Respiration

"Invitation to biology" - Helena Curtis.

Respiration at intracellular level refers to oxygen requiring events that take place in the mitochondria and are the chief source of energy for the cell. For the organism as a whole it is taking in of O_2 & expulsion of CO_2. - which is essential for the former to take place.

⇒ Organisms that extract energy without O_2 are not very efficient.

(1) So transition to an atmos. carrying free O_2 a big major step in evolution.

(2) Another major step is transition to land.
Air much richer in O_2 than water.
1/5 of air is free O_2. whereas even in water saturated with air free O_2 is 1 part ~~by~~ in 250 (by weight).
So more water to be processed for same O_2. Also water weighs much more ∴ fish spends 20% energy in respiration whereas air breather spends 1 - 2%.
O_2 diffuses much more rapidly in air. So can be replenished

Air under pressure responsible for respiration.
If low pr. one can feel the changes.
O_2 enters cell by diffusion Concn. gradient. More O_2 outside than inside where it is used up.
III^{ly} CO_2 also thrown out by concn. gradient.
The larger the volume of the animal, smaller is its exposed surface area. Hence, larger organisms in which interior cells are metabolically active require a means of increase of their surface over which diffusion of O_2 & CO_2 can occur. & also a means of transport of O_2 & CO_2 to and from this surface area. These increased surface areas are gills and lungs & the transport system is the bloodstream.

के सल्फाइड्स। संध्याकाल का धुंधलका इसमें समाया हुआ है। जैसे संध्याकाल मानो तो दिन का हिस्सा है और मानो तो रात का, और न मानो तो दोनों का नहीं इसी के चलते इस भा का नाम है संध्या भाषा।

रसशास्त्र दुनिया भर में उभरे एक प्रवाह का अंग है, जिसे अलकेमी या किमियागरी नाम दिया गया है। अनुमान है कि इसका उद्गम चीन में हुआ और वहीं से यह धारा अरबों तक पहुंची। इस दौर में अरब, या सही गायने में पश्चिम एशिया, दुनिया भर के ज्ञान का भण्डार बनता जा रहा था। सो वहां से यह धारा चौतरफा फैली। भारतीय उपमहाद्वीप में भी पहुंची। कालान्तर से यूनान और यूरोप में तो किमियागरी आधुनिक रसायनशास्त्र में तबदील हुई। किन्तु इस उपमहाद्वीप में ऐसा नहीं हुआ बल्कि कुछ समय बाद यह धारा सूख ही गई।

जैसा कि हम फिल्मों में कह चुके हैं कि किमियागरी की मूल प्रेरणा है एक दोहरी खोज-मनुष्य को अमरत्व प्रदान करना और हर पदार्थ को सोने में बदलना। वैसे मनुष्य को अमरत्व देने का बातें आयुर्वेद में भी थीं और अन्य देशों के चिकित्सा विज्ञान में भी थी। परन्तु किमियागरी उससे भिन्न है क्योंकि इसका मार्ग अलग है। यहां सच्ची विद्या की कसौटी यह है कि वह किसी भी धातु को सोने का रूप दे सके। यही लक्ष्य किमियागरी के प्रयोगों का प्रेरणास्रोत है और किसी हद तक उसका बंधन भी। इस मूल लक्ष्य के कारण किमियागरी के प्रयोगकर्त्ता अपने विभिन्न प्रयोगों का अपने आप में आकलन-मूल्यांकन नहीं करते। अलग-अलग प्रयोगों के परिणामों का भी कोई अपना महत्व नहीं था। महत्व था तो प्रयोगों की पूरी श्रृंखला समाप्त हो जाने के बाद प्राप्त निष्कर्ष का। हुआ यों कि यूरोप में पेरासेल्सस ने इस श्रृंखला को तोड़ दिया और अलग-अलग प्रयोगों का महत्व स्थापित करने में सफलता पाई और इसकी बदौलत किमियागरी केमिस्ट्री में तबदील होने का रास्ता बन गया। यहां ऐसा कुछ न होने पाया और मूल लक्ष्य हासिल न होते देख धीरे-धीरे इस विद्या का महत्व कम होता गया।

रसशास्त्र का एक खास नजरिया था कि कुदरती घटनाओं को स्त्री-पुरुष तत्वों और इनके द्वन्द्वों के रूप में देखना। इन दो तत्वों में से किसी एक का स्थान ऊंचा नहीं था। रसशास्त्र का यह विचार मूलरूप में चीन के यिन-यान्ग द्वन्द्व में से उभरा था।

भारतीय उपमहाद्वीप में इसे अपने एक अलग ही रूप में ढाला गया। वैसे तो ऐसे द्वन्द्व का जिक्र सांख्य, तंत्र, योग और बहुत से आदिवासी जादू-टोनों में है परन्तु इस सबको कोई खास मान्यता नहीं थी। और फिर जाति-प्रथा आधारित सामंती समाज व्यवस्था में भला स्त्री और पुरुष तत्वों को एक बराबर कैसे माना जा सकता था?

तो, रसशास्त्र की विधाएं तत्कालीन मध्ययुगीन समाज की नजरों में बहिष्कृत थीं। उसी तरह से तांत्रिक क्रियाकलाप भी बहिष्कृत थे। शारीरिक क्रियाओं, संभोग, जादू-टोना, रसविद्या, आदि को तांत्रिक बहुत महत्व देते थे। ये सब उनके लिए अध्ययन-खोज के साधन थे। तांत्रिक गण मिलने भी चोरी छिपे थे और उनके क्रिया कलाप भी रहस्यमय होते थे।

आज त्रांत्रिक विधाओं को लेकर बड़ी दुविधा की स्थिति हैं। अधिकतर जानकर लोग तांत्रिक विधाओं को अतिरेक पूर्ण और कुरुप (विकृत) मानते है। और उनकि बात गलत भी नही है। लेकिन तांत्रिक विदाओं के योगदान को अनदेखा भी नही खिया सकता। चित्रकारी में आज तांत्रिक विज्ञास सुन्दर ज्यामितीय आकारो के रूप में दिखाई पडते हैं। और उनका प्रभाव काफी दूर तक फैल चुका है। चिकित्सा से तो तंत्र-योग सांख्य का पुराना रिश्ता है। रसशास्त्र के प्रभाव के कारण चिकित्सा में वनस्पतियों (जड़ी-बूटियों) के अलावा रसों और भस्मों का इस्तेमाल शुरू हुआ। एक पूरी सिद्ध चिकित्सा प्रणाली इसमें से उभरी। आज कुडंलिन योग आगी जैसी तंत्र विदाये कापी लोक प्रिय हो रही है। कुछ हद तक पाश्चात्य विश्व में भी चाहे उसके पुरे दर्शन से काटकर ही सही.

में देखती हूं तो मुझे रसशास्त्र और तांत्रिक विधाओं में एक अजीब सौन्दर्य की अनुभूती होती है। यह सौन्दर्य उनकि अभिव्यक्ति में उनके प्रस्तुतिकरण में झलकता है। यह सौन्दर्य अतिरेखपूर्ण और कुरूप के फतवे से मेल नही खाता। किन्तु जब मैं तांत्रिक विधाओं को उस काल मैं उभती मध्ययुगीन व्यवस्था के संन्दर्भ में रखकर देखती हूं तो बहुत कुछ स्पष्ट होने लगता है। समझ में आने लगता है। कि क्यों ऐसा फतवा जारी कीया होगा।

में देखती हूं। कि तांत्रिक ने जिन बातों पर "अतिरेखपूर्ण" बल दिया है। उनमें एक तालमेल है। एक पैटर्न है। जैसा स्त्री-पुरुष संबधों का आनंद का साधन कदापी नही माना जाता था। (हकीकत में साधन होना और माना जाना दो अलग-अलग बातें जो है) इसी प्रकार से उस समय स्त्री और पुरूष तत्वो मैं पुरूष तत्व को ही प्रधान और निर्णायक माना जाता था। और स्त्रियों तथा नीची जातियों को इयलोक में अमरत्व पाने कि जरूरत और सहूलीयत की चर्चा ही निषिद्ध थी। शायद इसीलिए एकदम वीपरीत तांत्रिक विधाओं में शामिल होणे वालों पर न जाती का बंधन था और न स्त्रि-पुरूष होने का।

मुझे लगता है बात अब कुछ-कुछ साफ होने लगती है। उनका चोरी छुपे मिलना भी उनका अतिरेक भी और उनका सौन्दर्य भी समझ में आने लगता है। व्यावस्था की अती कटोर बंधनो कि घुगट से बाहर निकलने की यह एक कोशिश थी। मैंने देखा है कि कई बार ये कोशिशे बीन्कुल एक प्रतिबिम्ब से होति है। साहीत्या में देखा ही है, इतिहास में भी देखा है अतिरेक प्रतिबिम्ब अतिरेक ही होता है। अधुनिक काल में पाश्चात्य समाज के अजीब और गरीब दबावों के चलते एक अजीबो गरीब प्रतिक्रिया हुई थी। जिसे हिप्पीराद का नाम दिया गया है। एक अतिरेक के रूबरू उसका प्रतिबिम्ब!

लेकिन सात ही तांत्रिको की यह कोशिश कहीं स्वतंत्रता मुलक भी थी। यह उनके अजीब सौन्दर्य का आधार हैं। यह कोई बेतुका अतिरेक नही है। आज अगर तंत्र इत्यादी लोकप्रिय हो रहे है। तो उसका भी कारण यही है। लेकीन अंततः हमें याद रखना चाहीए उसी संध्याभाषा का सबक। बात अतिरेक की कही जाए तो सच बात शायद उसकी गहराई में जाने की हो उससे ऊपर उठने की हो।

Math-astro

तेरहवीं सदी के शुरू में इटली के पश्चिमी शहर पीसा में लिनार्दो फिबोनाची रहते थे, जो एक व्यापारी व यात्री थे। वे एक अच्छे गणितज्ञ भी थे। उनके नाम से प्रसिद्ध फिबोनाची श्रेणी पर आज एक गणित पत्रिका भी नियमित रूप से निकलती है। लिनार्दो अपने धंधे के सिलसिले में देश-विदेश, खासकर अरब देशों में घूमा करते थे। कई उन्होंने १२२० ई. में एक गणितसंबंधी किताब लिखी थी। कई विद्वान इस किताब को यूरोप में गणित के पुनरूत्थान की शुरूआत मानते हैं। इस किताब में लिनार्दो ने लिखा कि जब तक यूरोप, अरब लोगों की अंक पद्धति नहीं अपनाता, तब तक वहां गणित की प्रगति असंभव है। शून्य को शामिल करके इस उपमहाद्वीप में बनी वही अंक पद्धति आज अंतर्राष्ट्रीय अंक पद्धति बन चुकी है।

यह एक उदाहरण है जिससे पता चलता है कि तेरहवीं सदी तक यूरोप के गणित और भारतीय उपमहाद्वीप (और चीन व अरब देशों) के गणित में कितना फासला था।

लिनार्दो खी किताब जब प्रकाशित हुई, तब भास्कराचार्य (द्वितीय) को जन्मे सौ शाल भी नहीं हुए थओ। मतलब जब यूरोप में एक सुगठित अंक पद्धति भी विकसित नहीं हुई था, तब तक यहां पर गणित विकास चरमोत्कर्ष पर पहुंच चुका था। इसकी एक मिसाल तो स्वयं भास्कराचार्य ही हैं। लगभग उतनी ही जबर्दस्त एक और मिसाल है 'माटीगमित' की परम्परा।

पाटीगणित दरअसर गणित का एक पूरा पाठ्यक्रम था। अब चूकि यह संस्कृत में था, इसलिए ब्राह्मणों को ही उपलब्ध होता था। किन्तु इसकी विशेषता यह है कि इसमें किसी असाधारण गणितीय प्रतिभा का नहीं बल्कि एक मामूली पाठ्यक्रम का समावेश है। खुद भास्कराचार्य के ग्रंथ 'सिद्धान्त शिरोमणी' का 'लीलावती' नामक अध्याय पाटीगणित का ही एक उदाहरण है।

आर्यभट के समय से इस पाटीगणित का मोटा-मोटा रूप तय हो चुका था। इसमें आम तौर पर २९ किस्म की गणनाएं सामिल थीं, जिन्हें

Human lungs

Air → warmed & cleaned in nasal passage → trachea → bronchi → divide & subdivide into smaller passageways → alveoli where actual exchange of gases occurs. alveoli are air sacs each only 1 - 2 mm in diameter. A pair of human lungs has about 300 million alveoli providing respiratory surface area of 70 sq. m. or 750 sq ft - ~40 times surface area of entire human body.

Lung volume controlled by changes in size of thoracic cavity. While inhaling contract muscles beneath rib cage flattening diaphragm, increasing thoracic cavity ↓ pressure. Air enters. As muscles relax, again lungs get emptied. 10% exchanged at every breath. Deliberate deep breathing - 80%.

Rate controlled by centre in brain. Sensitive to presence of CO_2. If amount increases rate changes. It is generally involuntary control.

Transport of O_2

O_2 not very soluble in water. Carried in blood by haemoglobin. Each mol. combines with 4 atoms of O_2, enabling blood to carry 60 times as much as O_2 as could be transported by an equal (~~amount~~ vol.) of water or plasma. If these molecules were free, blood would be more viscous & it would be a greater load on heart & blood vessels. So carried in specialised red blood cells. A mature RBC carries ~265 million molecules of haemoglobin (which is red).

CO_2 is 30 times more soluble so carried largely by plasma.

CO combines with haemoglobin in the site for O_2 & hence is so poisonous.

SS-4

७ / मध्ययुग / रंजन

श्रृंखला की इस सातवीं कड़ी में शामिल है ईसा की सातवीं से लेकर बारहवीं सदी तक का एक लंबा अंतराल। हमारे मुताबिक यह भारतीय उपमहाद्वीप के मध्यकाल का प्रथम चरण है। मैं जानबूझकर "हमारे मुताबिक" कह रहा हूं क्योंकि इसी बात को लेकर हमारे बीच एक बहस छिड़ गई. इस बहस की वजह मैं ही था क्योंकि मुझे मालूम नहीं था कि मेरे जेहन में अंग्रेज़ इतिहासकार मिल विराजमान था।

जब हम लोगों ने इस कड़ी के बारे में चर्चा सुरू की, तो निसिम, मैत्रेयी और शहनाज़ बड़ी सहजता से इसे 'भारतीय उपमहाद्वीप का मध्यकाल' पुकारने लगे। दूसरी तरफ मुझे लग रहा था कि मंदिरों का बनना, रसशास्त्र व गणित का विकास, आदि बातों से इसका तालमेल नहीं बैठ पा रहा है। और वैसे भी धुंधला सा याद आता था मध्यकाल तो कहीं बारहवीं तेरहवीं सदी से शुरू होना चाहिए। अमृता के मन में यही बात थी। सो हमने उन्हें रोककर शंका उपस्थित कर दी।

मुझे अच्छे से याद है कि कैसे एक क्षण के लिए पूरी बातचीत कूर गई थी और फिर निसिम, मैतेयी और शहनाज़, जिनमें पहले से घनिष्ठता थी, मुस्कराने लगे। निसिम ने कहा, "मैं को राह देख रहा था कि यह सवाल कोन, कब उठाता है।"

मैंने खीझकर कहा कि "भाईसाहब, यदि आप लोगों को पहले से इस सवाल की उम्मीद थी, तो पहले ही इस मसले को करीने से सुलझाया क्यों नहीं ?

निसिम मुस्कराते रहे और बोले "इसलिए कि मैं तुमसे एक सवाल पूछना चाहता हूं कि क्यों ? याने क्यों मध्ययुग बारहवीं सदी से शुरू होना चाहिए ?"

मैं अब तक सचमुच झुंझला गया था। "तो क्या अब मुझे इतिहास का इम्तिहान देना होगा ?"

