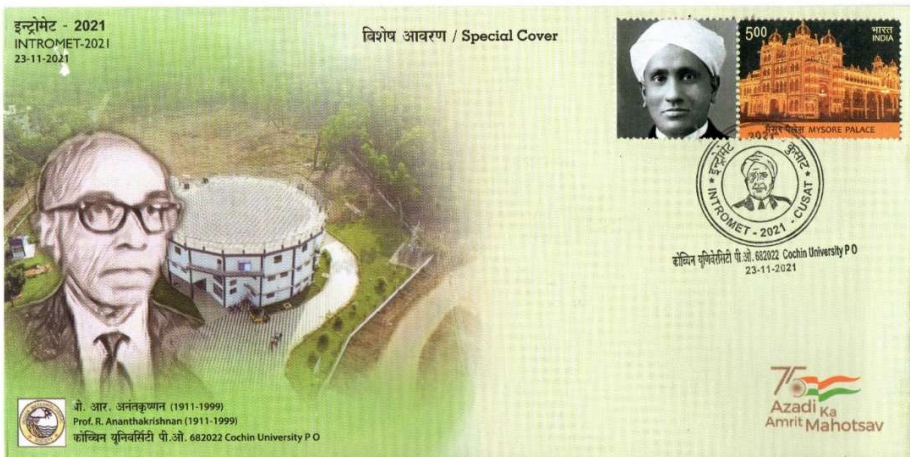

Figure 2: A Special cover on Prof. R. Ananthakrishnan was released with a Mystamp of Sir C. V. Raman, on 23rd November, 2021 during the INTROMET 2021 at ACARR, CUSAT, Kochi, Kerala.

Prof. P. R. Pisharoty:

Born on February 10, 1909 at Kollengode in Kerala, **Pisharoth Rama Pisharoty** had a brilliant academic career and worked with Prof. C. V. Raman at Bangalore and Prof. J. Bjerkenes at Los Angeles. He got his Doctorate from University of California in 1954. He worked on various aspects of the **general circulation, monsoon meteorology and climate** and **published more than hundred publications** in national and international journals. **One of the most distinguished Indian meteorologists of international repute** and considered to be the **father of Indian Remote Sensing, Prof. P. R. Pisharoty**, passed away in the morning of September 24, 2002 at Pune when he was 93 years old.

One of his most significant contributions was the finding that the **Indian summer monsoon is a delayed response to the inadequate poleward transport of heat in the northern hemisphere during the antecedent winter and a significant part of the moisture for an active monsoon period arises through evaporation from the Arabian Sea**. He was instrumental in **heralding the remote sensing** in the country through his pioneering experiment to detect coconut wilt disease in Kerala in the late sixties.

Prof. Pisharoty had occupied many important positions in Indian scientific departments. He was a senior officer in the India Meteorological Department; Director, Colaba Observatory and Director, Indian Institute of Tropical Meteorology. In 1967, Prof. Pisharoty joined the Physical Research Laboratory at Ahmedabad as a Senior Professor. He was the Director, Remote Sensing and Satellite Meteorology, at ISRO Space Applications Centre, Ahmedabad during 1972-75 as well as Emeritus Professor at Physical Research Laboratory.

He was **President of the Indian Meteorological Society**; Fellow of Indian Academy of Sciences and Fellow of the Indian National Science Academy. On the International scene, Prof. Pisharoty was a member of the Scientific Advisory Board, World Meteorological Organization (1963-1968, **WMO**) and later became its Chairman, a member of Joint Organizing Committee for Global Atmospheric Research Programme (1969-77, **GARP**), and Vice President of the International Association for Meteorology and Atmospheric Physics (1972-79). Prof. Pisharoty was a recipient of **Raman Centenary Medal (1988)** and **Prof K. R. Ramanathan Medal (1990)** of Indian National Science Academy. He was **conferred Padmashri by the Government of India in 1970**. He was also a recipient of the prestigious International Meteorological Prize 1989 of the World Meteorological Organization. **In honor of Prof. Pisharoty,** a Special cover on Prof. P. R. Pisharoty with a Mystamp of Sir C V Raman, was released on 23rd November, 2021 during the INTROMET 2021 at ACARR, CUSAT, Kochi, Kerala (**Figure 3**).

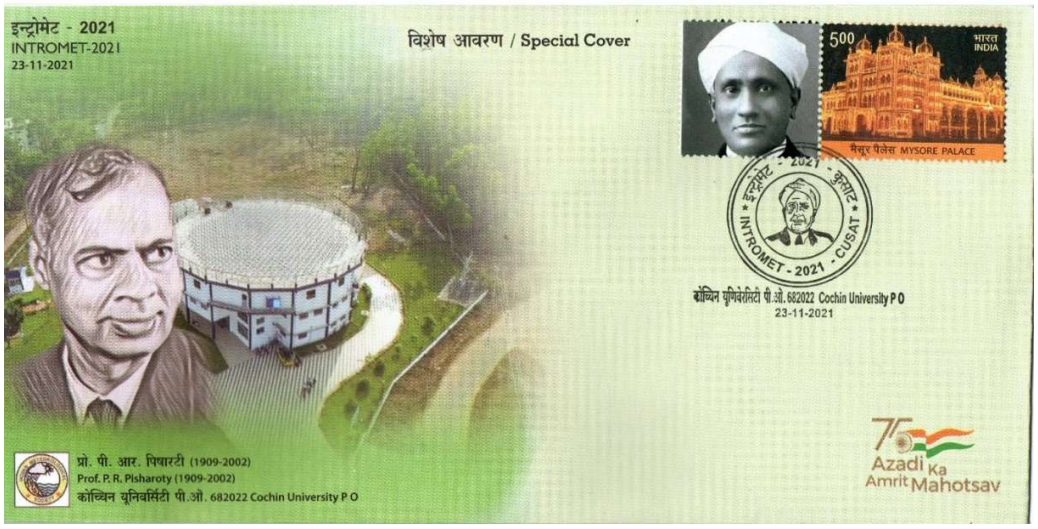

Figure 3: A Special cover on Prof P R Pisharoty with a Mystamp of Sir C V Raman, was released on 23rd November, 2021 during the INTROMET 2021 at ACARR, CUSAT, Kochi, Kerala.

Ms. Anna Mani

Ms. Anna Mani (23 August 1918 – 16 August 2001) was an **Indian physicist and meteorologist**. She retired as the Deputy Director General of the Indian Meteorological Department and further served as a visiting professor at the Raman Research Institute. She made **several contributions to the field of meteorological instrumentation**, conducted research and **published numerous papers on solar radiation, ozone and wind energy measurements**.

After graduating from the Pachai college, she worked under Prof. Solomon Pappaiah, researching the optical properties of ruby and diamond. She authored five research papers and submitted her Ph.D. dissertation, but she was not granted a Ph.D. degree because she did not have a master's degree in physics. After returning to India in 1948, she joined the Meteorological department in Pune. She published **numerous research papers on meteorological instrumentation**. She was mostly responsible for arranging for meteorological instruments, imported from Britain. By 1953, she had become the head of the division with 121 assisting her.

Anna Mani wished to make India independent in weather instruments. She standardized the drawings of close to 100 different weather instruments. From 1957-58, she set up a network of stations to measure solar radiation. In Bangalore, she set up a small workshop that manufactured instruments for the purpose of measuring wind speed and solar energy. She worked on the development of an apparatus to measure the ozone. She was made a member of the International Ozone Association. She set up a meteorological observatory and an instrumentation tower at the Thumba rocket launching facility.

Deeply dedicated to her work, Anna Mani never married. She was associated with many scientific organizations such as the Indian National Science Academy (**INSA**), American Meteorological Society (**AMS**), International Solar Energy Society (**ISES**), World Meteorological Organization (**WMO**), the International Association for Meteorology and Atmospheric Physics, etc. **In 1987**, she was a **recipient of the INSA K. R. Ramanathan Medal.**

She was transferred to Delhi in 1969 as the Deputy Director General. In 1975, she served as a WMO consultant in Egypt. She retired as the Deputy Director General of the Indian Meteorological department in 1976. In 1994 she suffered from a stroke, and died on 16 August 2001 in Thiruvananthapuram. The World Meteorological Organization remembered her on 100 birth anniversary and published her life profile along with Anna interview. **In honor of Ms. Anna Mani**, a Special cover on Ms. Anna Mani, was released on 23rd November, 2021 with a Mystamp of Sir C.V. Raman, during the INTROMET 2021 at ACARR, CUSAT, Kochi, Kerala (**Figure 4)**.

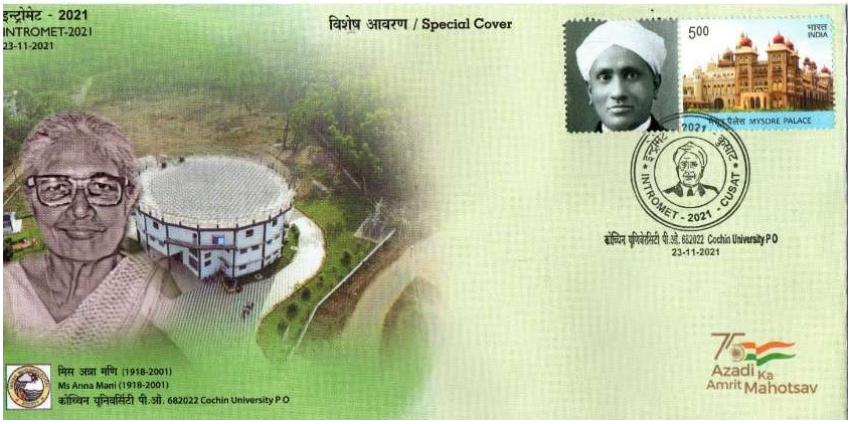

Figure 4: A Special cover on Ms Anna Mani, was released on 23rd November, 2021 with a Mystamp of Sir CV Raman, during the INTROMET 2021 at ACARR, CUSAT, Kochi, Kerala.

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Programming Languages for Classical Computers

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Classical computer technology dates from an era just before the World War II, i.e., from the late 1930s to the early 1940s. **The second half of the twentieth century may well be called the beginning of the era of Computers**. Computer programming languages are used to communicate instructions to a computer. They are based on certain syntactic and semantic rules, which define the meaning of each of the programming language constructs. Programming languages are classified according to the domain for which they are designed. Following is the domain specific classification of programming languages for classical computers.

(1) **Interpreted Programming Languages.**

(2) **Functional Programming Languages.**

(3) **Compiled Programming Languages.**

(4) **Procedural Programming Languages.**

(5) **Scripting Programming Languages.**

(6) **Markup Programming Languages.**

(7) **Logic-Based Programming Languages.**

(8) **Concurrent Programming Languages.**

(9) **Object-Oriented Programming Languages.**

Interpreted language is a programming language for which most of its implementations execute instructions directly, without previously compiling a program into machine-language instructions. The interpreter executes the program directly, translating each statement into a sequence of one or more subroutines already compiled into machine code. Some interpreted programming languages are**: APL, AutoIt, BASIC, Eiffel, Forth, Frink, Game Maker Language, ICI, J, Lisp, M, Pascal, PCASTL, Perl, PostScript, Python, REXX, Ruby, S-Lang,** and **Spin.**

Functional programming languages define every computation as a mathematical evaluation. They focus on the application of functions. Many of the functional programming languages are bound to mathematical calculations. Some functional programming languages are**: Charity, Clean, Curry, F#, Haskell, Joy, Kite, ML, OPAL, OPS5, Q** and **Python.**

Compiled language is a programming language whose implementations are typically compilers (translators that generate machine code from source code), and not interpreters (step-by-step executors of source code, where no pre-runtime translation takes place). Some compiled programming languages are**: Ada, ALGOL, C, C++, C#, LEO, COBOL, Cobra, D, DASL, DIBOL, Fortran, Java, JOVIAL, Objective-C, SMALL, Smalltalk, Turing, Visual Basic, Visual FoxPro, XL.**

Figure-1: Various Computer programming languages

Procedural (Imperative) programming implies specifying the steps that the programs should take to reach to an intended state. A procedure is a group of statements that can be referenced through a procedure call. Procedures help in the reuse of code. Procedural programming makes the programs structured and easily traceable for program flow. Some procedural programming languages are**: Bliss, ChucK, CLIST, Hyper Talk, Modula-2, Oberon, Component Pascal, MATLAB, Occam, PL/C, PL/I, Rapira, RPG.**

Scripting languages are programming languages that control an application. Scripts can execute independent of any other application. They are mostly embedded in the application that they control and are used to automate frequently executed tasks like communicating with external programs. Some scripting languages are**: AppleScript, Awk, Bean Shell, ColdFusion, F-Script, JASS, Maya Embedded Language, Mondrian, PHP, Revolution, Tcl, VBScript, Windows Power Shell.**

Markup language is an artificial language that uses annotations to text that define how the text is to be displayed. Some markup languages are**: Curl, SGML, HTML XML, XHTML.**

Logic Programming is a type of programming paradigm which is largely based on formal logic. Any program written in a logic programming language is a set of sentences in logical form, expressing facts and rules about some problem domain. Some logic-based programming languages are**: ALF, Fril, Janus, Leda, Oz, Poplog, Prolog, ROOP.**

Concurrent programming is a computer programming technique that provides for the execution of operations concurrently — either within a single computer, or across a number of systems. In the latter case, the term distributed computing is used. Some concurrent programming languages are**: ABCL, Afnix, Cilk, Concurrent Pascal, E, Joule, Limbo, Pict, SALSA, SR.**

Object-oriented programming (OOP) is a programming paradigm based on the concept of "objects", which may contain data, in the form of fields, often known as attributes; and code, in the form of procedures, often known as methods. In OOP, computer programs are designed by making them out of objects that interact with one another. Some object oriented programming languages are**: Agora, BETA, Cecil, Lava, Lisaac, MOO, Moto, Object-Z, Obliq, Oxygene, Pliant, Prograph, REBOL, Scala, Self, Slate, XOTcl, IO, C++, JAVA, C#, Actor, Simula, Python. Python** is a high-level programming language that supports imperative, object-oriented, and functional programming paradigms. In its features like the dynamic type system and automatic memory management, it is similar to Perl. Originally released in 1991 by Guido van Rossum, a Dutch computer programmer, **Python is an open community-based language** whose development is **managed by the Python Software Foundation**.

Programming languages are also **classified according to the generation** like generation-based classification of computers. **Generation of computers is based on the technology** underlying the design and fabrication of computers. Computers are categorized into five generations as showcased in the following table.

Table-1: Generation based classification of Computer Technology and language category

Generation	Period	Computer Technology	Language Category
First	1940 – 1956	Vacuum Tube Based	Machine Languages
Second	1956 – 1963	Transistor Based	Assembly Languages
Third	1963 – 1971	Integrated Circuit Based	Imperative Languages
Fourth	1971 – 2010	Microprocessor Based	Object Oriented Languages
Fifth	2010 – Beyond	Artificial Intelligence Based	Logic Languages

Generation oriented classification of computer programming languages is listed below

(1) **First Generation Languages** also known as 1GL – **Low Level Machine Languages**

(2) **Second Generation Languages** also known as 2GL – **Low Level Assembly Languages**

(3) **Third Generation Languages** also known as 3GL. – **High Level Languages**

(4) **Fourth Generation Languages** also known as 4GL – **High Level Languages**

(5) **Fifth Generation Languages** also known as 5GL – **High Level Languages**

First-generation languages, aka (**a**lso **k**nown **a**s) **1GL**, are the low-level languages that are machine languages.

Second-generation languages, aka **2GL**, are also low-level languages that are assembly languages. They are sometimes used in kernels and hard ware drives and are more commonly used for video editing and video games.

Third-generation languages, aka **3GL**, are high level languages such as Fortran, **C**, **C++**, **Java** and **Visual Basic**.

Fourth-generation languages, aka **4GL**, are languages that consist of statements that are similar to statements of human languages like English. Fourth generation languages are commonly used in database programming and scripts. Some of the fourth-generation languages are **Ruby**, **Perl**, **PHP**, **Python** and **SQL**.