निसिम गम्भीर हो गए और बोले, "नहीं ऐसी बात नहीं है। पर यकीन मानो, मैं मजाक नहीं कर रहा हूं। खैर, जवाब भी मैं ही देता हूं लेकिन उसे थोड़ा ठोंक-बजाकर ही स्वीकार करना।" तभी मुझे पता चला कि मेरे जेहनसे मिल का क्या संबंध है।

मिलने भारतीय उपमहाद्वीप के इतिहास को तीन हिस्सों में बांटा था - हिन्दू, मुस्लिम और आधुनिक सन् १९४७ के बाद भी इन हिस्सों की सीमाणं ज्यादा नहीं बदली हैं, सिर्फ नाम बदल गए हैं। अब हम इन्हें प्राचीनस मध्यकालीन और आधुनिक काल मानते हैं। मुझे यह अटपटा लग रहा था कि मंदिर बनना, रसशास्त्र, इत्यादि में कहीं इस्लाम का प्रभाव नहीं दीख रहा था। फिर भला वह मध्यकाल कैसे हो सकता है ?

बात यह है कि वर्गीकरण के लिए कोई आधार चाहिए। मिल का आधार स्पष्ट है - धर्म। यदि हम इस आधार को नहीं मानते तो प्राचीन, मध्यकालीन और आधुनिक की सीमाएं बांधने का क्या आधार है ? हमारे सोच में इस आधार को लेकर अस्पष्टता है। इस वजह से बिना कहे वह आधार धर्म ही बन जाता है। आरिवर समय-सीमाएं जो वही हैं। एक तरह से यदि हम उन्हीं काल खण्डों को प्राचीन, मध्य, आधुनिक कहते हैं, तो इस विभाजन के धार्मिक आधार को भी मौन स्वीकृति सी मिल जाती है।

अगर हम दुनिया के बाकी हिस्सों में मध्यकाल का आधार देखें, तो काफी स्पष्ट नजर आता है - पुराने एक छत्र रोमन साम्राज्य का पतन और उसकी जगह स्थानीय सामंत आधारित शासन व समाज का उभरना। इसी कसौटी पर अपने यहां की परिस्थिति को देखें, तो मध्यकाल की शुरूआत गुप्त साम्राज्य के आरम्भ से नहीं, तो इसके पतन से तो हो ही जाती है। हम जानते हैं कि सारे इतिहासकार इस बात से सहमत नहीं हैं। निसिम को छोड़कर हममेन से कोई भी 'इतिहासज्ञ' नहीं है। फिर भी हम यह मत आपके सामने रखने की धृष्टता रहे हैं।

स्वामीभक्ति और यगुण ईश्वरभक्ति, दोनों ही इस सामंथी नज़रिये के पहलू हैं। ये भी इसी काल में स्थापित हुए। इसी काल में लड़ाईयों का रूप बदला कबीलों की आपसी लड़ाईयों के बजाय ग्रामव्यवस्था पर टिके सामंतों की खींचतान ज्यादा महत्वकी बनने लगी। जातिप्रथा पर आधारित हिन्दूधर्म का गठन और शंकराचार्य की पीठों द्वारा उस पर मोहर लगाना भी इसी काल की घटनाएं हैं।हमारे मुताबिक, जिसे मध्यकाल कहा जाना चाहिए, वह इनी दौर में शुरू हुआ था।

मिल के विभाजन को बिना जांचे-परखे स्वीकार करना काफी खतरनाक भी है। क्योंकि इसे स्वीकार कर लेने के बाद, हम यहां आए तुर्की, अरबी, अफगानी, मुग़ल-अलग-अलग देशों के सामंतों, कबीलों, सैनिकों को एक ही श्रेणी - मुसलमान - के रूप में देखने लगते हैं। असल में यहां जो सामंतों के अलग-अलग तबके ये उनकें ये नये तबके बनकर जुड़ गये और इन सारे तबकों में आपसी खीचतान चलती रही. इनको इस तरह एक साथ रखकर मुस्लिमों के तौरपर देखने से उस समय का मुख्य संघर्ष सामंतों के बीच की खींचतान न दिखकर, हिन्दू बनाम मुसलमान नजर आने लगता है। असल में ये तबके बनते थे सामंत-विशेष के अनुरूप। और फिर 'हिंदु' सामंत की तरफ से लड़नेवाले मुसलमान स्वामीभक्त कहलाते हैं और 'मुस्लिम' सामंतों की तरफ से लड़ने वाले हिन्दू गद्दार करार लिए जाते हैं - या इससे ठीक उल्टा ! दोनों धर्म के कट्टरपंथी यही तो चाहते हैं कि हम तवारीख को इसी नजर से देखें। इस मामले में वे पूरी तरह एकमत और एकजुट हैं।

तो, यह रेखा धर्म के नाम पर नहीं खीची जी सकती है। इतिहास गवाह है कि ऐसी कोशिशें हमेशा नाकाम रही हैं। मक्कामदीना और काबे के प्रति समान श्रद्धा के बावजूद इरान-इराक युद्ध नहीं टला। लेकिन हमारे यहां एक बड़ी गलतफहमी यह है कि इस श्रद्धा से देशभक्ति में खलल पड़ता है, कमी आ जाती है।

यह धारणा इतनी आम है कि क्या कहें। मुझे लगता है कि इस उपमहाद्वीप के अधिकांश, खासकर हिंदू, सिक्ख, जैन, इत्यादी धर्मों के लोगों के अनुभव में एक बड़ी कमी है।

एक अध्येता और चिंतक की बात यहां याद आती है। वे कहते हैं कि हर व्यक्ति, हर समूह की तीन भूमियां होती हैं - जन्मभूमि, जहां वह जन्म ले; कर्मभूमि, जहां वह अपना कृतित्व साकार करे; और धर्मभूमि, जहां से उसकी धार्मिक श्रद्धा जुड़ी हों।

वे आगे यह भी कहते हैं कि भारतीय उपमहाद्वीप के अधिकतर लोग इस मामले में अपना सौभाग्य, अपना अनूठापन और उसकी सीमाओं को बिलकुल नहीं पहचानते। यहां इस्लाम और इसाई धर्मावलंबियों को छोड़कर बाकी अधिकांश धर्म के लोगों की जन्मभूमि, कर्मभूमि और धर्मभूमि एक ही है। ऐसा होना आम बात न होकर अपवाद ही है।

दुनिया के अधिकांश लोगों के मामले में ऐसा नहीं है। अगर किसी की जन्मभूमि और कर्मभूमि एक है, तो धर्मभूमि कहीं और है। यदि कर्मभूमि और धर्मभूमि एक है, तो जन्मभूमि कहीं और है। और यहूदियों, फिलिस्तिनियों और कई खानाबदोश समूहों के लिए तो तीनों अलग-अलग हैं। इस तरह से जीने का, इस तरह से तीन भूमियों के प्रति श्रद्धा की परस्पर अंतर्क्रिया का उन्हें अनुभव है। हिन्दू धर्म की सहिष्णुता को मैं नकारता नहीं। लेकिन इसाईयत और इस्लाम को लेकर जल लोगों से बातचीत होती है, तो लगता है कि इस अनुभव की कमी का बड़ा महत्व है। हमारे अचेतन में कहीं यह अपेक्षा है कि ये तीनों भूमियां एक ही होनी चाहिए। कहीं मन में इसे एक सामान्य सी बात मानकर चलते हैं। किन्तु इससे जो एक अव्यक्त सी मांग बनती है, वह असंभव चीज की मांग होती है। दरअसल यह अहसास बहुत जरूरी है कि इन तीन भूमियों का एक होना असामान्य है, अनोखा है। यह अहसास न हो, तो हम सहिष्णुता के दायरे को कभी विस्तार न दे पाएंगे।

७ / रसशास्त्र / अमृता

मुझे रसशास्त्र से पहले उसकी भाषा ने आकर्षित किया, जिसका नाम भी बड़ा प्यारा है - संध्या भाषा। यहां रसशास्त्र का विकास तांत्रिक विधाओं के एक अंग के रूप में हुआ और इसी में उसकी भाषा का स्वरूप निहित है।

इस संध्या भाषा में कहा कुछ जाता है बात कुछ और होती है। जैसे शिव और पार्वती की लीला और उनका मिलन। रसशास्त्र के दायरे में शिव नाम है पारे का और पार्वती है गंधक। इनके मिलन से बनता है या तो सिन्दूर या फिर कजरी अर्थात् पारे

Circulation

Bloodstream carries gases, food mols, hormones & wastes
Heart → arteries → smaller arteries → capillaries who supply to tissues. Substances pass in and out by diffusion
Total length of capillaries in human adults: 50,000 miles.
Even cells in walls of arteries and veins as well as the heart depend on the capillaries.
Capillary → small veins → large veins → heart.
dia. of aorta (largest artery): 2.5 cm. cap: 8 microns
vena cava (" vein) 3.0 cm.
Pumping essential to push thro' capillary.
Veins carry back due to movements. Valves prevent backflow.
Heart: Two parts. Right receives blood from tissues → lungs for oxygenation → left part → body tissues.
High pr. double circulation system necessary for high metabolic rates of both birds & mammals with constant body temp & high level of activity.
Heartbeat regulated by pacemaker → area on heart itself.
→ Nervous system does not initiate heartbeat but controls its rate (Adrenaline ↑ in times of stress. Also constricts peripheral veins More blood to heart & lungs)
Blood: 55% Plasma. 90% H_2O. fibrinogen (nec. for clotting) nutrients, ions, antibodies, hormones & enzymes, waste materials such as urea. A filtrate of plasma with no cells and no proteins bathes cells of the body seeping out of cap. walls flowing into tissue spaces & reentering caps.
45% of blood: red cells, white cells, platelets.

red cells ↓ mainly for hemo. life 127 days 25×10^{10} in body. Produced in the bone marrow

white cells ↓ for every 1000 rbc 1 wbc. Fight by (i) creating antibodies (ii) phagocytosis. Pus → dead white cells. Formed in spleen, bone marrow & other special tissues.

platelets → imp. in plugging breaks in blood vessels & clots form.

5/ मौलिक - bवा/1

जो वर्णमाला हम सीखते - रटते है उसका ~~क्रम~~ और विभाजन उच्चारण के प्राचीन अध्ययन ~~division goes back to the old study~~ पर आधारित है ~~of phonetics~~. स्वर और व्यंजन ये विभाजन सबसे पहले आता है. स्वर - जैसे कि अ, आ, इ - हम अलगसे उनका उच्चारण कर सकते हैं. लेकिन व्यंजन - ~~क~~ जैसे क्, ख्, ग् (याद रहे क, ख, ग नहीं बल्कि ~~नीचे पैर~~ हलन्त वाले मुडे हुआ क्, ख्, ग्) का हम अलगसे उच्चारण नहीं कर सकते. उसे किसी स्वरसे या किसी अन्य अक्षरसे जोड़कर ही हम उसका उच्चारण कर सकते है. यानी

क् - उच्चारण नहीं कर सकते

क् + अ - क
क् + ई - की
क् + र - क्र
प + क् - पक्

} उच्चारण कर सकते है

~~व्यंजनों में भी वो किस तरह बोला जाता है~~

~~इसके से नरीकोंसे~~

व्यंजनों में भी एक रचना है; कहांसे उच्चारण होता है, मृदु है, ~~कठिन~~ कठोर या अनुनासिक और उच्छ्वासित है या नहीं. इ. इसका एक ब्यौरा आगे दर्शाया गया है.

	कठोर: अनुच्छ्वासित	कठोर: उच्छ्वासित	मृदु: अनुच्छ्वासित	मृदु: उच्छ्वासित	अनुनासिक (न.कं.)	
कण्ठ्य (गलेसे)	क	ख	ग	घ	ङ	
अर्धो तालव्य तालु (~~पूर्व~~ के पिछले भाग को जीभसे छूकर)	च	छ	ज	झ	ञ	य श
ऊर्ध्व तालव्य (तालू के अगले भाग को जीभसे छूकर)	ट	ठ	ड	ढ	ण	र ष
~~दन्त्य~~ दंततल्वा (जीभके दांतोंको छूकर)	त	थ	द	ध	न	ल स
ओष्ठ्य (होंठोंके होंठ जोडकर)	प	फ	ब	भ	म	व

Digestion & Excretion

One symptom of life - capacity to exchange materials with the environment and still maintain their charact. chemical composition & str. This process thro' digestion & excretion. Digestion is breaking of food into molecules small enough to enter the cells. Mols: monosaccharides, amino acids, fatty acids, iron and other minerals.

Enzymatic processes begin in the mouth. Saliva alkaline. Activity is under nervous control. Hence 'watering' of mouth. Swallowing voluntary action but once it reaches pharynx it is automatically transferred to esophagus.

Secondary processing: stomach.

Secretes HCl: kills bacteria & activates pepsinogen → pepsin rxn.

pepsinogen ⟶ pepsin → breaks proteins

Little mucus absorption. Only that of glucose & ~~little~~ alcohol.

Stomach under neural & hormonal control.

Anticipation of food stimulates prodn. of gastric juices

Food in stomach releases hormone gastrin - ↑ gastric juices.

Food mass in stomach for 3 - 4 hrs. Then changed consistency due to action of mucus, pepsin, HCl & churning. At a particular time opening to small intestine opened & mass moves into it ~~due to~~ by peristalsis.

Duodenum, Liver, Pancreas:

Duodenum mouth of small intestine (SI) or upper part. Most digestion occurs here in presence of enzymes secreted from its walls or coming from Liver, pancreas.

Amylases → breakdown of starch & glycogen as in the mouth.

Lipases → fat to glycerol & fatty acids.

3 types of enzymes break protein

1 group acts on bonds linking particular amino acids

⇒ One large protein

↓

shorter peptide chains

जाते हैं, लेकिन शब्दों के प्रयोग अर्थात भाषा के लिए ~~व्याक~~ व्याकरणविद के पास नहीं आते।

भाषा के इस पूरे मामले में हमें संस्कृत का अलग स्थान भी दिखाई देता है। पाणिनी तो 'संस्कृत' नाम से किसी भाषा को जानते तक नहीं। वे उसे कहते हैं सिर्फ - 'भाषा'। वे जिस दूसरी बोली का ज़िक्र करते हैं, वह है छांदसी अर्थात छंदों की भाषा। (उस समय ~~तब~~ तक यह भाषा आम लोगों के जीवन और बोलचाल से जुड़ी हुई थी। ईसा की पहली सदी के बाद उसका स्थान बदला। तब वह सिर्फ ब्राह्मणों, और खासकर पंडितों की भाषा बनकर रह गई। लोगों का आश्रय छोड़कर उसने राजाओं का आश्रय ले लिया। भाषा से वह संस्कृत बन गई, बोली भाषाओं को असंस्कृत ठहराकर।

संक्षेप में यों कह सकते हैं कि प्रयोग आधारित व लोक आधारित परम्परा से शुरु करके भाषा का विकास सिद्धान्तों में बंधता गया। भाषा जब संस्कृत बनी तो उसका आधार सिमटता गया और उस पर ब्राह्मणों का एकाधिकार हो गया।

2nd enzyme : acts on ends amino - or carboxyl.
After these two have acted,
third breaks remaining dipeptides into single amino acids, which is the form in which they are absorbed thro' the walls of the S.I. into blood.
Also alkaline fluid from pancreas to act on acid.
Bile made in liver, stored in gall bladder
It is mixture of salts that emulsify fats breaking them into droplets so that lipases can act on them.
Co-ordn. & regulation almost totally by hormones.

Hormone	Produced in	Stimulated by	Action.
Gastrin	Stomach	Food in stomach	$\uparrow$ gastric juices
Enterogastrone	— " —	Fatty acids in blood	Inhibits HCl prodn & gastric motility
Secretin	Duodenum	HCl in Duodenum.	Stimulates prodn. of pancreatic fluids bile bicarbonate.
Pancreozymin	— " —	Food in Duodenum.	stimulates release of ~~&~~ pancreatic enzymes.
Cholecystokinin	— " —	Fat in food in Duo.	Stimulates release of bile.

What is imp. is to appreciate the complex interplay of stimuli and checks and balances which serve to activate and inactivate digestive enzymes & adjust chemical environment.

Pancreas & Liver special digestive organs.
Pancreas also synthesis insulin & glucagon hormones.
Released into blood & regulate glucose concn. in blood.
Glucagon also stimulates breakdown of glycogen → glucose.
Liver → storage for sugar as glucogen. which releases glucose when sugar is low in blood. Also synthesises urea from nitrogenous wastes etc.