Fifth-generation languages, aka **5GL**, are programming languages that contain visual tools to help develop a program. Some of the fifth-generation languages are **Mercury**, **Prolog** and LISP. LISP is the foundation of the fifth generation computer systems. The fundamental concept of LISP is linked list. Linked list is also called list. Name 'Prolog' stands for '**PRO**gramming in **LOG**ic' and 'LISP' stands for '**LIS**t **P**rocessing'. A fifth generation language is a programming language based on problem solving using constraints to the given problem, rather than using an algorithm written by a programmer. Most constraint based and logic programming languages and some declarative languages are the fifth-generation languages.

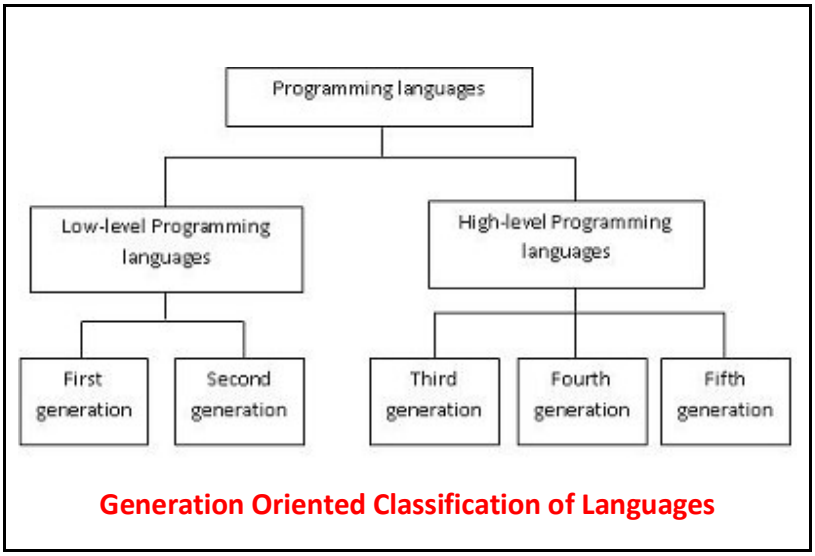

Figure-2: Generation Oriented Classification of Languages

Programming languages are also classified according to their level. Source code of a programming language is a collection of statements of the programming language, whereas the executable code of a programming language is a collection of machine instructions representing different statements of its source code. Number of machine instructions of executable code of a programming language representing each statement of the source code of the programming language defines the level of the programming language. Programming language is classified as a low/high level language if less/more number of machine instructions of its executable code represents each of its statement in its source code. Level of a computer programming language is of two kinds viz. 'Low' and 'High'. Computer language is either a low-level language or a high-level language. Low level computer languages are sub-classified as 'Low Level Machine Language' or 'Low Level Assembly Language'. Low level computer languages, viz. 1GL and 2GL, are associated with first and second generation-computer systems. A low-level computer programming language provides little or no abstraction from a computer's instruction set architecture. Commands and functions in the low-level language map closely to processor instructions. High level computer languages are associated with third, fourth and fifth generation computer systems. High level languages, viz. 3GL, 4GL and 5GL, came from 1950s onwards. An ideal low level programming language is the one in which one machine instruction of its executable code represents one statement of its source code. Ideal low level programming language is a theoretical concept which has not been realized in any programming language till today. Bits are digitally represented by digits 0 and 1 (**Digital Bits are called Classical Bits**) in the design and architecture of '**Classical Computers**'.

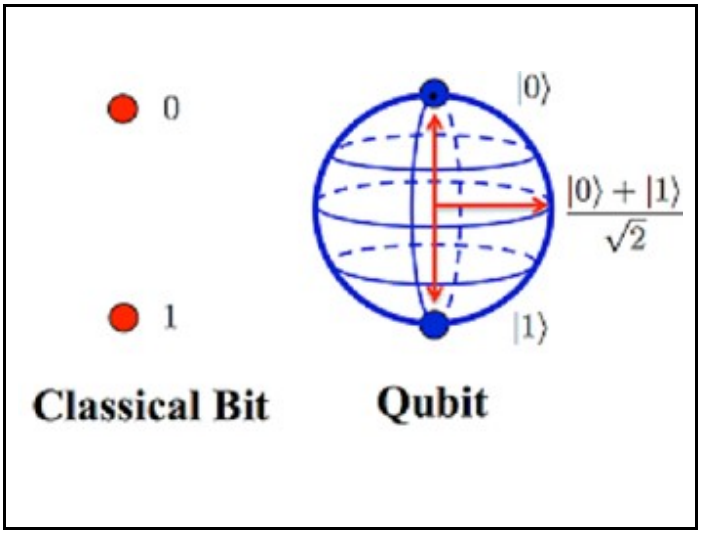

Figure-3: Classical Bit and Quantum Bit (Qubit)

Bits are however represented by waves (**Quantum Bits**) in the design and architecture of '**Quantum Computers**'. Quantum bits (**Qubits**) are unit vectors in the 2-dimensionaql complex vector space and are symbolically represented using Dirac's notation for vectors as |0> and |1>. Unlike digital (classical) bits 0 and 1, qubits can exist in superposition. Qubits represent atoms, ions, photons or electrons and their respective control devices that are working together to act as computer memory and a processor. Similar studies covering programming languages for '**Quantum Computers**' and '**Nano Computers**' shall be made separately sometime in future

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Water quality problems in rural and mining areas of Jharkhand

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Jharkhand (meaning 'The Land of Forests") is a state in eastern India [Wikipedia]. The state shares its border with the states of Bihar to the north, Uttar-Pradesh to the northwest, Chhattisgarh to the west, Odisha to the south and West Bengal to the east. It has an area of 79,710 km^2 (30,778 square miles). It is the 15th largest state by area, and the 14th largest by population. Hindi is the official language of the state. The city of Ranchi is its capital and Dumka its sub capital. The state is known for its waterfalls, hills and holy places; Baidyanath Dham, Parasnath and Rajrappa are major religious sites. The state was formed in 2000, from the territory that had previously been part of Bihar. Jharkhand is very rich in minerals & ores and contributes largely to the economy of the country. **Figure-1** shows the Location Map of Jharkhand.

Figure-1: Location Map of Jharkhand

Ranchi is the capital of Jharkhand. Ranchi was the centre of the Jharkhand movement, which called for creation of a separate state for the tribal regions of South Bihar, northern Orissa, western West Bengal and the eastern area of the present-day Chhattisgarh. The Jharkhand state was formed on 15 November 2000 by carving out the Bihar divisions of Chota Nagpur and Santhal Parganas. Ranchi has been selected as one of the hundred Indian cities to be developed as a smart city under PM Narendra Modi's flagship "Smart Cities Mission". Ranchi lies at 23°22′ N, 85°20′ E near to the Tropic of Cancer. The city covers an area of 175 km^2 (68 square miles) and its average elevation is 651 m above sea level. Ranchi is located in the southern part of the Chota Nagpur plateau, which is the eastern section of the Deccan plateau. Ranchi has a hilly topography and its dense tropical forests, a combination that produces a relatively moderate climate compared to the rest of the state. However, due to the uncontrolled deforestation and development of the city, the average temperature has increased in recent years. As of 2011 India census, Ranchi Municipal Corporation had a population of 1,073,427, making it the 46th largest urban city in India. Males constitute 52.1% of the population and females 47.9%. Ranchi has an average literacy rate of 87.68%. The area surrounding Ranchi has been endowed with natural attractions and it is referred to as the "City of Waterfalls". The Subarnarekha river and its tributaries constitute the local river system. The channels Kanke, Rukka and Hatia have been dammed to create reservoirs that supply water to the majority of the population. **Figure-2** shows a detailed map of Ranchi district.

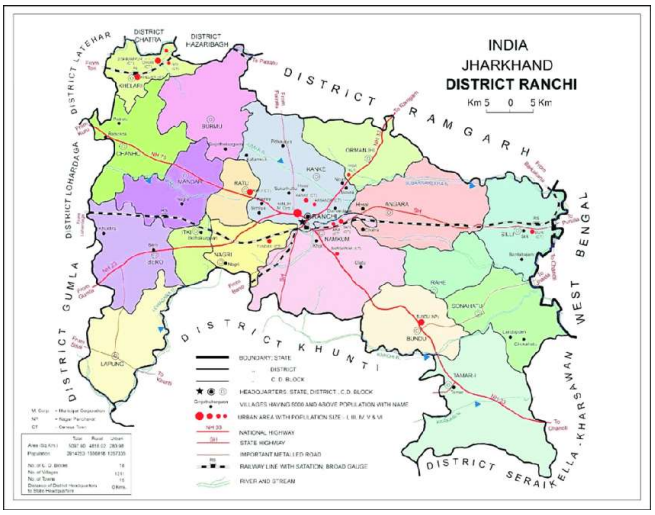

Figure-2: Detailed map of Ranchi district of Jharkhand state

Ranchi has a **humid subtropical climate.** However, due to its position and the forests around the city, it is known for its pleasant climate. Its climate is the primary reason why Ranchi was once the summer capital of the undivided State of Bihar. Ranchi used to be a preferable hill station in the past. Temperature ranges from maximum 42 to 20 °C during summer, and from 25 to 0 °C during winter. December and January are the coolest months with temperature getting to freezing point in some places of the city. The annual rainfall is about 1430 mm (56.34 inches). From June to September the rainfall is about 1,100 mm. The total area covered by the Ranchi municipal area is 175.12 square kilometres and the average elevation of the city is 651 m above sea level.

The **Subarnarekha River** flows through Jharkhand, West Bengal and Odisha states of India. The name is related to "Subarna", meaning "gold", because gold was mined near the origin of the river at a village named Piska near Ranchi. After originating near piska/nagri, near Ranchi, the capital of Jharkhand, the Subarnarekha traverses a long distance through Ranchi Seraikela Kharsawan and East Singhbhum districts in the state. Thereafter, it flows for shorter distances through Paschim Medinapur district in West Bengal for 83 kilometres and Balasore district of Odisha. There, it flows for 79 kilometres and joins the Bay of Bengal near Talsari. The total length of the river is 395 kilometres (245 miles).

Groundwater in Jharkhand is affected in many districts with excess Fluoride, Iron, Nitrate and Arsenic. In the case of treatment plants, that remove iron and manganese through aeration or potassium permanganate oxidation, disposal of sludge to receiving-waters may cause problems such as water discoloration and destruction of aquatic life. Treatment plants, that use an ion exchange softening process, have brine wastes (high salts) which become critical disposal problems, especially when the sludge has a high manganese content. The salts cannot readily be recovered or removed from the wastes. Brine wastes are almost impossible to treat. Bacterial contamination is found in surface water in many places in Jharkhand, in addition to increase in turbidity levels due to mining activities. There is reported radioactive contamination of water in East Singhbhum district. The presence of fissured rocks below top soil allows percolation of waste water into the ground. **About 80% of rural areas in Jharkhand suffer water quality problems.** There are various types of drinking water sources and several types of schemes existing in the rural areas of Jharkhand. Sources include Open wells (Dug wells), Hand pumps, Tube wells, Surface sources (rivers, infiltration structures, dams etc) and Wetlands (ponds, lakes). It is observed that a majority (more than 75%) of the rural population of Jharkhand is dependent on hand pumps. However, water quality of shallow hand pumps of rural areas is found to be poor, and not good for consumption by the villagers. The types of schemes are Single village schemes, Multi-village schemes, Piped water supply schemes and Mini water supply schemes. The total requirement of water for the proposed schemes is approximately 66 MCM per annum which is roughly 2.8 % of annual replenishable groundwater and 1.5% of the available surface water resources available in Jharkhand.

Till a decade back, poor sanitation, unhygienic behavioural patterns and practices coupled with unsafe drinking water, etc. along with various other factors had paved way to cycle of diseases, brought uneven growth pattern in the socio-economic development of the state, posing a serious threat to the overall quality of life of every individual, with most women and children being adversely affected. Keeping this in mind- Government of Jharkhand focussed on sanitation and hygiene issues in institutions and common public places, e. g., in schools, AWC, market places, tourist places and health facilities. Under the Swachh Bharat Mission (SBM), sanitation coverage in rural Jharkhand has increased from 16.25% in October 2014 to ~ 100% as of November 2018 and the state has achieved Open Defecation Free (ODF) status. Over 35.47 lakhs toilets have been constructed in rural Jharkhand since the Mission began. 29,564 villages and 24 districts have declared themselves Open Defecation Free (ODF). [Ref: **https://blog.mygov.in/swachh-bharat-mission-journey-of-jharkhand/**].

However, the problem of unsafe drinking water still persists and quality of drinking water is still not good, especially in the mining areas and rural areas of Jharkhand. This is really a health concern in the state. Solid and Liquid Waste Management does not exist in most parts of rural Jharkhand. While the solid waste management is absent, the liquid waste management is limited to building of a few meters of isolated non-functional drains. Jharkhand has 22,894 Sq. Km of forest which is 29% of the total geographic areas of the state, which is amongst the highest in India. There are 11 wildlife sanctuaries and reserves in Jharkhand. Wetlands constitute an area of 170,000 ha. in the state. Forest lands are being increasingly designated as mines in Jharkhand, thus reducing forest cover. Jharkhand is famous for its rich mineral resources, like Uranium, Mica, Bauxite, Granite, Gold, Silver, Graphite, Magnetite, Dolomite, Fireclay, Quartz, Feldspar, Coal (32% of India), Iron, Copper (25% of India), etc. The mining of these resources affects the groundwater availability and quality of water in these areas.

The sources of water available in the rural areas of Jharkhand, as already listed earlier are open or dug wells, hand pumps, tube wells, rivers, lakes ponds or dams. According to the results of tests of the water samples under the Rajiv Gandhi National Drinking Water Mission (**RGNDWM**), 7 out of 12 districts selected are afflicted with quality problems. On the other hand, according to the reports of the Central Ground Water Board (**CGWB**), there are quality problems of one or more kinds in almost all districts. The laboratories that were established at district levels are reported to be mostly non-functional and all tests are either done at the few functional laboratories or are not done at all. Most of the rural population is covered by hand pumps. There are few piped water supply schemes. The hand pumps installed in areas where fluoride levels are high, are not provided with any facility to treat excess fluoride to make the water drinkable. The forest cover in Jharkhand, even after continued denudation for decades, is still the maximum amongst the states of India and there is plenty of rainfall in Jharkhand. In spite of this fact, ground water exploitation is very little. This is said to be because the geological formation at most places is rocky, water percolates into the ground through fissures and cracks and stored in voids, small in size, that hold limited quantities of water and yield small discharges. Bores are successful if these voids are hit. Otherwise, they fail. The quality of ground water is affected by the natural geological formations and have minerals of various kinds present in them. The quality of ground water is also aggravated by the leachates from mines.

Most probable number (**MPN**) is a statistical estimate of the number of coliform-group organisms per unit volume of sample water, and it is expressed as a density or population of organisms per 100 mL of sample water. One remarkable fact about the quality of ground water, as it appears from the test results of the RGNDWM, is that water obtained from hundreds of deep tube wells (in local terminology a tube well deeper than 50 m is called a deep tube well), the MPN count is very high. It is necessary to carry out a detailed and thorough investigation into the causes of the MPN being so high and in such a large no of tube wells. The test reports on record, of deep tube wells, also reveal abnormally high turbidity contents. It also needs detailed investigation. If turbidity is contributed by partially soluble minerals within the strata, that form colloidal solutions in water, such as those of iron, the turbidity will have to be treated. Iron, if it is in excess of permissible limits, will have to be brought within acceptable limits.

Because of uncertainty of success of tube wells & their short life and unsatisfactory quality of water in these, there is reason for surface water to be preferred. The durability of source is certainly an advantage in case of river waters, provided rivers are perennial. But there are hardly any perennial rivers in Jharkhand. The quality of river water is, however, much worse than the quality of tube well water. Provided that there is no chemical pollution, water from tube well requires only disinfection, while river water requires complete treatment including sedimentation and filtration. The limited availability of power in rural areas is an equal demerit in both cases. The capital cost as well as the maintenance cost is likely to be higher for the river water than for the tube well water. There are several dams and natural lakes in Jharkhand that can be used for supplying drinking water after treatment to sizeable chunks of rural population nearby. There are also smaller wetlands that can be used, perhaps for single village schemes. It was observed that the perception people had of the quality of water, was limited to the water being physically clean, without colour or turbidity. The devices used for storage of water were often unclean, particularly in places of public utility.