सही भी है। युक्लिड जैसे गणितज्ञों की इच्छा थी कि कुछ थोड़ी सी मूल मान्यताएं बना लें, जिनके आधार पर बाकी सारे समीकरण/सूत्र हल किए जा सकें। इस प्रयास में यह विश्वास होना जरूरी था कि इन मान्यताओं का कोई अपवाद नहीं होगा। इसके विपरीत हमारे यहां सामान्य सूत्र के साथ ही अपवाद सूत्र भी दिया जाता था। ऐसा करने के पीछे मान्यता यह है कि कोई भी सामान्य सूत्र अधूरा होता है और हर सामान्य सूत्र के अपवाद होंगे ही।

खैर, गणित में इसका जो असर हुआ सो हुआ। ~~पर अपवाद सूत्र की~~ व्याकरण में जो अपवाद सूत्र की परम्परा थी, उसके पीछे एक आसान सी बात थी। भाषा, बोलचाल की, लोक व्यवहार की भाषा व्याकरणविदों के हाथ में तो थी नहीं। लोग बोलते-चालते उसे बदलते रहते थे। अपने ढंग से नियम भी तोड़ते रहते थे। जिस परिस्थिति में ये नियम तोड़े जाते, वही अपवाद की परिस्थिति बन जाती और अपवाद सूत्र का जन्म हो जाता। जैसे पातंजलि कहते हैं, "प्रयोगशरणं वैयाकरणम्"। मतलब यह हुआ कि व्याकरण प्रयोग की शरण में है, उस पर टिका हुआ है। मतलब यह हुआ कि लोग जिस ढंग से भाषा का इस्तेमाल करते हैं, व्याकरण उसी में से बनता है; क्योंकि, पातंजलि के ही शब्दों में, लोग बर्तन के लिए कुम्हार के पास

Lower intestinal tract

From duodenum to ileum lower segment of S.I.
Most absorption of food mols. occurs here.
Also water is resorbed. Large qtys. of water enter stomach & S.I. from body fluids during digestion. So this is imp. process.
In L.I. most of remaining water removed. Indigestible remnants broken down by bacteria residing in the guts. These bacteria chief source of vit K necessary for blood clotting. Residue stored in rectum → anus.

Excretion, chemical regulation, water balance

Excretion crucial to regulation of chemical environment.
3 distinct excretory processes.

(i) Elimination of toxic or excess by products. - mainly CO_2 and N_2 compounds. CO_2 excreted as a gas
N by products → as urea.

(ii) Maintenance of ion concn. in intra-& extra-cellular fluids. e.g H^+, Na^+, K^+, Mg^{++}, Ca^{++} & Cl^-, HCO_3^-.

(iii) Regulation of water content.
Very imp. ∵ concn. of solutes is imp. not qty.

Kidney ~~consists~~ contains about a million filtration units, nephrons which filter, analyse & adjust the blood flowing thro' them. In the nephron is a ball of capillaries from whose walls due to blood pr. fluid is pushed out. This fluid has small mols. of the blood but not the blood cells and blood protiens. Fluid flows thro' a tubule that twists down & up again in the nephron & in the process most of the water and other useful substances are reabsorbed into the blood thro' capillaries around the tubule. Waste material like urea passes on & is stored in the urine collecting tubule → bladder, water & salt excretion also subject to hormonal regulation.

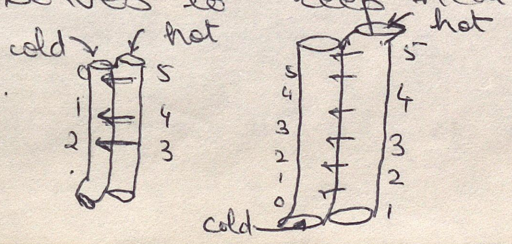
इस उपमहाद्वीप की लिपियों में आम तौर पर स्वर और व्यंजन पृथक किए जाते हैं और ~~उन्हें~~ प्रत्येक को एक ही उच्चारण से जोड़ा जाता है। व्यंजन को किसी स्वर से ~~जोड़~~ जोड़ने के लिए अलग चिन्ह होते हैं। अक्षर की इकाई को ~~समझने के बाद~~ समझ लें, तो ~~ये~~ इन सारी लिपियों में उच्चारण को सीधा लिपिबद्ध किया जा सकता है। यह बात समझने के लिए अंग्रेज़ी से ही तुलना करके देखिए। शब्दों की सही उच्चार से जो ~~spelling~~ वर्तनी ~~वर्तनी या हिज्जे~~ की झंझट इस उपमहाद्वीप की किसी भाषा में नहीं है।

यहां के संस्कृत उच्चारणशास्त्र और व्याकरण को जोड़ने वाली एक और चीज थी। इसका महत्व किसी मायने में कम नहीं है। यह चीज है नियमों के ढांचे और उनकी ऊंच-नीच। ~~अव्वल तो~~ ये नियम सूत्र शैली में बंधे हुए थे। परन्तु इनमें भी एक खास क्रम था। मोटे तौर पर इसे यों समझ सकते हैं: सबसे पहले कोई सामान्य नियम बनाया जाता, फिर यह बताया जाता कि अपवाद की स्थिति में क्या होगा। इसके बाद ऐसे उदाहरण भी दिए जाते थे जो इन दोनों स्थितियों में फिट नहीं होते थे।

इस बात का महत्व ~~आजकल~~ कुछ शोधकर्त्ता आजकल यहां के गणित से भी जोड़ते हैं। और मुझे लगता है कि यह काफी हद तक

Temp. Regulation

Life exists only in small temp. range, upper and lower limit of which is imposed by nature of biochemical reactions. Reaction rate doubles for every 10°C rise in temp.
Lower temp. limit fixed by fact that water necessary for reactions. So lower limit is freezing pt.
Upper limit is set by point when H bonds break.
So animals have to exist betn. temp. just under freezing to about 40°C or regulate internal temp. - homeostasis.
Warm blooded animals homeotherms birds & mammals.
Warmer at the core than the periphery.
Heat transported from core to periphery by blood.
At surface heat → air.
Temp. regulation involves increasing or decreasing heat production and increasing or ↓ heat loss at surface.
Constancy maintained by an autonomic system a thermostat in the hypothalamus which measures body temp. & triggers appropriate control mechanisms.
Although skin also has receptors they are not involved in maintaining internal equilibrium.
At high temp.: blood vessel near skin surface dilate ↑ blood supply. Perspiration begins. Evaporation cools the blood below skin. It involves water loss.
At low temp. blood vessels constrict restricting heat loss. Metabolic processes increase. ↑ thyroid hormone production ⇒ ↑ metabolic rate. Shivering is another process.
Extreme heat: too much water loss. needs to be compensated.
~~Low~~ " cold: adaptation by increased amounts of insulation.
Countercurrent exchange: betn. veins & arteries leading from and to the extremities serves to keep heat in the body & away from extremities



जाती है। अफ्रीका में ऐसे तबके हैं जो अपनी जनजाति का इतिहास याद रखते हैं। लेकिन भारतीय उपमहाद्वीप में विशेष ~~बात~~ बात यह रही है कि लिपियां और लेखन अच्छी तरह स्थापित हो जाने के बाद भी सदियों तक यह मौखिक परम्परा ही ज्ञान-विज्ञान के लेन-देन या संचार का साधन रही। इसकी सबसे 'विशुद्ध' और उतनी ही अतिरेकपूर्ण मिसाल हमें उन विषयों में ~~विषय~~ मिलती है जो अन्ततः ब्राह्मणों का एकाधिकार बने।

ऐसा माना जाता है कि ऋगवेद काल के अन्त में ऋगवेद और बाद में अन्य वेदों को हूबहू मौखिक रूप से पीढ़ी-दर-पीढ़ी हस्तांतरित करने की बात सोची गई थी। मुझे लगता है कि यह एक ऐसा कदम था, जिसके परिणाम दूरगामी हैं। ऐसा लगने का ~~के पीछे जो~~ ~~मूल में जो~~ आधार है, 'हूबहू हस्तांतरण ~~हस्तान्तरण~~' के विचार से शुरू होने वाली प्रक्रियाओं की शृंखला।

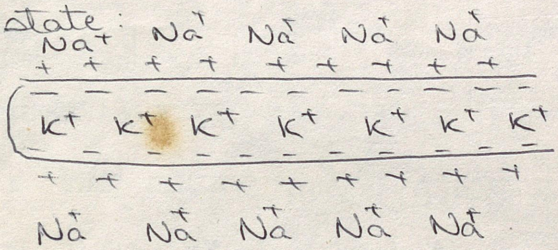
हूबहू हस्तांतरण का कारण यह था कि वेदों की ऋचाओं को मंत्र का दर्जा प्राप्त था। मंत्रशक्ति की कल्पना और साहित्य में कविता या ~~ग~~ पद्य का स्थान, इन दोनों का बहुत गहरा संबंध है।

यूं तो पद्य और गद्य के बीच कोई पत्थर की लकीर नहीं है किन्तु आम तौर पर दोनों में शब्दों का इस्तेमाल अलग-अलग ढंग से होता है और दोनों का उद्देश्य भी अलग-अलग है। पद्य ~~का~~ के तथाकथित

Nervous System

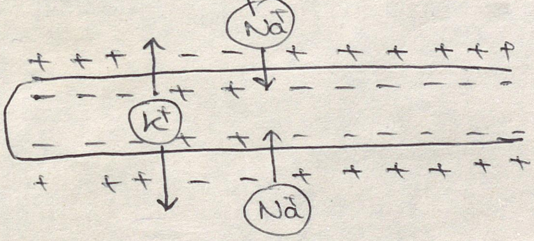
- Functionally differs from endocrine in its capacity for rapid response. Plants - slow living organisms - no nervous system.
- Unit is ~~neron~~ neuron or nerve cell.
  3 functional parts : reception area
  cell body
  axon / nerve fibre which transmits signals.
- Remarkable properties of the cell membrane.
  Membrane pumps out Na^+ & pumps in K^+.
  Concn. of K^+ 30 times higher inside & Na^+ 10 times outside.
  In resting state membrane impermeable to Na^+ & permeable to K^+. So Na^+ kept out - K^+ tend to leak out

Resting state:



Electric potential exists.

Stimulus depolarises a small portion



Depolarised membrane permeable to Na^+, impermeable to K^+. Na^+ rushes in, altering polarity at membrane within fraction of second reversal.
$-70mV \rightarrow +50mV$. and back.
Again regains permea. to ~~Na^+~~ K^+ & imperm. to Na^+

Excited segment affects adjacent section.
+ve charges inside membrane move to -ve charges. Same process repeated & impulse renews itself as it travels down the axon. Everything soon returns back to original concn.

- <u>Synapse</u>: Impulse from one cell → other across jn called synapse. Transmission across a synapse is by chemical means.
- 3 types of neurons (1) motor neurons carry impulses to glands
  (2) sensory nerons. receive impulse from sensory organs → CNS.
  (3) interneurons interpret & process messages from sensory neurons & send out messages to other interneurons or motor neurons

~~कथ्य~~ विषयवस्तु को, उसके शब्दों, उनकी ध्वनि और उनके आपसी तालमेल से अलग करके नहीं देखा जा सकता। गद्य पढ़कर हमें प्रायः उसकी विषयवस्तु याद रहती है। किन्तु पद्य पढ़ने के बाद विषयवस्तु तो याद रहती है, पर उसके शब्दों, ध्वनि, लय, ताल, सबके सहित। इसीलिए शायद अच्छी कविता लिखना जितना मुश्किल है, उसे मुंहजबानी याद रखना उतना ही आसान।

अच्छी कविता और उसके अकेले या सामूहिक गान/पाठ में एक शक्ति भी होती है। इसमें वर्णित घटनाओं का भाव बहुत असरदार और जीवन्त बन जाता है। वे घटनाएं, एक तरह से फिर से घटने लगती हैं। जैसे कि उस कविता में और उसके पाठ में एक शक्ति हो, मंत्रशक्ति की कल्पना को साकार करती हुई।

कविता जब रची जाती है, जब वह पंक्तियों के रूप में कवि के मन में उभरती है, तो मानो ये उसे कहीं से सुनाई पड़ती हैं। कवि को ये पंक्तियाँ कौन सुनाता है? आज के व्यक्तिवादी माहौल में कवि दावा कर सकते हैं कि यह उनके ही अन्तर्मन की आवाज है। हमें यह बात आसानी से समझ में आती है किन्तु यदि इसे थोड़ी देर के लिए भूल जाएं, तो फिर क्या कहेंगे कि ये पंक्तियां कहां से आती हैं। जरूर कोई अद्भुत शक्ति ही ये पंक्तियां कवि को सुनाती होगी। वेदों को 'श्रुति' मानने के पीछे कहीं ऐसी ही अद्भुत शक्ति की कल्पना जुड़ी है।

Brain & spinal chord constitute the CNS.
Nervous system outside of this is peripheral nervous system.
Within spinal chord sensory and motor neurons synapse with interneurons clustered in nuclei & fibres carrying info. from various parts of the body & those relaying instructions from the brain are clustered together in fibre tracts.

Somatic & Autonomic nervous system.

Autonomic generally classified as involuntary in contrast to somatic which controls muscles that we can move at will.
Distinction betn. voluntary and involuntary not clear cut.
Sympathetic and parasympathetic divisions of the automomic nervous system.
Somatic – motor & sensory neurons.
excitory reactions
restorative actions.

Vertebrate eye.

Photoreceptors in human eye are of two types.

rods: more light sensitive responsible for night vision

cones: finer resolution, more acuity and colour vision.

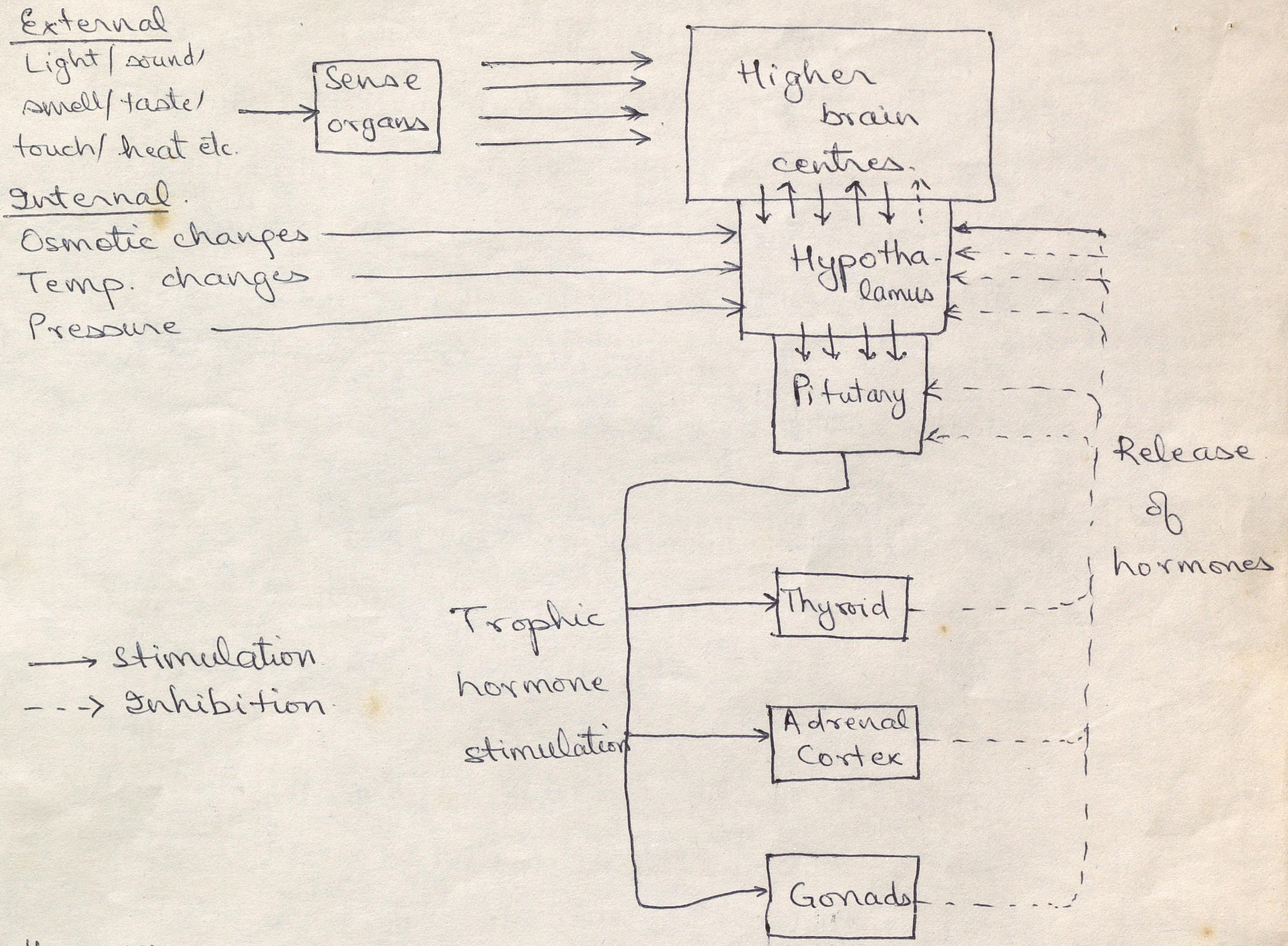
Overlapping of visual fields → stereoscopic vision.