The large-scale industrial growth has caused serious concerns regarding the susceptibility of groundwater contamination due to discharge of the waste. So, it is necessary to assess the quality of groundwater. Water Quality Indices aim at giving a single value to water quality of a source, reducing numerous parameters into a simpler expression and enabling easy interpretation of monitoring data. Water quality index (**WQI**) is a well-known method as well as one of the most effective tools to express water quality that offers a simple, stable, reproducible unit of measure and communicate information of water quality to the policy makers and concerned citizens. The quality of water can be evaluated by testing various physico-chemical parameters such as pH, Total Dissolved Solid (TDS), Total Hardness, Bicarbonate, Fluoride, Chloride, Nitrate, Sulphate, Calcium and Magnesium.

Water Quality Index (WQI) is an important technique for demarcating groundwater quality and its suitability for drinking purpose. Water quality of any specific area or specific source can be assessed using physical, chemical and biological parameters. WQI utilizes the water quality data and helps in the modification of the policies, which are formulated by various environmental monitoring agencies. It has been realized that the use of individual water quality variable, in order to describe the water quality for common public, is not easily understandable. WQI has the capability to reduce the bulk of the information into a single value to express the data in a simplified and logical form. It takes information from a number of sources and combines them to develop an overall status of a water system. They increase the understanding ability of highlighted water quality issues by the policy makers as well as for the general public as users of the water resources.

Weighted Arithmetic Water Quality Index (WAWQI):

Weighted arithmetic water quality index method classified the water quality according to the degree of purity by using the most commonly measured water quality variables. The method has been widely used by the various scientists and the calculation of **WQI** was made by using the following equation:

$WQI = \frac{\sum_{i=1}^{n}(Qi \,.\, Wi)}{\sum_{i=1}^{n} Wi}$, Where, Q_i is the quality rating scale for ith parameter, and W_i is the unit weight for ith water quality parameter (subscript **i = 1, 2, …, n**).

Q_i is calculated by using this expression:

$Qi = 100\ [\frac{Vi-Vo}{Si-Vo}]$ where, V_i = Estimated concentration of i[th] parameter in the analysed water, V_o = Ideal value of this parameter in pure water, V_o = 0 (except for pH =7.0 and DO = 14.6 mg/l), and S_i = Recommended standard value of i[th] parameter.

W_i is calculated by using the following formula:

$Wi = \frac{K}{Si}$

Where, K = Proportionality constant and can also be calculated by using the following equation:

$K = \frac{1}{\sum\frac{1}{Si}}$

Table-1: The rating of water quality according to this WQI is given below

WQI Value	Rating of Water Quality	Grading
0-25	Excellent water quality	A
26-50	Good water quality	B
51-75	Poor water quality	C
76-100	Very Poor water quality	D
Above 100	Unsuitable for drinking purpose	E

Ratings & gradings of water quality, according to WQI value ranges, are given in **Table-1**.

In rural and mining areas of Jharkhand, the WQI values generally range from the value of 139 (maximum) to the value of 29 (minimum). The high value of WQI is found to be mainly from the higher values of total dissolved solids, hardness, fluorides, bicarbonate, chloride, nitrate and calcium in the groundwater. It may be noted that several other types of Water Quality Index are defined, like National Sanitation Foundation Water Quality Index (NSFWQI), British Columbia Water Quality Index (BCWQI), Canadian Council of Ministers of the Environment (CCME) Water Quality Index (WQI), etc.

For water samples of the poor category, the water is not suitable for direct consumption and requires treatment before its utilization (through **Water Treatment Plants).** Management of wastes from water treatment plants needs study of sources and types of waste, characteristics of each type of waste/sludge, and waste management procedures. The discussion of management of sludge (waste) covers minimizing sludge production, methods of sludge treatment, and ultimate sludge disposal.

Sources and Types of Waste: A water treatment plant not only produces drinking water but is also a solids-generator. The residues (solids or wastes) come principally from clarifier basins and filter backwashes. These residues contain solids which are derived from suspended and dissolved solids in the raw water, the addition of chemicals, and chemical reactions. Depending on the treatment process employed, wastes from water treatment plants can be classified as alum, iron, or polymer sludge from coagulation and sedimentation; lime sludge and brine wastes from softening; backwash wastewater and

spent granular activated carbon from filtration; and wastes from the iron and manganese removal process, micro-strainers, and diatomaceous earth filters.

Rural Water Supply and Sanitation Project will address to the problems of sustainable water supply and sanitation in rural areas of Jharkhand and shall be implemented in 6 selected districts of the state by the State Drinking Water and Sanitation Mission, Drinking Water and Sanitation Department, Ranchi, Jharkhand. The overall goal of the project is to promote decentralised service delivery arrangements with increased Panchayati Raj Institutions (P.R.I.) and community participation, improved financial sustainability and enhanced accountability at all levels. The wastewater treatment to be adopted by village, towns, and cities depends on capital cost, technical feasibility, operation and maintenance cost and acceptance level of community as well as mind set of the governing bodies. Hence the problem for water of villages and towns should be seen not only from the point of view of water supply but also reuse of treated wastewater. Effective systems in place will conserve the natural ground water, lakes, rivers and avoid its contamination. This will also ensure the improvement in cleanliness, healthy community leaving.

Table-2 provides the comparison of several States and Union Territories of India, in terms of Access to safe drinking water in households of India (in percent), both for urban and rural areas, with available data for 1991, 2001 and 2011. (Courtesy to following web-Reference: https://en.wikipedia.org/wiki/List_of_Indian_states_and_union_territories_by_access_to_safe_drinking_water)

Table-2: Access to safe drinking water in households of India (in per cent)

No	States & Union territory	1991			2001			2011		
		Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban
1	Jammu & Kashmir	na	na	na	65.2	54.9	95.7	76.8	70.1	96.1
2	Himachal Pradesh	77.3	75.5	91.9	88.6	87.5	97.0	93.7	93.2	97.8
3	Punjab	92.7	92.1	94.2	97.6	96.9	98.9	**97.6**	96.7	98.9
4	Chandigarh	97.7	98.1	97.7	99.8	99.9	99.8	**99.3**	98.7	99.4
5	Uttarakhand	a	a	a	86.7	83.0	97.8	92.2	89.5	98.7
6	Haryana	74.3	67.1	93.2	86.1	81.1	97.3	93.8	92.0	96.7
7	Delhi	95.8	91.0	96.2	97.2	90.1	97.7	95.0	87.9	95.2

8	**Rajasthan**	59.0	50.6	86.5	68.2	60.4	93.5	78.1	72.8	94.3
9	**Uttar Pradesh**	62.2	56.6	85.8	87.8	85.5	97.2	95.1	94.3	97.9
10	**Bihar**	58.8	56.5	73.4	86.6	86.1	91.2	94.0	93.9	94.7
11	**Sikkim**	73.1	70.8	92.8	70.7	67.0	97.1	85.3	82.7	92.2
12	**Arunachal Pradesh**	70.0	66.9	88.2	77.5	73.7	90.7	78.6	74.3	91.3
13	**Nagaland**	53.4	55.6	45.5	46.5	47.5	42.3	53.8	54.6	51.8
14	**Manipur**	38.7	33.7	52.1	37.0	29.3	59.4	45.4	37.5	60.8
15	**Mizoram**	16.2	12.9	19.9	36.0	23.8	47.8	60.4	43.4	75.8
16	**Tripura**	37.2	30.6	71.1	52.5	45.0	85.8	67.5	58.1	91.9
17	**Meghalaya**	36.2	26.8	75.4	39.0	29.5	73.5	44.7	35.1	79.5
18	**Assam**	45.9	43.3	64.1	58.8	56.8	70.4	69.9	68.3	78.2
19	**West Bengal**	82.0	80.3	86.2	88.5	87.0	92.3	92.2	91.4	93.9
20	**Jharkhand**	a	a	a	42.6	35.5	68.2	**60.1**	**54.3**	78.4
21	**Odisha**	39.1	35.3	62.8	64.2	62.9	72.3	75.3	74.4	79.8
22	**Chhattisgarh**	a	a	a	70.5	66.2	88.8	86.3	84.1	93.9
23	**Madhya Pradesh**	53.4	45.6	79.4	68.4	61.5	88.6	78.0	73.1	92.1
24	**Gujarat**	69.8	60.0	87.2	84.1	76.9	95.4	90.3	84.9	97.0
25	**Daman & Diu**	71.4	56.9	86.8	96.3	94.9	98.9	98.7	97.8	99.0
26	**Dadra & Nagar Haveli**	45.6	41.2	91.0	77.0	70.5	96.1	91.6	84.3	98.4
27	**Maharashtra**	68.5	54.0	90.5	79.8	68.4	95.4	83.4	73.2	95.7
28	**Andhra Pradesh**	55.1	49.0	73.8	80.1	76.9	90.2	90.5	88.6	94.5