संस्कृत साहित्य से मैं पहले से ही परिचित थी, वेदों से भी, लेकिन सिर्फ साहित्य के तौर पर। इस सीरीयल के काम के दौरान, जैसे-जैसे मैं विभिन्न अध्ययनकर्त्ताओं की रचनाएँ पढ़ती गई, उनसे और अपने साथियों से चर्चा करती गई, वैसे-वैसे मानो संबंधों की एक नई दुनिया मेरे सामने खुलती गई। अब वह साहित्य सामने आता है उस काल की घटनाओं से जुड़कर, उस जमाने के ज्ञान-विज्ञान के भण्डार से जुड़कर। उनमें अब इतने तरह के संबंध दिखाई देते हैं कि मुझे लगने लगा है कि किसी भी समाज के साहित्य की समझ इन संबंधों को समझे बिना अधूरी रह जाती है।

अब जब मैं वेदों से लेकर बाद तक के संस्कृत साहित्य को देखती हूं तो लगता है कि एक बात है जो बहुत सारे पहलुओं को जोड़ती है। वह बात है, एक खास मौखिक परम्परा जिसे इण्डो आर्यभाषी इस महाद्वीप में लेकर आए थे। इस मौखिक परम्परा की प्रकृति, उससे उभरने वाली जरूरतें, उसका प्रभाव-विकास और गठन की प्रक्रिया में बहुत सारी चीज़ों को छूते नजर आते हैं। यहां के सशक्त व्याकरण से लेकर गणित की कुछ परम्पराओं तक और मंत्रशक्ति की कल्पना से लेकर ज्ञान पर ब्राह्मणों के एकाधिकार तक - कितने सारे पहलुओं को यह प्रभावित करती है।

मौखिक परम्परा वैसे तो इण्डो-आर्य भाषियों की जागीर नहीं है। कई आदिवासी जनजातियों में भी यह पाई

Hormones



Hormones

Defn. : Chemicals produced in specific cells or tissues which act on other cells or tissues that are distant from production site. Released into bloodstream & carried to all parts of the body. Response to a hormone depends on the cell & also on the physiological state.

- General effects of hormones known, way in which they act at cellular level not clear.

इस 'श्रुत', ~~का~~ अद्भुत मानी जाने वाली शक्ति को समेट कर, उसे हूबहू हस्तांतरित करने के निर्णय में से कुछ जरूरतें भी उभरीं। सिर्फ शब्दों को हस्तांतरित नहीं करना था, साथ में उनकी ध्वनि, लय, ताल सब कुछ सौंपा जाना था। जो सामग्री थी, वह अलग-अलग जनजातियों ~~class~~ से आई थी और बहुत विस्तृत थी। तो, एक पद्धति बनाना बहुत जरूरी था।

अतः उच्चारण ~~ध्वनियों~~ का अध्ययन किया जाता था ~~गया~~ कि ध्वनियां उत्पन्न कैसे होती हैं, ~~वे~~ कैसे आपस में उनका मिश्रण होता है, ~~किसी~~ कोई ध्वनि-विशेष ~~का~~ शरीर की क्रियाओं में कैसे उत्पन्न होती है ~~!~~; कि किसी लय को समय में कैसे विभाजित किया जाए। और आगे चलकर शब्द, और वाक्य का अध्ययन करवाया जाता था ~~हुआ~~, व्याकरण का अध्ययन होता था और पाणिनी के अष्टाध्यायी का अध्ययन किया जाता था।

इसका एक बहुत ही महत्वपूर्ण घटक यह है सवाल ~~~~ है कि उच्चारण की ~~मु~~ मूल इकाई क्या है। ~~वे~~ यही अक्षर हैं। अक्षर उच्चारण की इकाई है और अक्षर या तो स्वर हो सकता है या फिर ~~वे~~ किसी स्वर (या अक्षर) के साथ जुड़ा हुआ व्यंजन। उच्चारण का यह विश्लेषण इस उपमहाद्वीप में बहुत पहले किया जा चुका था - लेखन ~~~~ के प्रचलन से भी पहले। इसीलिए यहां की सारी लिपियाँ ध्वन्यात्मक (उच्चारण आधारित) ~~ध्वन्यात्मक~~ हैं और उनमें उच्चारण की यह समझ शामिल है।

Some background determinants on health and disease.

[Ch. 2 'Dynamics of health & disease' Marshall]

The major determinants identified & dealt with in the chapter are:

(i) Genetic inheritance
(ii) Nutrition
(iii) The population problem
(iv) Poverty
(v) Iatrogenic disease. (!)

(ii) Nutrition:

Malnutrition → Infection → Malnutrition → Infection → Malnutrition

Although malnutrition sometimes produces diseases which reflect a single dietary inadequacy, it is usual for several deficiencies to exist simultaneously... An inadequate diet and a superimposed infection act synergestically to produce either frank disease or an infinite variety of less serious conditions – protein calorie malnutrition.

The most serious forms of protein calorie malnutrition are marasmus and kwashiorkor. The former is frank starvation, ingestion of too few calories. Connected with weaning period. Latter appears later. Preceded by infection & caused by a lack of protein & essential amino acids. Swahili word meaning 'disease of the first son' referring to condition of first son when a second child occupies his place at the mother's breast.

करे,कैसा आचरण करे। यह उत्तर कुरान या बाइबल जैसे ग्रंथों में मिल जाएगा।

लेकिन हिन्दूं धर्म में ऐसी कोई संहिता नहीं है। डॉ. आंबेडकर ने हमेशा कहा है कि हिन्दू धर्म में इस बात का कोई स्पष्ट उत्तर नहीं है कि मात्र एक हिन्दू व्यक्ति होने के नाते किसी व्यक्ति के क्या कर्तव्य हैं। शायद "अपना-अपना कर्तव्य करो" जैसा जवाब मिलता है। किन्तु इस तरह के कथन को स्पष्ट तो नहीं कहा जा सकता। मैं हिन्दूं हूं,इतना कहने से पूरी बात स्पष्ट नहीं होती। मैं किस वर्ण का हूं,किस जाति का हूं,यह जानने के बाद ही स्पष्ट उत्तर मिलता है और कर्तव्य निरधारित होता है।

यह एक महत्वपूर्ण बात है,खासकर जब हम भक्ति पर विचार करें। भक्ति एक पंथ था,एक विचार था और एक सुधार भी था। भक्ति के अलावा जो हिन्दू धर्म था और है,उसमें भगवान से रिश्ता जोड़ने का माध्यम ब्राह्मण ही थे। सामान्य व्यक्तियों का, खासकर निचली जाति के व्यक्तियों का तो भगवान से सीधे रिश्ता जोड़ना ही आपत्तिजनक था।

जब हम मन्दिर को भगवान के घर के रूप में और धर्म को भगवान और इन्सान के बीच की कड़ी के रूप में देखते हैं, तो एक स्पष्ट सिलसिला नज़र आता है। भीमबैठिका के शैलचित्रों में और हड़प्पा के शहरों में भगवान या परलोक के साथ रिश्ता जोड़ने का प्रयास हमें नजर आजा है,तो शायद हमारे आज के दृष्टिकोण की वजह से। परन्तु इण्डो-आर्यभाबियों के आने के बाद वैदिक काल में धार्मिक कर्मकाण्ड एक समुदाय-विशेष के हाथ में सिमटने की प्रक्रिया शुरू हो चुकी थी। इस परलौकिक शक्ति के साथ कैसा रिश्ता बने और उसके लिए उपयुक्त स्थान क्या हो? इसी में से शायद भगवान का घर यानि मंदिरों का सिलसिला शुरूहुआ होगा।

इस सिलसिले में बौद्ध स्तूप, बौद्ध गुफाएं, पहाड़ियों को तराश कर बनाए गए मंदिर और पत्थरों को चन-चुनकर बनाएं गए मंदिरों की एक लम्बी यात्रा थी। इस दौर की इस यात्रा में हर कदम पर धर्म का संस्थागत स्वरूप बनता रहा। मंदिर हमेशा से सत्ता का प्रतीक रहा और समय के साथ-साथ यह सत्ता और पुख्ता होती गई। इंसानों और भगवानों के बीच का फायला लगातार बढ़ता रहा। गुफाओं में,अपनी शर्तों पर,भगवान से सीधा संबंध बनाने से लेकर हम उस हाल में पहुंचे जहां एक गुफानुमा गर्भगृह है,एक बाहरी कक्ष है,उसके बाहर एक और कक्ष है, परकोटा है और बीच में ब्राह्मण और पंडित जैसे कई मध्यास्थ। भगवान को अपने बीच लाने के प्रयास ने उसे और दूर कर दिया। भगवान से इन्सान के संबंध को धर्म की संस्था तय करती थी।

यह बहुत ही दिलचस्प बात है कि यह संस्थागत स्वरूप दक्षिण में सबसे ज्यादा जोरदार था जबकि वैदिक परम्परा के दायरे में दक्षिण सबसे अन्त में शामिल किया गया था। और इसका विरोध भी वहीं से शुरू हुआ नयनाय और अलवर के माध्यम से यह सदियों तक खेतीहर व शहरी भारत में फैलता रहा। कबीर तक हमें इसके स्वर मिलते हैं। भक्ति ने पहली बार आम इन्सानों को ईश्वर से एक सीधा रिश्ता बनाने का मौका दिया। अब यह जरूरी नहीं था कि यह रिश्ता किसी खास वर्ण तथा जाति के हिन्दू पुरुष के माध्यम से ही बनाया जाए। किसी भी धर्म,जाति,वर्ण और लिंग के स्त्री-पुरुष ये रिश्ता बना सकते थे। ईश्वर से एक अपनापे का रिश्ता जोड़ सकते थे।

परन्तु ऐसे रिश्ते के लिए साधन भी तो चाहिए। सारा साहित्य दुर्गम संस्कृत में था। पाणिनी का दौर बीत चुका था,जब संस्कृत सिर्फ भाषा कहलाती थी। ईश्वर के प्रति अपनी भावनाएं व्यक्त करने का,उससे संवाद करने का औजार भी सामान्य जनजातियों के हाथ से निकल चुका था। न उनकी भगवान से पहचान थी और न पहचान का अधिकार। ऐसे में वह साधन क्या हो?

प्राकृत से पनप रही प्रादेशिक भाषाएं यह साधन बनीं। सारी स्थानीय भाषाएं भक्ति की इस लहर से प्रभावित रहीं और इसकी प्रगति में सहायक। ब्राह्मणों और राजाओं के घेरे में संस्कॉत तो श्रंगार-आभूषण से ढंकती गई। दूसरी तरफ स्थानीय भाषाओं ने इस भक्ति लहर में जो सहज पहनाखा धारण किया,उसखा सौंदर्य कुछ अलग ही निखरा।

भक्ति ने जब आम लोगों के बोलचाल की भाषाएं अपनाई,तो इसका प्रभाव उसकी विषयवस्तु पर, कथ्य पर तो पड़ना ही था। दोहे, अभंग, चौपाश्यां..... यह एक ऐसी चौपाल थी जहां हर कोई अपना व्यक्तित्व मुखर कर सकता था। और फिर उन्होंने ईश्वर के साथ रिश्ता भी अलग तरह से व्यक्त किया। भगवान को कभी साथी, कभी मां, कभी नटखट बालक, तो कभी प्रेमी मानकर उससे वार्तालाप इस अभिव्यक्ति का हिस्सा है। एक अपनापन, माया-ममता-स्नेह का एक तंतु भक्त को ईश्वर से जोड़ता है। इसमें एक जीवन के बारे में उसके दुखदर्द के बारे में उसके दर्शन के बारे में ईश्वर से संभाषण सम्भव हुआ।

अलबत्ता इस सबमें एक ही बात मुझे कचोटती है। एक अनुत्तरित 'क्यों' इसमें से झांकता है। आखिर विज्ञान-प्रेमी जो ठहरा मैं। वह 'क्यो' यह कि इतना सब होने के बावजूद भी क्षेत्रीय भाषाएं ज्ञान के भण्डार का माध्यम नहीं बनीं। तमिल ही कुछ लगभग १२०० पाण्डुलिपियां उपलब्ध हैं।

इस क्यों का एक अधूरा सा उत्तर सामने आता है कि कहीं जाकर ढांचाबद्ध हिन्दू धर्म ने भक्ति को अपना तो लिया था परन्तु एक शर्त पर। के दो मार्ग कहे जाने लगे एक था भक्तिमार्ग और दूसरा ज्ञानमार्ग। भक्तिमार्ग तो आम लोगों के आन्दोलन में से उभरा था,सो वह तो आम लोगों का ही था। उसे सीमित करना सम्भव न रहा होगा। तो, भक्तिमार्ग को हिन्दू धर्म में आत्मसात् करने की शर्त यह रही हो सकती है कि ज्ञानमार्ग को कुछ लोगों तक सीमित रखा जाएगा। प्रकारांतर से यह ज्ञान को सीमित करने का ही पर्याय है। इस प्रकार से भर्क्तिमार्ग और उससे अभिन्न रूप से जुड़ी क्षेत्रीय भाषाएं ज्ञान का साधन बनने से वंचित रह गई होंगी।

(iii) Population problem

> In 1960, India and Pakistan were the only two developing countries with government sponsored programmes. A decade later 30 countries had official programmes.

> Much has been made of the economic role of children in developing areas. They help with farming and also provide a built-in social security program. What is more imp., however, is that children are ~~more~~ also desired for themselves i.e. adults are fond of them, enjoy having them around & do not like to be without them!

(iv) Health and poverty:

Simply treating acute medical problems will not substantially improve the health of persons from the disadvantaged areas. Nonmedical solutions are the proper concern of health workers. -- If a physician knows only the medical history of a patient and nothing of the environmental conditions which contribute to making or keeping him sick, the physician can only cure the symptoms not the causes.

∴ Good health does not invariably emerge from the end of a stethescope!

(v) Iatrogenic disease:

This is more a foreground than a background factor. It is illness which results from ministrations of a physician and so enters the picture after the patient seeks medical attention.

20% admitted to hospital aquire an illness related to hospitalisation experience.
Most are minor related to drug or diagnostic procedures but 40% of them prolong stay. And ~2% → death.
↑ chance with ↑ stay.