29	**Karnataka**	71.7	67.3	81.4	84.6	80.5	92.1	87.5	84.4	92.3
30	**Goa**	43.4	30.5	61.7	70.1	58.3	82.1	85.7	78.4	90.4
31	**Lakshadweep**	11.9	3.4	18.8	4.6	4.6	4.6	**22.8**	31.2	20.2
32	**Kerala**	18.9	12.2	38.7	23.4	16.9	42.8	**33.5**	28.3	39.4
33	**Tamil Nadu**	67.4	64.3	74.2	85.6	85.3	85.9	92.5	92.2	92.9
34	**Puducherry**	88.8	92.9	86.1	95.9	96.6	95.5	97.8	99.6	97.0
35	**Andaman & Nicobar Islands**	67.9	59.4	90.9	76.7	66.8	97.8	85.5	78.2	98.1
	ALL INDIA	**62.3**	**55.5**	**81.4**	**77.9**	**73.2**	**90.0**	**85.5**	**82.7**	**91.4**

(https://en.wikipedia.org/wiki/List_of_Indian_states_and_union_territories_by_access_to_safe_drinking_water)

In 2011, among the states **Punjab** ranked highest with **97.6%**, while **Kerala** had the worst rank with only **33.5%** households having access to safe drinking water. National average was standing at **85.5%,** while among Union Territories, **Chandigarh** ranked highest with **99.3%** and **Lakshadweep** had the worst rank with only **22.8%** households having access to safe drinking water. **In 2011, Jharkhand had total 60.1%, with rural value at 54.3%** households having access to safe drinking water. The deficiency needed to be taken care by Government of India. Therefore, Department of Drinking Water & Sanitation, Ministry of Jalshakti, Government of India initiated the "**Jal Jeevan Mission"** (Web-reference: **https://jaljeevanmission.gov.in/**). **Jal Jeevan Mission, is envisioned to provide safe and adequate drinking water** through individual household tap connections **by 2024** to all households in rural India. The programme will also implement source sustainability measures as mandatory elements, such as recharge and reuse through grey water management, water conservation, rain water harvesting. The Jal Jeevan Mission will be based on a community approach to water and will include extensive Information, Education and communication as a key component of the mission. The Jal Jeevan Mission (JJM) will be based on a community approach to water and will include extensive Information, Education and communication as a key component of the mission. JJM looks to create a Jan Andolan (people-movement) for water, thereby making it everyone's priority. The web-link showed that Total rural households on 08/04/2022 was 19,31,99,823 and Rural household tap connections on 08/04/2022 was 9,40,73,343, i.e., coverage is about 48.69 % in rural India. This means that less than 50 per cent of the rural household population in India has access to safely managed drinking water. Chemical contamination of water, mainly through fluoride and arsenic, is present in 1.96 million dwellings. With a population of 1.38 billion people, India is the second most populous country in the world, hence the Mission will require lot of works to be done in coming years. This Mission aims for "**Har Ghar Jal"** (Clean & safe drinking water to every household of India) and we wish its grand success.

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Zero – Perceptions Through Ages

Manoj Kumar Tandon[1, 2, 3]

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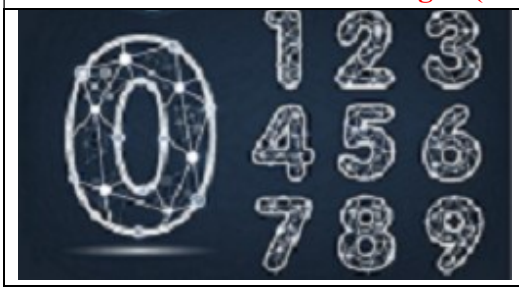
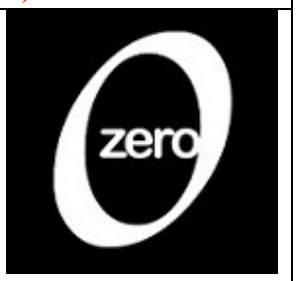
Zero (**हिन्दी में शून्य**) was invented independently by the Babylonians, Mayans and Indians although some researchers say the Indian number system was influenced by the Babylonians. The Babylonians got their number system from the Sumerians who were the first people in the world to develop a counting machine. **The number 0 is the only number which is neither positive nor negative, neither a prime number nor a composite number, nor a unit.** The number 0 (zero) is the least non-negative number.

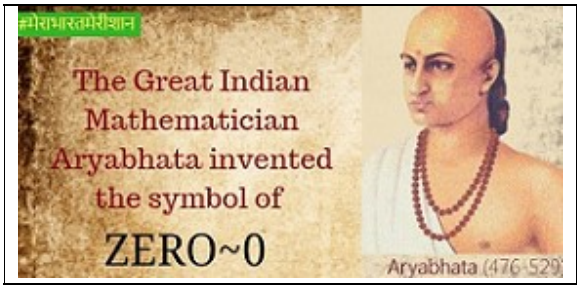
Numeric Digits (0 to 9)





There are two uses of zero that are both extremely important but are somewhat different. One use is as an empty place indicator in place-value number system. **Place-value number system is the Sumerian number system**. In a number like 2106 in place-value system, zero is used so that the positions of the 2 and 1 are correct. Clearly 216 mean something quite different. The second use of zero is as a number itself in the form we use it as 0. There are also different aspects of zero within these two uses, namely the concept, the notation, and the name. Name "zero" derives from the **Arabic word 'sifr – सिफर'** and the word "zero" came from Italy. Neither of the above uses has an easily described history. It just did not happen that someone invented the ideas, and then everyone started to use them. Also, it is fair to say that the number zero is far from an intuitive concept. Mathematical problems started as 'real' problems rather than abstract problems. Numbers in early historical times were thought of much more concretely than the abstract concepts, which are our numbers today. One might think that once a place-value number

system came into existence then the 0 as an empty place indicator is a necessary idea, yet the Babylonians had a place-value number system without this feature for over 1000 years. Moreover, there is absolutely no evidence that the Babylonians felt that there was any problem with the ambiguity, which existed. Remarkably, original texts survive from the era of Babylonian mathematics. The Babylonians wrote on tablets of unbaked clay, using cuneiform writing. The symbols were pressed into soft clay tablets with the slanted edge of a stylus and so had a wedge-shaped appearance. Many tablets from around 1700 BC survived and we can read the original texts. Of course, their notation for numbers was quite different from ours and not based on 10 but on 60. To translate into our notation, they would not distinguish between 2106 and 216 as the context would show which was intended. It was not until around 400 BC that the Babylonians put two wedge symbols into the place where we would put zero to indicate which was meant, 216 or 21 " 6. The two wedges were not the only notation used, however, and on a tablet found at Kish, an ancient Mesopotamian city located east of Babylon in what is today south-central Iraq, a different notation is used. This tablet, thought to date from around 700 BC, uses three hooks to denote an empty place in the positional notation. Other tablets dated from around the same time use a single hook for an empty place. There is one common feature to this use of different marks to denote an empty position. This is the fact that it never occurred at the end of the digits but always between two digits. So, although we find 21 " 6 we never find 216 ". One has to assume that the older feeling that the context was sufficient to indicate which was intended still applied in these cases. We can see from this that the early use of zero to denote an empty place is not really the use of zero as a number at all, merely the use of some type of punctuation mark so that the numbers had the correct interpretation.