'परिक्रमा' कहा जाता था। इनमें पूर्णांकों का जोड़, घटाना, गुणा, भाग, वर्ग, वर्गमूल, घन, घनमूल; भिन्न संख्याओं की उसी तरह ८ परिक्रमाएं, त्रेराशिक से नवराशिक,.... त्रेराशिक, आदि शामिल थीं। इनके अलावा ८ अन्य तरह की गणनाएं भी शामिल की गई थीं, जिन्हें 'व्यवहार' कहा जाता था। इनमें मिश्रण, श्रेणी, क्षेत्रपल, खुदाई की गमनाएं, ईंटों की कतार की गणनाएं, छाया, आदि शामिल थीं। बीसवीं सदी के मध्य तक दुनिया भर में जो स्कूली गणित पढ़ाया जाता था, वह लगभग पूरा इसमें आ जाता था।

भास्कराचार्य की गणित की समझ शायद अपने समकालीनों से ज्यादा ऊंची थी। रचनाओं में एक परिपूर्णता झलकती है। उन्होंने अपने पूर्ववर्त्तियों के गणित को संकलित करने के अलावा उसकी बारीकी से जांच-पड़ताल करके छोटीमोटी खमियों को दूर किया और से लगभग खोट रहित बना दिया। मसलन गोले के आयतन का आर्यभट का सूत्र त्रुटिपूर्ण था या ब्रह्मगुप्त शून्य से भाग देने की क्रिया में गच्चा खा गए थे। भास्कराचार्य ने ऐसे सारे दोषों को दूर किया। किन्तु उनकी यही बेदाग परिपूर्णता मुझे व्यग्र कर देती है।

आर्यभट वगैरह का गणित तुलनात्मक रूप से अधूरा सा है। किन्तु उनकी रचनाओं में एक कौतूहल और खोज की तड़प झलकती है। थोड़ा आत्म-गौरव भी नजर आता है। किन्तु भास्कराचार्य में एक निश्चिंतता, एक शांतभाव झलकता है। मुझे लगथा है जैसे पहले के गणितज्ञ किसी खोज की प्रक्रिया में हैं, उसके लिए उत्सुक हैं। भास्कराचार्य की रचनाओं से लगता है कि जैसे वे मंजिल तक पहुंच चुके हैं और पूरे दृश्य का सिहांवलोकन कर रहे हों. लगता है मानो मुख्य काम निपट चुका है। बस छोटी-छोटी चीजें बच गई हैं।

आज जब मैं मौजूदा गणित के संदर्भ में देखता हूं, तो निश्चिंतता का यह अहसास मिझे बेचैन कर देता है क्योंकि वास्तव में काम पूरा नहीं हुआ था, मंजिल नहीं आई थी। बहुत कुछ होना बाकी था। वह हुआ परन्तु यहां नहीं, यूरोप में। तेरहवीं सदी में भारतीय उपमहाद्वीप और यूरोप के गणित में जितना फासला था, वह सत्रहवी सदी आते-आते उससे भी ज्यादा हो गया परन्तु उल्टी जिशा में। खरगोश की मुगालते की नींद में कछुआ आगे निकलते की कहावत चरितार्थ हुई।

दरअसल भारतीय उपमहाद्वीप के सामने सवाल था अपना स्तर बदलने का। उस स्तर पर जितना विकास हो सकता था, हो चुका था। एब अलग स्तर पर जाने की बात थी। जैसे भास्कराचार्य अवकल गणित (डिफरेन्शल केल्कुलस) की दहबीज पर पहुंच चुके थे लेकिन उसको बांधने के लिए एक नए स्तर पर जाने की जरूरत थी। वह दहलीज पार न हो सकी।

सवाल यह उठता है- और इस सवाल का सामना करता जरूरी है कि क्या वजह थी एक स्तर पर ठहराव की? क्या वजह थी कि वह दहलीज पार न हो सकी? अलग-अलग रूप में, अलग-अलग दौर में, कभी यूरोप के बारे में कभी इस उपमहाद्वीप के बारे में यह सवाल उठना जरूरी है। बदलाव का परिमाण और रफ्तार इतनी तेज़ है कि वह खुद-ब-खुद यह सवाल कर देती है।

ऐसे सवालों को कई विद्वानों ने प्रत्यक्ष या परो, रूप से टटोला भी है। 'टटोला' इसलिए कह रहा हूं क्योंकि घटनाओं का जो सिलसिला आधुनिक विज्ञान के साथ शुरू होता है उसका अध्ययन करेगा वह दरअसरल हाथी और अंधोह वाली स्थिति में ही रहेगा। मैं भी उसमें शामिल हूं। आरिवर इस बदलाव को टटोलकर उसमें से कुछ निकालना, कुछ सबक लेना तो आज के युग के हर व्यक्ति के लिए जरूरी है, चाहे वह अध्येता हो या न हो।

फिर खुद अध्ययन कर्ता भी इस सबको देकर एकमत थोड़े ही है। कुछ अध्ययनकर्ता निकलते हैं इस सवाल के जवाब की तलाश में और ढूंढ निकालते हैं यूरोप की संस्कृति तथा विचारों की श्रेष्टता। कुछ अन्य विद्वान बतौर जवाब यह कह डालते हैं कि यूरोप में विज्ञान हुआ करे, इस उपमहाद्वीप में अध्यात्मक की श्रेष्ठता तो थी। बाकी के अध्ययनकर्त्ता दो धड़ो में बंटे हुए। एक धड़ा मानता है कि ऐसे सवालों के जवाब विज्ञान के सामाजिक संदर्भऊ में मिलेंगे। उनका मानना है कि विज्ञनमों पर प्रभाव डालनेवाले सामाजिक कारकों को टटोलना होगा। दूसरा धड़ा मानता है कि इन प्रश्नों के उत्तर विज्ञान की अन्दरूनी बनावट और विचारों में मिलेंगे। ऐसी स्थिति में बेहतर यही होगा कि सबकी सुनो, मन की करो। सोचकर करो पर करो मन की। इसी भावना से मैं सबकी सुनकर आपको अपने मन की सुना रहा हूं। आप भी मेरी और सबकी सुनकर अपनी राय बनाइए।

मुझे तो इस पूरे गोरखधंधे में सबसे महत्वपूर्ण बात यह लगती है कि यहां गणित और ज्योतिष (खगोलशास्त्र) का अटूट संबंध था। जैसा कि हम पहले ही देख चुके हैं, सारे गणितज्ञ खगोलशास्त्री भी हुआ करते थे। खगोलशास्त्र से जुड़े सवालों की बदौलत ही यहां का गणित आगे बढ़ा। जैसे त्रिकोणमिति या गोलीय सतह की ज्यामिति के सवाल या अपरिमित समीकरण, आदि। मुझे लगता है कि जब यहां का और यही का नहीं बल्कि चीन और अरब देशों का भी खगोलशास्त्र एक स्तर पर आकर थम गया, तो यहां के गणित का विकास भी मन्द हो गया।

तो, सवाल यह हो जाता है कि यहां का खगोलशास्त्र एक स्तर पर पहुंचकर क्यों थम गया। इसके अलग-अलग तरह के कारण नजर आते हैं। कारण सामाजिक भी हैं और विज्ञान के अन्दरूनी भी। कुछ ऐसे अन्दरूनी कारण हैं जा यहां के खगोलशास्त्र की बनावट से जुड़े हुए हैं। यहां गणना की 'बीज' पद्धति इस्तेमाल की जाती थी। कुछ आध्यनों से पता चलता है कि अस पद्धति से गमना करने पर ग्रहों की वास्तविक स्थिति और अनुमानित स्थिति के बीच का अन्तर बढ़ता जाता था। सौ-डेढ़ सौ साल बाद, जब अन्तर काफी बढ़ जाता, तो नई स्थितियों के आधार पर नया 'बीज' बना दिया रहती। यह नई गणना कुछ सौ-डेढ़ सौ साल तक चलती रहती। और उसी स्तर पर रहकर भी गणन पद्धति में थोड़े-बहुत सुधार भी लाए जा सकते थे।

उधर ग्रीक खगोलशास्त्र का आधार था नभमण्डल का एक बारीत भौतिक चित्र। यह थी क्रिस्टल गेंद जिस पर ग्रह-तारे चिरके हुए थे। अधिचक्र ता मतलब था इस गेंद से चिपकी हुई और गेंदे। जैसे-जैसे गमनाओं में सुधार हुए वैसे-वैसे इस भौतिक चित्र को भई भदलना पड़ा। इस तरह से यह चित्र और भी पेचीदा हो गया। नई-नई उलझनें पैदा होती गई। हमारे यहां ऐसा कोई भौतिक चित्र नहीं था। जैसे आर्यभट के खगोल में मन्द और शीघ्र अधिचक्र अलग-अलग तो हैं पर इनका आधार कोई भौतिक वस्तु या चित्र नहीं है। यह तो संख्याओं के गुणा-भाग के आधार पर अनुमान लगाने का साधन मात्र है, जिसमें गणना की पद्धति ज्यादा महत्वपूर्ण है बजाय भौतिक चित्र के। ऐसे में कोई अचरज की बात नहीं क यहां गणित और खगोल में इतना अटूट संबंध रहा।

और आखिर खगोलशास्त्र का सामाजिक महत्व क्या था? पंचांग और मुहूर्त्त निकालना ही इसकी भूमिका थी। इस काम में एक स्तर की सटीकता आ चुकी थी। इससे ज्यादा सटीकता की मांग करनेवाला कोई सामाजिक जबाव नहीं था। पश्चिमी यूरोप में जब समंदर-पार यात्राओं का दौर शुरू हुआ तो खगोलशास्त्र और काल निर्धारण के विज्ञान से नए किस्म की बारीक गणनाओं की अपेक्षा पैदा हुई। यहां तो समंदर पार करना घोर पाप माना जाने लगा था। तो, खगोलशास्त्र का विकास उतना ही हुआ जितनी उसकी सामाजिक भूमिका थी।

७ / भक्ति

जैसे-जैसे धर्म की जड़ें गहरी हुई, वैसे-वैसे प्रकृति के साथ इन्सान के एकूत प्रत्यक्ष रिश्तें में भी बदलाव आए। वह रिश्ता भगवान के प्रति श्रद्धा में, प्रार्थना में और इसके जरिये ईश्वर को प्रसन्न करने में बदलता गया। साथ ही साथ इसी पर आधारित एक समाज व्यवस्था भी बनती गई। आज हम ईश्वर और मानर के संबंध और धार्मिक श्रद्धा का मूल स्रोत व्यक्ति में देखते हैं। धर्म को इन्सान का निजि मामला बनाने की कोशिश करते हैं। लेकिन अपने मूल रूप में धर्म समाज की बनावट का अभिन्न अंग रहा है।

धर्म एक अवधारणा भी है। जहां तक हिन्दू धर्म का सवाल है, उसका केन्द्र व्यक्ति नहीं है। हिन्दू धर्म, इस दृष्टि से, इसाई, इस्लाम, बौद्ध या जैन धर्म से अलग है। इन धर्मों में इस बात का स्पष्ट उत्तर मिलता है कि एक व्यक्ति अर्थात् एक इसाई, एक मुस्लिम, एक बौद्ध या एक जैन क्या नीति अख्तियार

Our social life and evolution

Geological studies and other methods of time measurement have indicated that we the human species has an existence of about hundred thousand years on this earth. We were then a species evolved from apes. If we accept this statement as a fact then the question that arises is, whether the existing species of apes and orangutans are still moving along the same ladder of development to eventually become humans? What is the process by which species come into being? Is it true that all existing species are continuously moving along the same path on the ladder of evolution? These and such questions have bothered human beings for a long time. While seeking answers one thing that is taken for granted by all is that homo sapiens are the most evolved species on this earth.

While looking for answers to these questions related to evolution many other tasks were achieved. The variations and specificities of the different species were identified and defined, all species were classified and the basis for determining a species were also formulated. The theory of evolution gave the norms for classification based on the variations between and commonalties within species. This theory of evolution provided a `scientific basis' to ensure that human beings remained the most evolved species on this earth.

Having established ourselves, the homo sapiens, as the most evolved species we are now trying to prove superiority and fitness over one another. In this age of competition what is the purpose of raising a debate on the theory of evolution? We are today reaching the heights of development. We have divided ourselves on the basis of the degree of development achieved. At least as far as nature goes we consider ourselves very `evolved'. In fact we are busy making new relationships with other species that exist in nature. We were never before so complacent and arrogant of our superiority and fitness.

At the same time debates about quality and quantity of the species are also being held amongst human beings. Like terms like `developed ' and `developing', we are also hearing terms like `over population', as well as `fit' and `unfit' to survive. In this age of polarisation that is gripping all of us there is a great need to relook at the theory of evolution. This is all the more necessary because in a way the social changes and developments are sought to be justified with the use of these theories of evolution.

Every society has a hierarchical structure with divisions based on race, community, religion, colour, sex, etc. These differences define the variations in the human species and are physical, geographical and also social and cultural. The differences have been made into hierarchical categories and to achieve this task the principles of the theory of evolution have been used. Whether it is to justify women's subordination to be a consequence of their `weaker' physical structure, or to differentiate between the whites and the blacks, theory of evolution has been cited to justify inequalities. All existing oppressive social structures are explained off. The laws of nature are being applied to complex social systems to justify status quo. The problem however is that `laws of nature' are also definitions made by human beings themselves. And like all other social constructs these definitions are also reflective of the prevailing structures and prejudices in society.

The point is that this hierarchical order of society has been imbibed by each one of us. In India in fact the whole `jati or varna' system shows this bias very obviously. First of all the categories were formed on the basis of the occupations in which people were involved. The different occupations got low or high status and this same was then passed on to the corresponding community strata or `jatis'.

Scientists, anthropologists and social scientists are all also part of this society and hence they too carry society's prejudices with them. An example of this prejudice is that of the illness which was initially called `mongolism'. The reason for this choice of name was that a person affected by the disease had the same features as the Mongols. The scientist who had been responsible for the coining of this term, later accepted publicly that his racial biases had led to this selection of name. The name was then changed to the Downs syndrome.

Today with the bogey of population explosion once again the principles of social biology are being given importance. All individuals, organisations and institutions involved in population control activities are freely and widely using the language and vocabulary of evolution. On the surface their concern seems to be for the welfare of the planet but go a little deeper and it smacks of eugenics. To reduce the consumption of natural resources, it is being openly suggested that a way out is to check and control the numbers of the `non white' populations from the developing world. The whites are being projected as the `best' and `fittest' of all species. To retain the comforts and life styles of the whites, control of the black and non-white population is considered and being projected as the inevitable.

Actually this concern and belief in eugenics with the effort to help the right kind of people to survive on this planet and to prove who is `fit' or `unfit' is part of the prejudice of those who began the work of population control. For example, we can see the example of Marie Stopes. Her name is quite well known in the world wide revolution to achieve birth control. There are a number of clinics in her name in most of the cities of Bombay. Marie Stopes had sent a trained nurse to Bombay in 1952 to impart education related to birth control. In a public meeting in 1927, Marie Stopes said,

"It must be made clear that by birth control I do not only mean prevention of birth of children but I am also talking of bringing only healthy, happy and wanted children to this world." In the same speech Marie Stopes further said, `In the past the development of the human species has been unplanned and random. Our species is full of accidents, coincidences, hardships and crime. But now we shall proceed with the zeal of missionaries and make this great age possible at all.'

Another important person involved in the work related to population control has been German demographer Hans Harmsen. He was one of the founding members of the `International Planned Parenthood Federation' set up in Bombay in 1952. Harmsen writes in one of his articles, `The aim of any practical policy for birth control should be aimed at seeing to it that the future generation is healthy and more superior in quality so that the national identity is maintained.' Harmsen believed that intelligence and character were genetic characteristics. He also was convinced that principles of socio biology help in 'the creation of a new world view which claims that inequalities are naturally present in the human species.'

In recent years these same kinds of ideas have been put forward in a more crude manner. For example John Fletcher, a representative of the developed world says that along with all financial `aid' given to the poorer countries there should be a condition that in that country contraceptives be sold along with other items from the ration shop. Similarly another English scientist Dr Maurice King has also suggested that programmes for immunisation be scrapped to see to it that the number of children surviving does not rise! The chief economist of the World Bank, Mr Laurence Summers says something similar. According to him all pollutants should be dumped in the the developing countries because even if any one of them fell ill they would not even have the necessary support to even approach for compensation.

These kind of racist understanding is getting justification through the discipline of socio biology. All of the above people are scientists, doctors or in some such `respectable' profession. If we look carefully all of them are trying to show that the inequalities in nature are natural because that is how it is in nature. Phrases like `survival of the fittest', `natural selection', are used by them for this purpose.

There is in fact a two way mutual relationship between science and society. Each influences the other. This mutuality is very evident in the case of evolution. The social situation at the time when the theory of evolution was put forward was very much responsible for the nature of the theory itself. Today for controlling the social condition of `population explosion' terms and understanding of evolution like distinguishing between `fit' and `unfit' is being freely used. People are considered unfit to live and produce more of their kind and all this is being done in the guise of `scientific' principles and theory.

The theory of evolution as put forward by Charles Darwin was undoubtedly a revolution in concept and thought at the time that it was put forward. It was put forward in the face of a strong and bitter resistance from the religious heads. And yet it was an idea whose time had come. Actually evolution as understood by Darwin had been suggested by Lamarck fifty years before Darwin did so.

According to Lamarck many animals are forced to undergo a number of changes within their lifetime due to the pressures of their natural environment. These changes are carried over to the next generation. In this way through this process of phased change or change undergone step by step absolutely new species are created. The example of the giraffe's long neck is often quoted in this context. To reach to the leaves higher and higher up in the trees its neck grew slowly to finally become so long. In this theory put forward by Lamarck an important fact is that it is stressed that changes occur in the species through mutual exchange with the environment. This means that no species has remained the same through time and no no species can remain the same. But this theory of Lamarck had a number of limitations.

One was that this process of slow and graded change could not account for the life span and history of life on this planet. Similarly the theory had not been able to explain the variations within a species, the evolution of each species, the impact of these changes in the species on the overall environment and on other species, and such issues. The theory could not satisfactorily explain all the details of this endless world of life and nor could it provide many of the factual details also.

Yet Lamarck had been successful in challenging the prevailing understanding put forward by religion. that of `genesis', to explain the nature of life on the planet. It was also not as if only Lamarck raised these challenging ideas. At that time there were many who raised questions like why were there so many living species on the earth, how did these various species come about, how can one establish the superiority of homo sapiens over all these, and so on. These questions were part of the intellectual environment at that time in the eighteenth century. Darwin himself has given names of thirty thinkers pondering on these and such issues.

The editor of Darwin's `Origin of the Species', John Murray says that the established religion of Christianity has got three major shocks. The first was through the philosophy of Aristotle. The second was during the period of renaissance when the causality principle was stressed upon stating that there had to be a cause for every natural event that occurs. The third shock was provided by the theory of evolution which questioned the whole basis put forth by Christianity about the evolution of life.

The theory of evolution defines and helps understand the changes in a species that help bring about a variation and differentiation within the species and with other species. The theory tries to explain why this happens. But while putting forward the explanation it is assumed that humans are the most evolved species. Taking this for granted explanation for the process of achieving this `most evolved state' are put forward.

When the utmost superiority of the humans is accepted obviously all other species are also tried to be fitted on this ladder where there are some who are more evolved and some who are less. These categories in which all species are classified attain a hierarchy within themselves. All cells whether they belong to the unicellular species like the amoeba or to a multi cellular species like human beings, all of them the same chemical within them. And yet there are numerous differences too. The theory of evolution helps establish the link between these unicellular and multicellular species.

Darwin put forward his theory on the basis of his observations during his voyage through the Galapagos islands. In putting a theory together Darwin took the theory for human reproduction put forward by Malthus. Malthus believed that there are limited natural resources on this planet and so it was necessary to curb the growing number of people who would be consuming these and depleting them in the process. Darwin extended this argument to say that due to the limited nature of the resources in nature, all living species were in a constant state of competition to have access to this. This competition was the key to the evolution of the species. In this struggle for resources, the `survival of the fittest' takes place.

Anthropologist Butner Janus says that Darwin put forward his theory and laid the basis for modern biology only in 1859. In less than a century this basic understanding of the world had been accepted as a fact. The very existence of so many species is itself obvious proof for the theory. According to Janus there can be no debate about whether the theory of evolution can be termed a theory or not. It is as much a fact as the existence of our solar system and gravity.

Today in the light of the knowledge acquired in genetics we are able to give an explanation for the theory and its basic tenets. Today we can say that between two generations any changes that occur are due to the changes in the gene patterns during reproduction. We have also been able to understand the factors responsible for these changes. One such factor is that of natural selection occurring at the time of reproduction which lead to changes. The genes of a species combine in various ways and provide the variation within a species. The greater the variation in a species the stronger is the species.

Of course today the stress is towards removing and eliminating this variation. Whether it is through monoculture agriculture or animal breeding helped by hybrid productions or the rigidness of categories of caste and religion even in human interactions. These categories are not purely based on biological variations, they are very socially constructed divisions but crossing these is very difficult.

As far as the theory of evolution goes the other change in the genetic pattern is achieved through the process of mutation meaning sudden changes. We often talk of the drug resistant strains of certain disease producing bacteria. These strains have undergone a genetic mutation caused due to the environmental changes of that species. It is, however, not necessary that there be an environmental cause for this change. Many a times there are mutagenic changes even for no apparent reason at all.

One more process by which changes occur is the sudden disappearance of certain genes. There is no change in the gene structure but one gene just disappears slowly. This does not destroy the species as such just changes it.

The understanding provided by genetics has helped test and validate the basic principles of the theory of evolution. There was a lot of stress on the environment in the theory of evolution. Changes in the species were explained on the basis of the environmental changes. In the process it was not realised that change in the genetic structure of various species is in itself an inherent characteristic. The study of genetics has helped modify and restate this basic tenet of the theory of evolution.

Science is no body of ultimate unchangeable knowledge. The processes of redefining, changing and adapting the theories for various processes is a part of science. Nothing is taken as the absolute truth. Many a times a whole theory is totally rejected based on new findings. It is in this context of openness and change that even the theories of evolution are evolving.

The way in which we are intervening in nature today it has become all the more essential to look carefully at the theories that are accepted. Due to human intervention the nature of nature itself has changed. Whether it is through destruction in genetic patterns of plants and animals through harmful chemicals or radiations, or playing with basic genetic structures using techniques of genetic engineering, human intervention is altering the basic pattern of nature. In this question it is important to raise and understand the question of natural environment and evolution in this context.

While trying to answer these questions or understand these situations the basic principle of the theory also bothers us. The philosophical basis of the theory is being used to justify inequalities. Growing competition among humans is being claimed to be a natural instinct. Darwin had also created this confusion between the social and the biological. His concern for the reproduction and presence of the so called `unfit' is evident in his own statements.

He says, "We civilised people ... are trying our best to stop the process of elimination. We are making refuge homes for the mentally retarded and our doctors are trying their best to save all life... meaning that even the weaker members of this civilised society are allowed to reproduce and grow. Anyone who has any experience with the reproduction or fertilisation of animals would accept that this would undoubtedly be disastrous for the human race."

This is a stark example of inverted circular logic that ought to be dismissed in no uncertain terms. Darwin's principle had emerged in a particular environment and was totally influenced by the changes in the social environment. These values were of competition and survival of the fittest. These were used to put forward a theory for nature. Now this very same theory of nature which evolved from the social values in the first place was being used to prove that social norms and practices were unchangeable or unchallengable because they were based on truths of nature!

Darwin's views are those shared and propagated by certain powerful sections of society. Many thinkers have realised this and criticised Darwin and his theory in this light. Philosophers like Marx and Engels have criticised the undue stress on competition and this attempt to impose social norms on nature. Of late many feminist scholars have brought to light the gender biases in the principles and theory put forward by Darwin.

Today when we are faced with the racist attack on population by demographers and scientists like Maurice King and John Fletcher and when our population programmes are based on the inherited values and biases of eugenicists like Marie Stopes and Hans Harmsen, examining this links between science and society becomes essential. In the process we might also need to again evaluate our understanding of nature and natural processes. Today when we are being divided into artificial categories of race, religion, community, family and nation justified through scientific principles, it has become all the more necessary to find new ways of understanding nature and challenge the `human' (read man) made nature.

It is necessary to realise that with our interventions it is not only resources that are being depleted but more importantly it is the destruction of natural cycles. These cycles are processes that maintain a balance. It is many supportive and complementary mechanisms in nature that help achieve the total ecological balance. We have to think and question why this co-operative character and nature of nature is being marginalised to justify and put forward qualities of competition, aggression and violence.

Various kinds of animals and plant species have coexisted for a long time. The lifestyle of one species helps and supports the lifecycle and existence of another species. There are many examples of coexistence which cannot ever be explained on the basis of competition as the natural process. We have to get rid of our anthropocentric perspective and look at nature in its holism. In claiming our superiority we have distorted the very meaning of development, growth and evolution.

In the new outlook the question of depleting resources will be also seen in a new perspective. The question of dwindling resources will not be looked at as only a question of growing population but will also be linked with the way in which these resources are being consumed. Are we consuming in ways that would support the co-operative and supportive way of the ecosystem or are we just wanting to throw around scary numbers about the population? Does not the `survival of the fittest' paradigm today essentially suggest that the world be restricted for living of a selected few, all others being eliminated in the process?

This work has to be done at two levels. One we have to expose the politics and power play involved in justifying the unjust social values. Second we have to continue to understand nature and its processes. Natural evolution is a fact. But how did it come about and how is it progressing are aspects not completely understood at the moment. It is necessary to understand this in a better way. Not only so that we have a better more complete theory but also so that our future interventions into nature are also more informed and supportive to the ecosystem and its processes.

Article written by
Swatija
9, Sarvesh; Govindnagar,
Thane (E). 400 603.

Written in 1994 in Hindi for a science feature service `Srote' for Hindi newspapers and magazines.

Science : A Cultural Expression

How does one begin writing on science was a question that had been bothering us for a long time. Science, religion, religiosity, fundamentalism, all of these are so much a part of our basic makeup and have contributed in so many different ways to our mental state and understanding. This was a fact that we were aware of and this was also something that bothered us when we began to write.

In a way thinking about science is not something that has started of late. These thoughts have been with us since both of us did our graduation in science. That this has been with us for a long time we realised when we sat to write this article and suddenly it was very clear as to what was to be the starting point. Obviously we had to begin with ourselves. We had interacted with science through different disciplines and from different backgrounds. While working out the ideas that we present here, however, was the realisation that the journey had moved along the same lines for both of us.

We feel that it is essential that we openly state this launching into science that each one of us had. It is also necessary because this viewpoint and this journey are very much linked to the person, the social setup and the culture. And to be able to break through the barriers seperating science today from most of us, this sharing is even more important.

**** **** **** **** **** **** **

I wanted an education in science which would be vocation oriented, which would get me a job. This attitude to education itself was not at all appreciated by my idealist parents. They did not, however, have any objection in my taking up medicine. Medicine and related areas were not mere occupations or professions. They looked at these in a more appreciative manner.

`If you wish to go into these areas also, you should become a doctor and that too one with an M.B.B.S. degree and of course only if you can get admission on your merit.' I got a few marks less and so that was the end of our common dream of my being a doctor. A degree in Microbiology and research in it was the commonly agreed upon compromise.

After graduation I joined one of the well known medical colleges in Bombay for research and further degrees. The subject chosen for my research was study of the organisms that infected burn wounds. While studying Microbiology I had been most impressed by an underlying principle -- like there has to be a cause for every happening, there has to be a cause for every disease also. Usually the cause for the disease are these micro-organisms. This, the cause effect theory as applied to disease had left me astounded. Science had taken so many years, in fact centuries before this very simple, basic fact could be understood. How much more time would it take to reach this simple idea to people at large? When would this understanding reach those for whom today is because of what one did in the previous birth or maybe even in the births before that?

I could see the effect of this new knowledge on me. I had realised the connection between menstruation and conception. I was finding myself being freed from all the misconceptions about menstruation. This was part of the journey which led to a postgraduate degree. The research included isolating the bacteria responsible for infection in burn wounds, growing them and then studying them. What were these bacteria? Which kind of medication would be effective on them? Locating those organisms, understanding how they infected the wounds, from where and how are they contracted, and how many wounds that had got thus infected could possibly be cured, these were all issues that had to be studied. On an average if I studied 100 such cases I would be eligible for a degree.

Burn cases are usually kept in a neglected corner of the surgery ward. All the `cases' are covered by net covers and kept behind red curtains. It goes without saying that the death rate in this part of the ward is much higher. For any case to be useful in my study it was necessary that she survived for at least eight days. Hence women who were important for my study were those with 60 - 70% burns. (On an average persons with 30 to 40% burns are likely to survive. With greater care those with even more burns could survive. But their percentage is very low. This is because there is loss of vital body fluids from the parts of the body that get burnt and so as more parts of the body get burnt, less are the chances of survival.)

Those were the days of the state of emergency, of people's struggle and also of kerosene shortage. Kerosene was not available in the open market. Since I was dealing with burn cases, my patients were mainly women. The news that we read today of women burning themselves today is no different from what it was then. But with a shortage in kerosene the number of cases went down noticeably. "What a problem! There is a dearth of burn cases these days. The kerosene shortage has affected my cases." This sentence of mine kept haunting me. Someone's burns becoming a case and each case taking me nearer to my degree. Burns = Degree. No burns = no degree. The implications of this equation shattered me. Why do so many women get burnt? What is the relationship between shortage of kerosene and burn cases? Why are these horrendous deaths of women not stopping? Who is responsible for these deaths? Why do you want to continue this kind of a research? Questions thronged my mind. A degree which got postponed with kerosene shortage! No! I did not want a degree which made me selfishly wait for somebody to burn and die.

The decision was made. My dream had been of doing research that would benefit humankind. In reality this was the benefit of research -- my degree, one more name in the long list of students working under my guide, some more papers on my guide's name, and accidental death to so many women. Those women did not die because of the bacteria that had infected their wounds. Those women had reached this state of wanting to die without any bacteria playing any role. Then what was the cause of their death? Is society responsible for their death? Are those responsible who have no value for either women's lives or for their death? Are those who have brought women to this state responsible? Who will do this research? I was just thinking of the wound, of the organisms that were affecting these wounds in reality. I do not need such research. I do not want such a degree.

From that aborted attempt at doing research, I aquired a new philosophy of life that there is something beyond the obvious in the cause-effect theory. there is the social reality and values therein of man woman inequality and discrimination and also of women's lives which are not given any worth.

What is science? After all science is also intricately linked to society. This seperation from society was artificial. Today's understanding of science and this knowledge that I had aquired long back seem important. There are, hawever, questions being raised in my mind about the so-called scientific mathod.

Micro-organisms, Microbiology a study of these organisms done to know these organisms better, apparently to find ways of treating those infected wounds. Why in the first place did those germs and wounds come together? Asking such questions does not fall within the scope of the scientific method. Single minded attention is an important aspect of science. My reality indicates this to me. But I could not create the equation wound plus germ = death/life. And making such equations is a necessary part of science.

**** **** **** **** **** **** **

This was an experience and reality very much related to the body and one's life. My journey beginning with a subject which was unemotional and abstract introduced me to a reality which was very different.

`I do not want to dissect frogs and so I do not want to be a doctor.' This decision was taken at age five. And I managed to see it through also. People at home and others around believed that to be something, to be able to accomplish some dreams for oneself, becoming a doctor was a simple answer. My reason for not obliging was very clear. In those days there were only two professions accepted -- medicine and engineering. The first rejected by me. The second was not considered because girls did not study engineering. I had also accepted and imbibed this social norm.

To be considered intelligent, it was necessary to study science. There was no glamour to the subjects that came under the `arts'. All this led to a decision at age thirteen that I would do research. The subject also was forcibly decided. Physics, something which I had just then got introduced to. I had no proper understanding or idea of either Physics or of research and yet I decided to be a scientist, to do research in Physics. Today I realise that this is not enough to be a scientist.

In keeping with this decision, I first did my B.Sc. and then entered I.I.T. for my M.Sc. and stayed on to get a Ph.D. too. But all along there were in my mind a number of questions.

Research in science, being a scientist meant doing some good work for society was my understanding from childhood. Yet when I actually started my research the society itself was nowhere to be found. What is the relevance of our area of study to understand the happenings in this world? What is its connection to one's daily life? My friends used to ask me what was the importance of the figures and equations that I scribbled on pages after pages? I also used to wonder what was the meaning of all this algebra that I coloured pages with.

The small child Rekha living in one of the slums of Bombay. The gang rape on her, the gas disaster which took thousands of lives in Bhopal, it left thousands more maimed and injured for life, the riots that gripped the country after Indira Gandhi's assassination which killed countless innocent persons. This was part of my reality as I became active in the social, progressive movements and at the same time on the other hand were my efforts to get my degree, to determine some future direction for a meaningful life. It was as if there was no connection between these two aspects of my reality. And then I got a chance to go abroad for a short period to a research institution especially set up for so-called `third world' scientists. That was a chance to see and observe scientists closely. Scientists who were making and developing science, who were demi-gods for the present society. These persons who were devoted to science seemed to be basically careerists. These were the people whose research, quest for knowledge, everything was hidden away by their careers.
Science means a worldview to understand the world to aquire and evolve a philosophy towards life. But here there was just commercialisation, running after one's career, endless competition and efforts of each person to push oneself ahead. This endangered the possibilities of a multi-faceted development of science. `An objective method of understanding truth' was a far cry from what got prominence here as science. It was important to succeed, to win and get a name. In such places success also had different parameters. So also were there different ways of selling oneself while remaining in an institution.