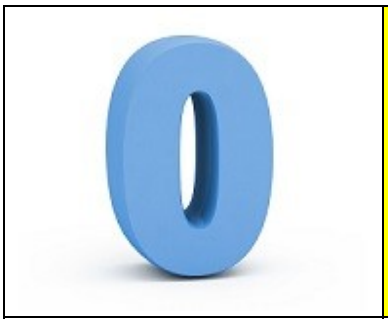


The first known calculator, viz. abacus (2400 BC), was probably invented by Babylonians as an aid to simple arithmetic around this date. This laid the foundations for positional notation and other computational developments. The ancient Greeks began their contributions to mathematics around the time when zero as an empty place indicator was coming into use in Babylonian mathematics. The Greeks however did not adopt a positional number system. It is worth thinking just how significant this fact is. How could the brilliant mathematical advances of the Greeks not see them adopt a number system with all the advantages that the Babylonian place-value system possessed? Greek mathematical achievements were based on geometry. Greek mathematicians did not need to name their numbers since they worked with numbers as lengths of lines. Merchants, not mathematicians, used numbers, which required to be named for records, and hence no clever notation was needed. There was however exception to what have just been stated. The exceptions were the mathematicians who were involved in recording astronomical data. **Here we find the first use of the symbol, which we recognize today as the notation for zero, and the Greek astronomers began to use the symbol O**. There are many theories why this particular

notation was used. Some historians favor the explanation that it is omicron, the first letter of the Greek word for nothing namely "ouden". **Otto Neugebauer** (1899-1990), Austrian American Mathematician, however, dismissed this explanation since the Greeks already used omicron as a number and it represented 70 (the Greek number system was based on their alphabets). Other explanations offered include the fact that it stands for "obol", a coin of almost no value, and that it arises when counters were used for counting on a sand board. The suggestion here is that when a counter was removed to leave an empty column it left a depression in the sand which looked like O. Zero represents nothingness and emptiness. The idea of nothingness and emptiness has always inspired mathematicians, physicists and even philosophers. Though the humans have always understood the concept of nothingness or having nothing, the **concept of zero is relatively new as it only fully developed in the 5th century AD**. Before these mathematicians struggled to perform even the simplest arithmetic calculations.

Ptolemy – Greco Egyptian Mathematician, Astronomer, Geographer and Astrologer, in the Almagest written around 130 AD, used the **Babylonian sexagesimal system (base 60 numeral system)** together with the empty placeholder O. By this time **Ptolemy** was using this symbol both between digits and at the end of a number and one might be tempted to believe that at least zero as an empty place holder had firmly arrived. This, however, is far from what happened. Only a few exceptional astronomers used the notation and it would fall out of use several more times before finally establishing it. Zero was certainly not thought of as a number by **Ptolemy** who still considered it as a sort of punctuation mark. **The idea of zero made its next appearance in Indian mathematics.** The scene now moved to India where it is fair to say the numerals and number system were born which have evolved into the highly sophisticated ones which we use today. Of course, that is not to say that the Indian system did not owe something to earlier systems and many historians of mathematics believe that the Indian use of zero evolved from its use by Greek astronomers. Some historians seem to want to play down the contribution of the Indians in a most unreasonable way. There are also those who make claims about the Indian invention of zero, which seem to go far too far. **What is certain is that by around 650 AD, the use of zero as a number came into Indian mathematics. The Indians also used a place-value system and zero was used to denote an empty place.** In fact, there is evidence of an empty placeholder in positional numbers from as early as 200 AD in India but some historians dismiss these as later forgeries**. First use of zero by mathematicians in India is dated around 500 BC**. **Indian Jaina mathematicians invented logarithms around 200AD.** Around 200AD, **Indian mathematician Brahmagupta was the first to describe the modern place-value numeral system (Hindu-Arabic numeral system).**

In 1400AD, Kerala School of Astronomy and Mathematics in South India invented the floating-point number system. In 300 BC, Indian mathematician, scholar and musician **Pingala was the first to describe the binary number system consisting of 0 and 1, which is now used in the design of essentially all modern computing-equipment**. **Pingala also conceived the notion of a binary code (collection of bits 0 and 1)**. **Similar to the Morse code, Binary codes of numbers are the lifeline of present- day classic computers** and will perhaps remain so till the design of classic computers is based on digital technology wherein both bits have digital representations of 0 and 1 and will perhaps continue to remain so till the arrival of **"Quantum Computers"** wherein both bits are represented by waves.



The brilliant work of Indian mathematicians was transmitted to the Islamic and Arabic mathematicians further west. Hindu Art of Reckoning describes the Indian place-value system of numerals based on 1, 2, 3, 4, 5, 6, 7, 8, 9, and 0. Ibn Ezra, in the 12th century, wrote three treatises on numbers, which helped to bring the Indian symbols and ideas of decimal fractions to the attention of some of the learned people in Europe. "The Book of the Number" describes the decimal system for integers with place values from left to right. In this work Ibn Ezra uses zero, which he calls 'galgal'(meaning wheel or circle). **The Indian ideas spread east to China as well as west to the Islamic countries.** In 1247 the **Chinese mathematician Ch'in Chiu-Shao** wrote "Mathematical Treatise" in nine sections which uses the symbol O for zero. A little later, in 1303, **Zhu Shijie** wrote "Jade mirror of the four elements" which again uses the symbol O for zero. **Fibonacci** was one of the main people to bring these new ideas about the number system to Europe. It is significant that **Fibonacci** was not bold enough to treat 0 in the same way as the other numbers 1, 2, 3, 4, 5, 6, 7, 8, 9 since he speaks of the "sign" zero while the other symbols he speaks of as numbers. One might have thought that the progress of the number systems in general, and zero in particular, would have been steady from this time on. However, this was far from the case. **Cardan solved cubic and quartic equations without using zero**. He would have found his work in the 1500's so much easier if he had a zero but it was not part of his mathematics. By the 1600s zero began to come into widespread use but still only after encountering a lot of resistance.

The differences between zero and nothing are critical. Many civilizations could not solve tricky calculations due to their ignorance towards the magical figure of zero. "Zero" is considered to be a number while "nothing" is considered to be an empty or null set. Zero has a numeric value of "0". A zero placed after a number increases the value of the number while zero placed before a number does not change the number. Imagine there are two students, "A" and "B" in a class. In a mathematics examination of 100 marks, "A' attends classes and appears is the examination while "B" neither attends classes nor

appears in the examination. Student "A" got zero marks in the examination while student "B" got nothing. The fact that "B" got zero marks in irrelevant. Zero has a measurable beginning and measurable end while "nothing" has neither any beginning nor any end. Zero is a relative term while absence of anything measurable is reflected in nothing.

The Roman number system did not need any value to represent zero. Instead of zero, the word 'nulla' was used by the Romans to specify zero. In Latin language, the word "nulla" means none, but there is no specific symbol to represent zero in the Roman literal system. Hence "nulla" is used to represent zero. Of course, there are still signs of the problems caused by zero. Recently many people throughout the world celebrated the new millennium on 1 January 2000. Of course, they celebrated the passing of only 1999 years, since when the calendar was set up no year zero was specified. Although one might forgive the original error, it is a little surprising that most people seemed unable to understand why the third millennium and the 21st century began on 1 January 2001. **Zero is still creating anxieties about its different perceptions through ages.**

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IMSP News:

❖ Annual Monsoon E-Workshop (AMW 2021) & National E Symposium

Annual Monsoon E-Workshop (AMW 2021) & National E-Symposium on "Changing climate and extreme events: impacts, mitigation & Role of oceans" was successfully organized by Indian Meteorological Society, Pune Chapter (IMSP), in association with Ocean Society of India, Pune Chapter (OSIP) and with kind supports from IITM Pune, IMD Pune and DASS SPPU Pune, on online platform, during 21st – 23rd February 2022 (3 days: Monday - Wednesday).

The inaugural session of the event included welcome address by **Dr. C. Gnanaseelan**, IMSP Chairman; expert addresses by Chief Guest **Dr. M. Mohapatra**, DGM IMD & President IMS; and by Guests of honour **Dr. R. Krishnan**, Acting Director, IITM and **Mr. K. S. Hosalikar**, Head CR&S, IMD; followed by vote of thanks by **Dr. Madhu Chandra R. Kalapureddy**, Secretary IMSP.