In those three months that I spent in the company of these `eminent' scientists, however, for me a question had resolved itself. I felt that if I had to retain my self, my norms of honesty, then I had to get out from this rat race. I had not thought of research to pursue a career and making a career like this, in this atmosphere was not possible for me. Retaining interest and integrity was something that was not possible in such places. In fact the realisation was that after all research was also just one more career. It was no different from the rest. Also I realised that to not be part of this conspiracy of careers, one needed to have a special genius and insight in the subject, which was not something that I had. I could just have the honesty to accept my limitations.

Again a decision was made. This research was not something that I wanted to do. Then whatever knowledge had been aquired was to be used for teaching. Meanwhile participation in social movements of all kinds had increased. And with this decision, my association with science went beyond the degree and career. I got a chance and opportunity to look at science in a more holistic manner, could develop a different understanding of it. I could look at the principles and basics of science outside of and away from the framework of its institutionalisation.

Training in science never goes a waste. In fact I now realised how much it had become a part of my life and living. no doubt the training also brings with it certain limitations for one has to be careful about not getting carried away by the ideas accepted within the framework. Feelings, experiences, not part of the formal structure of science have their own specific role and importance in life which has to be consciously included.

Today while writing all this, the dominant thought is that after having taken a distance from formal science and research, the process that ensued has given me a new vision. While being stuck in that vicious circle this vision had been denied. And this has also given a new outlook to science itself.

* * * *   * * * *   * * * *   * * * *   * * * *   * * * *   * *

Meanwhile new words with new definitions were emerging -- feminism, woman-centred viewpoints and perspectives. Within this it was clear that although there were a few questions particular to women it was necessary to look at all questions from a woman-centered perspective. With this new awareness and understanding it was necessary to look at everything around in a different way. As part of this effort it was necessary to begin with stating clearly and openly all questions in our minds.

Could one look at science also in a different way? Can there be a woman- centered way of looking at science? When one looked like this, one of the first realisations was that science also was not as objective as it was made out to be. And beginning with this comes the change in the outlook towards science. The changes that take place according to the situation are also noticed.
What exactly is science? This is the question that remains. Science is the tool with which one tries to reveal the unrevealed in nature. The knowledge that is aquired while resolving the mysteries of nature gets stored as science. An expression of human civilisation and culture. With modern science this expression has been formalised and structured away from its natural and simple beauty. Its connections from the ordinary persons have been severed. Science aquired an abstract form. This knowledge base of science got divided into many compartments. It was as if knowledge was itself divided into infinite compartments. Today it is difficult to give an answer to the question `what is science'. Science is objectivity, science is knowledge, science is an unbiased, unprejudiced collection of thoughts -- of thoughts which have no societal values attached, which are objective. The base of this compartmentalisation in science is its own philosophical basis. Earlier science was a part of society, very much linked to all that happened in society. Today it is a question whether we can find the connections between science, culture and society even when we specifically look for them.

The health workers in Tamilnadu were having an intense discussion in a meeting. What is progress? It is said that there has been a lot of progress in the field of contraceptive technology. The scientists are very confidently and with pride wanting to introduce newer and newer methods of contraception in the market. It was in this context that the discussion was taking place and the reactions of those women was very educative and expressive of the situation. "We surely need contraception. And yet we are not happy with the contraceptives available today. We want methods of contraception which would help us understand our body better. With this new knowledge about the body we would be able to have a new relationship with it, gain confidence in ourselves and only then use the contraceptive method. In our view hence, progress lies in this growth in confidence in us."

Whose progress? Debelopment of what and for what purpose? These questions are before us all the time. The world is divided into the developed and the developing, a division basically emanating from the control over natural resources. Development hence is naturally defined in terms of harnessing natural resources, using them and keeping control over them.

Persons living in caves, adivasis living in jungles are all considered undeveloped today. These adivasis have built a relationship of understanding and respect for nature over the years. And yet they are the ones who are underdeveloped, needing our help to progress. At the same time, however, we who are growing up in the polluted urban environments, fighting for our existence every minute in the new kind of lifestyles, we have acheived the greatest heights in progress and development. Hence we talk of the development of the tribals and others not similarly placed. The real question is of determining who is developed and who is not.

For us today the measure of development is the extent of mechanisation, modernisation and industrialisation. The measure is based on the extent to which we have aquired control over and taken over the processes of nature. The basic questions about nature that had initially been addressed were `why did this happen'. Today the main question has become, `how can we achieve and carry out the same process?' Resolving of the mysteries of nature is not enough, it is necessary to find out how we could benefit from it. And from this emerged `modern science'. It has almost grown into a demi-god -- trying to provide answers to all the `whys'. And for this purpose a method is used, the scientific method.

This particular method which has been identified as `the' scientific method evolved in the Western countries as an inherent part of the other developments that were taking place there during the 15th and 16th centuries. There are two basic constituents of this scientific method. One is the cause effect theory (an excellent example of this is the relationship between the bacteria and the disease, basically stating that for something to happen there is a definite process that takes place) and the other is the reductionist method of understanding the whole by understanding the behaviour of the constituent particles.

Every body is made up of the constituent particles. And hence to understand the body better it is necessary to divide and subdivide to know the basic particles that constitute the body. In the last century finding the `basic' constituents of all matter living or non-living, has been the hallmark of progress in science. First was discovered the molecule, a constituent particle of all matter. Then the molecule was further subdivided and one came across the atom, a constituent of the molecule. The constituents of the atom were also uncovered and one came across the core of the atom, the nucleus. Understanding this nucleus of atoms then became the indicator of both progress and development. Understanding what are the constituent particles of the nucleus, their structure and nature was progress and finding ways of using the latent energy within this nucleus for our purposes became an indicator of our development. If two nuclei are made to collide with each other at a specific speed and in a specific direction and situation, the collision gives rise to an immense amount of energy. In a similar way fusion of two nuclei also gives leads to release of large amounts of energy. With this knowledge, nuclear physics and nuclear energy became synonymous with progress of modern science and development of society.

And suddenly 1945 left the world stunned. The science which had been developed for people's benefit, for peace and progress put forward a hitherto unseen facet. It came forward as a violent, aggressive, disastrous force in the devastated cities of Hiroshima and Nagasaki and in the grief and suffering of the people there. That destruction and agony are a reality even today. So that progress in science is not stopped, it was said that everything has its good and bad effects and which of these got used depended on the user of the knowledge. Knowledge in itself is valuefree it is not good or bad. Atomic energy is useful to society and so Nuclear Physics is useful and necessary for progress.

1985 gave another shock to the world. The nuclear power station at Chernobyl, meant for purely peaceful purposes broke down and radioactivity permeated the whole region around it. A lot of known and unknown questions once again were posed. Visble and invisible damages, to the present generation and to generations to come occurred. The power station was not for any kind of harm to life. It was meant for improvement in the quality of life. And yet it proved to be dangerous to a lot of life. This was the disastrous effect of atomic energy produced for peaceful purposes.

It is not also as if all this evident only through such accidents. The disposal of wastes from nuclear power stations that are partially contaminated with radioactive materials is a problem that is bothering for a long time now. There are no methods available for destroying these wastes and so they need to be deposited somewhere in the world. The radioactive wastes are obviously harmful to life. Hence these wastes were being deposited in America in the areas where the poor and the deprived sections live -- in regions that were predominantly inhabited by Blacks, Hispanics and Natives. These communities had no power to resist. They were the deprived, underdeveloped in rich, developed America. These radioactive wastes just added to the already polluted atmosphere that existed in these communities.

People from these communities did protest also. Environmentalists also raised this issue and as a result of these efforts of concerned citizens there was a ban in the United States against disposal of hazardous wastes in such communities. But for the developed world their `area' is not confined to their national boundaries, it extends to the vast developing world as well. And so a ship carrying hazardous wastes has been cruising around the world trying to find a customer amongst the various countries for accepting its load of hazardous wastes. This ship has travelled to most places that are far from North America and the `North' in general, but are closer to us -- those societies which have yet to create such hazardous wastes. It went to small nations whose names are anyway heard only in the context of the games of the superpowers of this world. All such small nations, islands were asked permission to be allowed to dispose.

Some countries were forced into acceptance. People from these nations, however, raised their voices against this acceptance. The people were not interested in the aid and benefits that were being given as compensation for harbouring these time bombs. The people were aware of the value of their lives. A woman from one such nation -- Papua New Guinea -- who had been part of this struggle spoke emotionally of the struggle. She narrated a slogan that they had evolved in the course of their campaign against disposal of hazardous wastes, `Build Your toilets in your backyards, not in our countries'. This slogan had arisen out of their struggle for their lives and also of all lifeforms that were threatened with the presence of such wastes.

These global effects arising out of successful campaigns in America led a group there to network against all such dumping of nuclear and hazardous wastes anywhere in the globe. They came up with a more comprehensive slogan, `We oppose dumping of such hazardous wastes in any one's backyard.'

This then is the main question. Can one call any increase in knowledge progress if inherent in its progress is harm to a certain section of society? What is the use of the knowledge aquired in Nuclear Physics? On the ine hand it gives rise to such dangerous and hazardous technology. On the other it perpetuates an unidimensional scientific understanding of the world in society. According to this viewpoint every process and everything can be explained and understood from a reductionist viewpoint.

If all matter can be explained well in this way then why not everything also be understood in the same way be it our bodies, or any animal or plant form or even all of nature. This method was considered to be so perfect that then it was applied to even objects and processes that did not fit into its purview. In a sense this also led to strengthening of a unidimensional viewpoint that gave rise to the tendency of gaining control over. Then it could be control over nuclear energy or over the human reproduction or over reproduction of `mother nature' itself!

With this tendency it so happens that we do not consider it necessary to reconsider our energy needs and consumption. The question of changing man woman relationships is secondary. The issue of distribution of resources is not something that needs to be addressed to. The scientific solution becomes the one that can be applied without doing all this. The issues raised in this context can be just put aside as `social problems', and keeping the situation unchanged one can use science and technology to find answers to problems and achieve further progress. All people asking questions in this regard, asking time to stop and think in this manner, wanting to raise all these issues are further branded anti- progress or hurdles in the path of progress.

There are enough examples of this. One of them is the green revolution and the food processing industry that it has given rise to. The principles of green revolution and the agriculture based on it has proliferated all over the world. There has also been all kinds of views and ideas about it being put forth everywhere.

It is said that women invented agriculture. In today's reality with every new invention in technology women have lost ground and their relationship with the land suffered. This is particularly true in the case of agriculture even if agriculture began with the initiative of women.

Green revolution means food for all and so how can you be against such progress? Are you against all progress? Don't you think about the poor not getting any food? This is criticism often advanced. But what is the truth? How far has the dream of thr green revolution materialised? Or has this revolution given rise to deeper questions of more basic nature? Is raising such doubts itself enough to label us anti-progress?

Progress in agriculture has been usually measured by the amount of use of tractor, by larger and larger lands being made arable and by increased use of fertilisers. Less use of fertiliser has been taken to mean lack of modernity instead of being seen as greater fertility of the soil! Similarly food processing today has become a coveted, modern industry. To put simplistically, all processes that were labour intensive are now being taken over by machines. With the use of machines, fewer persons are requied to work and so there is also saving of money spent on wages. It has also meant more use of transport technology since the production process has been removed away from the site of raw material production. And in return we have the availibility of modern processed foods.

We had read some research articles on the beverage `Frooti'. The question that had been raised was how does the juice of rotten, wasting mangoes get the dignified name of `mango juice' when packed in the tetrapack? How far can we call that liquid mango juice? The main aim if this industry is to utilise these rotting fruits and so the only important thing is to make that happen. The same is true of the green revolution. Large amounts of water, fertilisers and pesticides and with it large amounts of produce is the important aim of the whole exercise. With these kind of interventions, there is a disruption of the natural cycles and the balances in nature. And yet asking questions about nature's balances is made out to being anti progress. How does one look, however, at the vanishing forests, at the pest resistant crops, or at the soil which has reduced its fertility? Is this spelling progress or disaster? If you are losing out on your resources then what progress are we talking about?

But this is also a peculiarity of the scientific method. This knowledge base seperated from reality further gets entangled in its own web. One question gets only one answer when seen through a reductionist viewpoint. And yet it also raises a number of other questions. Again answers are sought within this same framework and the net gets tighter, and entanglement within it even more.

With the green revolution we have a larger production of fruits. This becomes excessive because people do not have the buying power to buy all that is produced. Then when the fruits start rotting beverages like `Frooti' are produced. Of course a whole new kind of economics is also evolved. A market is created to sell that new beverage. In the most scientific method then we land up with a product whose need was never felt, dominating the demand of the market!

Once the soil loses its fertility, more fertilisers are used. In a similar manner, to get more water for irrigation, big dams are built. Now these big dams lead to destruction of forests, reduction in catchment areas as well as reduced rainfall, worsened soil fertility and arability conditions, leading to more fertilisers and more big dams. All of it comes together. But large dams are a measure of more progress. Once this is decided any opinion which questions this, which says emphatically that we want development not destruction, anyone who questions this idea of progress, is either considered unpatriotic or considered to be totally anti-progress. If you do not agree with this measurement of progress, then you are even made out to be anti-progress.

Technocrats and scientists say that big dams would solve the problems of both water and power. Many of the present day scientists and technologists also have realised the problems raised by big dams. A lot has been learnt from the experience so far. And yet when it comes to the project like the narmada dams, then resorting to most scientific sounding facts and figures, it is constantly being pointed out after extensive objective cost-benefit analysis how we are to benefit from the dam. How faulty are these figures on the basis of which the analysis is being done is a known fact. A lot is being manipulated to be able to prove and make some points.

Few questions, however, would have remained even if there were no manipulations of facts and figures. Even if on the basis on which present day calculations are carried out it were to turn out there is profit in this project, the question of how these calculations are done would remain. Who is to benefit from this project? Is good of the nation such an uniform concept applicable to all its citizens? Is this nation made of equal persons so that we could say that everyone would benefit from such a project? When today's situation is such that one person's benefit rests on harm to someone else, when we have not been able to create a society based on cooperation, on what basis can we believe that the decisions of progress and benefit would be fair and just? What are the facets of the scientific method that take all this into account? How are we going to measure the destruction to the environment because of this? What is the cost incurred because of this? If for a benefit of a few people today (for example, the proposed benefit to the water starved people of Kutch as is being claimed), generations to come have to suffer then how do we calculate the costs of all this today? How are we going to meet the needs which have led us to these paths? To answer all these questions and make these decisions what is the objective scientific method?

At such a time we are reminded of the question about progress that the health workers in Tamilnadu had raised. It was in the context of the direct objective equation being made between understanding of reproduction and contraception. This equation made many a times has also made one realise this viewpoint of science at a personal level.
In fact it was women who were linked to health, medicine and health care right from the beginning. They were the ones who had also made the first attempts at understanding and controlling their reproduction. This is probably one of the major contributions that women have made to the knowledge

labelled science today. And this has been the information which has been kept alive, being passed from one generation to the next.

Modern science has put forth a different viewpoint for looking at reproduction with a social perspective. Population explosion has been explained as a cause for many social problems. Unemployment, poverty, pollution and inequality have all been claimed to have arisen only because there are too many people. And hence controlling the population becomes a challenge before science.

It was in this context that in the twentieth century, the relationship between reproduction and contraception became even more clear. It is only in the last 30 to 40 years that the menstrual cycle has been understood in detail and with this achievement scientists have been moving ahead gaining control step by step over the whole reproductive cycle. Control over reproduction has meant control over population. In this modern view that science has women do not need to understand all this knowledge about reproduction. Here the scientific perspective is used only to gain control by others. Women's knowledge, their relationship with their body, these are not the aspects that have to be given importance.

That this progress in science has only control over population as its motive and is totally uncaring about every other aspect of the problem, as well as real life experiences. How dangerous is this perspective to life and living is obvious from the example of the anti-fertility vaccine which is currently being tested and developed in India by Indian scientists. Due to the media like television, today all of us are aware of the role that vaccines in general play. Vaccines are mainly used as weapons for prevention of diseases. To be able to produce a vaccine against a particular vaccine, firstly the disease causing bacteria is identified and isolated. Identifying the disease causing proteins within these bacterial cells is the next step and introducing these into the body in small quantities is the next step. These disease causing proteins when introduced into our body create antibodies against that particular disease within our body thus making us prepared for an attack by those bacteria. The bacterial cells and proteins are different from the cells and proteins naturally present in our body. Even though the constituent amino acids are the same, all proteins differ from each other and so the proteins injected are alien to the body.