Annual Monsoon E-Workshop (AMW 2021) included presentations for both SW Monsoon and NE Monsoon over Indian region during the year 2021. **National E-Symposium on "Changing climate and extreme events: impacts, mitigation & Role of oceans" covered five themes,** respectively on **(1) Climate change, (2) Extreme events, (3) Impact of Climate change, (4) Climate change Mitigation, and (5) Role of Oceans on changing Climate and Extremes**. For these **5 themes, 52 abstracts** were received from various parts of the country. In total, there were **8 sessions** during the E-Workshop and the E-Symposium. The event included **20 Expert talks and 52 Oral presentations**. IMSP **received 30 feedbacks** from workshop participants and senior life members of the society. **Dr. Prabhat Kumar** was specially **felicitated by IMSP**, in recognition of his great achievement of obtaining **AMS** (American Meteorological Society) **Award**. For encouraging young participants & organizers, several awards were distributed. There were **16 awardees**, 13 for presentations and 3 for significant contribution in organizations. **Presentation awards were received by 13 young participants**: (1) Ambuj Kumar Jha (2) Meenu R. Nair (3) Subroto Halder (4) Naresh G. Ganeshi (5) Shreyas Dhavale (6) Diya Das (7) Dipankar Sarma (8) Anila Sebastian (9) Sandeep Narayanasetti (10) Anupama K. Xavier (11) Nandini G. (12) Darshana Patekar, and (13) Priya Priyadarshini. Ms. Smarti Gupta received award for the best performance (especially for nicely anchoring the event). Mr. Padmakar Domtuwar received award for the best IT services (especially for online arrangements, done very nicely) while Ms. Rashmi Sahu received award for the best services from the IITM Library (especially for webpage management & uploading important information). This year, the **Pune Chapter of Ocean Society of India (OSIP) joined hands** with IMSP, IMD & SPPU in conducting the AMW-2021 E-Workshop cum E-Symposium, and there was a very good synergy of Ocean and Meteorological Societies for working together towards popularizing science to the society. Great efforts by the Executive Committee of IMSP and various Committees formed for organization resulted in great success of this important event.

More Details (about this event) are available at the website of IMS Pune Chapter (IMSP), https://imdpune.gov.in/Links/imsp/index.html

❖ Election process for formation of new Executive Council (EC) of IMSP (for the term 2022-2024):

Election process for formation of new Executive Council (EC) of IMSP (for the term 2022-2024) has been initiated under the supervision of **Dr. Milind Mujumdar of IITM Pune**, **working as the Returning Officer**, and **Sh. Manish Ranalkar of IMD Pune**, working as the **Asst. Returning Officer**, with necessary supports from existing IMSP EC and IMS NEC member from Pune.

Formation of new National Executive Council (NEC) of IMS for the term 2022-2024

Following National Executive Council (**NEC**) of **IMS** was formed for the term 2022-2024:

Name and Number of the Post	**Name & Address of the Member elected**	**IMS Life-Membership No.**
President (1 Post)	Dr. Rupa Kumar Kolli, Pune	LM-325
Vice President (2 Posts)	1). Dr. D. R. Pattanaik, IMD, New Delhi	LM-992
	2). Dr. N. Subash, ICAR, Meerut, U.P.	LM-1762
Secretary (1 Post)	1). Dr. R. K. Giri, IMD, New Delhi	LM-746
Joint Secretary (1 Post)	1). Dr. Ananda Kumar Das, IMD, New Delhi	LM-948
Treasurer (1 Post)	1). Dr. Sankar Nath, IMD, New Delhi	LM-1926
Council Member (8 Posts)	1). Prof. P. V. S. Raju, Amity University, Jaipur	LM-553
	2). Dr. Vijay Kumar Soni, IMD, New Delhi	LM-993
	3). Shri Sikandar M. Jamadar, IMD, Pune	LM-1153
	4). Mr. Sanjay Bist, IMD, New Delhi	LM-1265
	5). Ms. Samanti Sarkar, IMD, New Delhi	LM-1296
	6). Dr. Pankaj Kumar, IISER, Bhopal	LM-1648
	7). Dr. Rajib Chattopadhyay, IMD, Pune	LM-2239
	8). Sh. Sunny Chug,IMD, New Delhi	LM-3159

There was **election for the President post**, contested between **Dr. Rupa Kumar Kolli of Pune** (**LM-325**) and **Sh. Anand Kumar Sharma of Delhi** (**LM-398**), The election was held by **e-Voting** only, during 28th March to 30th March 2022 [from 09:00 AM (IST), 28th March, 2022 (Monday) TO 05:00 PM (IST), 30th March, 2022 (Wednesday)], conducted smoothly by **Sh. N. Nigam, Returning Officer, IMS Election-NC-2022-2024**. **For all other posts, contesting members were elected unopposed**, as other nominations were not received to contest against them.

======== **Compiled by Somnath Mahapatra, Ex-Officio Member, IMSP EC** ==========

Become a Life Member (LM) of IMS, "Application Form for IMS LM Enrolment" is provided in Pages 38-39 of this Bulletin.

INDIAN METEOROLOGICAL SOCIETY **Affix latest Photograph**

FORM FOR ENROLLMENT

Proposal for Individual Membership

I wish to become Annual/Life member of Indian Meteorological Society.

1. Name in Full (Block Letter)

2. Office Address with Tel No.

3. Permanent Address with Tel No.

4. Residential Address with Tel No.

5. Mobile Number. **6. Email ID:**

7. Profession and present appointment

8. Nationality

9. Date of Birth

10. Academic and Technical qualifications:

11. Professional Record (appointments held)

12. Research Papers/Publications (Attach list, optional):

13. Member of Societies and Institutions:

14. Amount paid as Membership fee:

I hereby declare that I shall abide by the Statutes and Regulations of the Society and offer my co-operation in promoting its objectives:

Date: **Signature…….**

References

Name	Designation	Email	Mobile No.
1.			
2.			

Recommendation by Secretary, IMS

Signature…….Date……..

Approved / Not Approved, by IMS President

Signature…….Date……

Note All communication should be sent to the Honorary Secretary, Indian Meteorological Society, Room No. 605 Satellite Meteorological Building New Delhi – 110003 can be paid online or Cheque/DD should be made in favour of "INDIAN METEOROLOGICAL SOCIETY" payable at Delhi.

Bank details for Online payment towards IMS Life Membership

Bank Name: Central Bank of India

Branch address: 10, Loknayak Bhawan, Khan Market, New Delhi-110003

Branch Code: Khan Market / 0280310

Account No.: 1614232144

IFSC Code: CBIN0280310

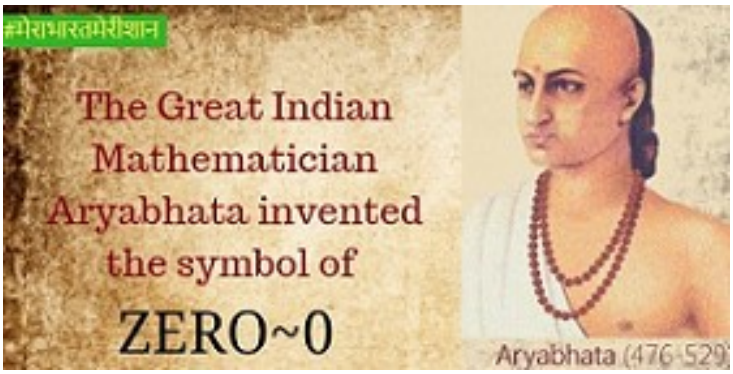
MICR Code: 110016018

SWIFT Code: CBININBBPAR

Membership Fee for Indian Members & Foreign Members

Annual Membership: Rs. 300/ -

Life Membership: Rs. 3000/- (for Indian Members); US $ 300 (for Foreign Members)



BIMSP Managing Editor: Somnath Mahapatra, IITM Pune

IMSP

INDIAN METEOROLOGICAL SOCIETY,
PUNE CHAPTER
(A Scientific Society registered under Govt. of India, New Delhi)

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