The very idea of an anti-fertility vaccine means first of all identifying or naming fertility as a disease. This basic philosophy itself is something that goes against the natural process of reproduction. The aim behind developing these vaccines is having contraception. Besides it is made of hormones that are produced naturally in the body because it is intended to act against them and prevent pregnancy. For example, the one that is presently being tried out is intended to act against the hormone produced at the uterus after implantation takes place and whose presence is essential to hold the implantation.

All this leads to understand that moving from an anti-women position now we have come to an understanding which raises questions about existence itself. Gaining control through contraception has led to a situation where reproduction, fertility, all are being looked upon as disease. Understanding of the menstrual cycle and using every aspect of it to develop newer and newer contraceptives has been going on for some time. For this the menstrual cycle was taken as a periodic variation of the chemicals within the body. The subjectivity of each person and her menstrual cycle did not have any role in this understanding. Objectivity was the thing that mattered. Taking the person into account meant becoming emotional and subjective. This was not something that could be accounted for in the objective method of science.

This is what becomes the objectivity based on the periodic variations of a few chemicals and its validity is on the basis of the objective information provided by numbers. In today's science statistics and numbers play an important role. Properly tabulated and presented figures and numbers imply objectivity of the highest order. People's emotions fell into the realm of the subjective and hence had no place in this scintific method. The measure of objectivity was statistics. Numbers are what speak the truth, they are honest, while people's emotions and experiences are not.

* * * *   * * * *   * * * *   * * * *   * * * *   * * * *   * *

Open trials and public hearings on the issue of high dose estrogen- progesterone drugs were held in the four major cities of the country. At the trial held in Bombay, the Drug Controller repeatedly made requests to the people present. His request time and again was, "Do not be emotional. Do not disrupt the objective scientific process here with your emotions."

Truly speaking these drugs have been medically approved and recommended for treating secondary ammenorrhea, which to a lay person means a delayed or absent menstrual period. These drugs apparently increase the hormone content in the body and induce menstruation to occur. One of the causes for missed periods could be pregnancy. Hence in practice these drugs were also being used as pregnancy testing drugs. (Being available across the counter it was highly misused and used without any kind of medical advice and support.) If on taking this medicine the periods did begin then it was assumed that there was no pregnancy and if there was no menstruation then it was concluded that the woman was pregnant. The danger in this was in the fact that due to this high dose E-P drugs the fewtus exposed could be born with some congenital defect. Hence the demand made by women and health groups was that as this drug was not essential for the treatment of this kind of secondary amenorrhoea it should be banned. At the open trials most of those asking for a ban made their presentations. After that were the representatives of drug companies and their doctors. They were using slides and statistics in their presentations to almost make it appear that secondary amenorrhoea was a deadly disease and these drugs the only life saving medicine.

On the one side one could see this `objectivity' and objectively stated statistics. At the same time on the other hand were a mother who had taken these drugs in her pregnancy and her sixteen year old handicapped, totally dependant daughter. The question that remained was whether it wasn't essential to make pregnancy tests available. When non- availibility of these forced women to take these drugs, wasn't it essential to change this situation. When periods are missed for reasons other than pregnancy, then too there is no need to give these high dose drugs. Then why are these drugs still given? These drugs might induce menstruation, but would the reason for the missed periods itself be known? Or are all these questions not objective? And along with these questions there is also the question of who is responsible for and who would look after children who are born handicapped and dependant because of having of having been unnecessarily exposed to these high dose drugs. This also has to be understood. On the whole all this raises questions about this apparent objectivity and the `proper' objective method.

A lot of what had troubled during one's own education again started raising questions. Scientists are not emotional is the assumption. But are they not emotional about their work? Isn't the framework within which scientists do science subjective? Is there no trace of emotions in it?

* * * * *   * * * * *   * * * * *   * * * * *   *

She was pleading with the doctor. "Doctor, please relieve me of this pain. Please remove this thing that you have placed in my body. I cannot even tell you the amount of pain that I am undergoing. All I know is that since this thing has been introduced in my body, my body does not feel mine. It feels so heavy. My back is breaking with pain. There is no guarantee about my periods. I am bleeding almost all the time. Doctor please get me out of this hell. Please free me."

As was usual the doctor first ignored her. Then he tried to give some kind of answers just to get her out of the way. "All of this is just in your mind. Do not get so emotional about that thing in your body. The implant that we have placed in your body will not do any harm to you. I have checked you also and found nothing. Look here do not waste my time with your imaginary complaints."

She used to go every day. The doctors also reached their limits of understanding her or of making her understand their point. They started screaming at her next. "We can see nothing wrong with you. In any case there will be some trouble. Why are you so agitated?" She was made out to be the one with less ability to bear the pain. If they had removed that implant in any case the trials that they were conducting would not have looked so good with such good results. She would have been one more to have rejected the implant and discontinuation rates would have gone up.

Through all this, however, her pain went on increasing. Slowly the doctors started neglecting her totally. Her screaming and complaining were spoiling the atmosphere at the Centre. Finally she was declared mad. "Slightly off balanced you know" was the secret signal between all the staff. She was considered a hypochondriac -- ill because she thought she was ill. And yet she continued coming. Maybe she thought that someone would accept her pain and remove the implant or maybe she had nowhere else to go to. But no help came forth.

And then she removed that small implant inserted under her skin by herself. She cut open her own arm with whatever she had access to and got rid of the implant. Naturally she had no aseptic environment or sterilised instruments to perform this `minor' surgery. As a result the wound festered. The infection spread all over the body and she died.

On hearing this story, we were reminded of yet another story. A story read by all those who have studied some amount of science.

There was a well known Greek scientist. The king had posed a problem to this scientist. Without breaking or in any way damaging the king's crown, the scientist had been asked to find out if it was made of pure gold or if there had been some other metal that had been mixed. The scientist must have been a jolly fellow. Undaunted by the king's orders of quick results he was merrily enjoying a bath in the tub. He found that his body was also trying to float in the water just like other things. And he had a brilliant idea for resolution of the crown problem. He realised that any object when trying to float in any liquid displaced a certain amount of the liquid and if one could understand this process then by calculations of the amount of fluid displaced etc., one could find out if the crown had only gold or if it were mixed with some other metal. No doubt he was thrilled with this discovery. In his happiness he jumped out of the tub and went running down to the king the way he was - - stark naked. All along the street he kept screaming, "Eureka!".

It is not known or at least it is not told whether the people on the street found him mad or not. But even today some things are highlighted when this story is told. For example, scientists have to be immersed in their thoughts, they have to be totally unaware of their surrounding reality and have to work with a certain kind of zeal and committment. This is an example of how Archimedes was immersed in his work, how he thought of nothing else. This is a story of his concentration. What is never spoken about and never highlighted is his emotional involvement in his work.

But what is our purpose in putting both these storis together? It is to raise a lot of questions. Wasn't that woman stating a scientific fact? Why were her statements ignored and she considered mad? Why was Archimedes' running on the street stark naked not considered an act of madness? Emotions, feelings and observations about one's own body are not scientific. Then how do observations related to some objects like the crown (or maybe someone else's body) get the labels of being scientific? That women could just describe what she was undergoing because of the implant. She could not rationalise and offer explanations. Is this enough reason to consider her observations unscientific? Archimedes was propounding a principle. Is that why the society could accept and tolerate his abnormal and unbecoming behaviour? Not only that it was tolerated but that even 350 years after him, why is it being told to all students of science? If that woman could have spoken of the disturbances in her body due to the implant in terms of the estrogen progesterone hormonal cycle and its disruption, would it have been accepted as scientific? If instead of restricting herself to her own body and its behaviour she could have generalised her observations, would they have become more scientific? Why is Archimedes' objectification of his body to explain floating of objects considered more scientific than that woman's subjective relationship with her body?

* * * * *   * * * * *   * * * * *   * * * * *   *

In today's situation where products made from locally available herbs and plants have become so popular, we have recently heard of a new find made by Indian scientists in the area of contraception. They have discovered a new drug which has been given the brand name `Saheli'. This drug has also been included in the Indian family planning programme. With growing commercialisation people have generally lost faith in drugs manufactured by the foreign and multinational drug companies. People have more faith now on indigenous medicines made from naturally available plants.The simple understanding on which this faith is based is that anything made from herbs and plants is natural, nature based, and so would be harmless to the human body. This faith is exploited and so called Ayurveda like indigenous drugs become popular and are sold in the market.

`Saheli' has been discovered in one of the biggest research institutes in the country, viz. the C.D.R.I. Since this is a Government institution it is believed that there are no personal or commercial interests involved or even if there are they would be minimum. From prior experiences with contraceptives no doubt there are a lot of questions and doubts that any new contraceptive raises. Hence we wrote to the C.D.R.I. to provide us with all the necessary and relevant information regarding this drug.

`Saheli' is not a hormone and hence its contraceptive effect does not interfere with the hormonal cycle of the woman's body. All chemical contraceptives so far had been based on the hormones estrogen and progesterone. Oral pills with different concentrations of estrogen and progesterone affected the ovulation and hence the menstrual cycle of the woman. They did create a lot of problems because they were hampering the menstrual cycle. Since `Saheli' was not made from these hormones it would not give rise to the same problems as the oral pills. This was the point that was stressed most in the material that had been sent to us. At the same time there was not a word about how these pills called `Saheli' acted and how they achieved the required contraceptive effect. The only thing that was mentioned was that even if there were fertilisation of the egg, by some method the embryo was not allowed to come to the uterus and get implanted there. How this happened was not explained. The only thing that was considered important and mentioned was that with these pills there would be no problems with the menstrual cycle as in the case of the hormonal pills and that it would not affect the process of ovulation.

Like any other drug obviously `Saheli' had also undergone all the necessary trials and tests. Reading about these trials also did not clarify much. As results or observations of the trials the only thing that was mentioned was the comparison of women who had taken `Saheli' with those who had taken the hormonal oral pills. Women taking oral pills complained of headaches, those on `Saheli' did not. Women on the oral pills had menstrual problems, those on `Saheli' did not have any such problems. The only objective of all the reporting on the trials and of all the trials itself seemed to be to prove how `Saheli' was better than the oral pills. The question before us is that when a drug is being included into the family planning programme then is it enough to just test and say how it does not have the problems that the earlier drugs had? What if it had some totally different kind of problems? Where are the trials for these other possible effects? To get `Saheli' passed how is this limited testing sufficient?

At the same time as when we read this we also read another book. It was the story of another contraceptive the Dalkon Shield. Dalkon Shield is a kind of intra uterine device (IUD). IUDs are placed in the uterus and because they occupy space there they do not allow the embryo to get implanted onto the uterine lining thus preventing pregnancy. How this actually happens is also not exactly known and yet a lot of research has been done on the shapes and materials of different IUDs. In the last two hundred years the Dalkon Shield has got maximum publicity and has created history. A lot of questions related to issues of health have been brought to light with the Dalkon Shield controversy.

Government, pharmaceutical companies and the family planning programmes have constantly collaborated with each other to develop newer and newer methods of contraception which are then used in the family planning programmes. Not having done the tests in the proper manner, it is only after having used them that the dangerous aspects are brought to light. With the Dalkon Shield also this is what happened. The episode, however, gained more exposure because there was legal action taken against the pharmaceutical company that had marketed the device. The company lost the case and had to give out declarations that it would compensate any woman anywhere in the world who had got the Dalkon Shield inserted. Today the Dalkon Shield is not available anywhere and the company has no right to sell it anywhere. The case has, however, taught a number of lessons. Normally it is believed that the laws and regulations for granting approvals to any new drug in the U.S. are very stringent. This example of the Dalkon Shield showed how the persons responsible for the implementation of such regulations can fool and be fooled. How with the help of half truths a lot can be done which is not known until there is a calamity of some kind.

To understand the whole disaster it is necessary to understand the social situation in which this introduction was done. In the sixties, the oral pill had got a lot of popularity. At the same time the IUDs had gained notoriety because they were a cause to a lot of pain and complaints like excessive bleeding, severe backaches, etc. The idea of keeping a foreign body within one's body was also not very acceptable. In such a situation achieving contraception just by taking a pill everyday was something that was very welcome. After some days of use, however, it was realised that the pill was also not all that safe. There were problems with that too. That small, apparently harmless pill was creating havoc with the menstrual cycle and these prblems were also being recognised. The initial infatuation with the pill was slowly coming to an end.

It was this state that was made use of by the company manufacturing the `Dalkon Shield'. It was shown and proved how the `Dalkon Shield' was better than the oral pill. This was achieved through advertisements and other proper marketing methods as well as hiding of certain information and glossing over some half cooked research results. It was only much later after a number of women had undergone a lot of pain that it was realised that the `Dalkon Shield' did not have problems similar to the oral pill. It had effects which were much more hazardous and which made the `Dalkon Shield' out to be a dangerous contraceptive device.

Now when `Saheli' is being marketed and introduced then again the question arises, how can we say that what happened with the Dalkon Shield would not happen with `Saheli'. `Saheli' is an indigenous product made of locally avaialable herbs and plants and so is different. But is that enough to assure us of its safety? We can assume that these hazardous, untested drugs have been introduced because of the selfish motives and carelessness of a few individuals and corporate structures. Yet in such research where is the much acclaimed objectivity of the scientific method? It can also be said that these drugs and devices have not been developed with the `real' scientific outlook. Yet this does not resolve or answer the questions. It has to be acknowledged that the objective reality is such that even if you, the observer, are very objective you can see only what you wish to see. Your experiments and trials are designed with a certain framework in mind and that is what determines what aspects you can observe and study. There is no question which can have an objective answer. Objectivity is not necessarily an adjective for science and it is not necessary that it be so too. The quest of science is also not of finding the universal, eternal truth.

* * * * *   * * * * *   * * * * *   * * * * *   *

In fact in one discipline of science -- relativity and quantum mechanics in Physics -- this subjectivity has been given recognition. These new developments have revolutionised the concept of experiments, of the aims and achievements of experiments. The postulates on the basis of which experiments are designed and results sought are themselves time, observer and perspective dependant had to be accepted within the framework of this new discipline.
The experiment that revolutionised ideas was that related to light. Research in science has always involved laying down of theories, modification of existing theories and evolving of new ones to explain newly observed phenomenon. At the same time new ideas are put forward and then tested with specially designed experiments. It was one such new experiment that gave a lot of new insights into the basic understanding of the world as well as the outlook of science itself.

In the first two decades of this century it had been a well established fact that what we saw as light was wavelike in character. Assuming a wavelike character, however, it was not posible to explain the wierd results of photoelectricity which was a phenomenon widely observed. All observations could be explained only if one assumed that light was made up of particles and not waves. Other experiments also further emphasised this particle like character. This gave rise to a real dilemma. How can light have both wave like and particle like character? How can both these conditions coexist?

To resolve this issue the revolutionising concept that was put forward was that light had a dual character. It showed its particle character in certain situations and the wave character in some other. Which characteristic of light would be exhibited was propounded to depend on the nature of the experiment and on what one wanted to observe. It depended on the framework of the observer, on the design of the experiment, on the tools used and on the framework within which the experiment was designed. The subjectivity of the scientist, of the observer were all given due recognition. This new outlook enriched science, made it more comprehensive and rich.

These changed perspectives have been absorbed in science. Science has the openness to accept totally new ideas. It is the scientific philosophy accepted by the world, however, which has not moved from the classical definition of scientificity and scientific method. New ideas in science do not in any sense negate the earlier theories and ideas. In fact, it is science itself that helps us determine the limits and limitations of its earlier theories. There is nothing like good or bad science, or true or false science, or right or wrong science. These are wrong questions if asked. The need actually is of recognising limitations, of accepting them. It is necessary to make earlier ideas, theories and definitions more complete.

We cannot today say that Newton's laws are good or bad. We cannot even say under any circumstance that they are wrong. It is not a question of questioning them. It is just that they are valid only within certain limits. The questions that are being raised vis-a-vis them are to the mechanistic viewpoint inherent in it that is being made applicable to everything around us. The opposition today is to the fact that this understanding is being extended to all of nature; that one is looking mechanically at human bodies, at nature. The objection is to this generalisation, to this lack of recognition to limits of application.

We have seen fruits falling off trees very often. This is something that many have seen before and after

Newton also. But it required Newton and his particular social condition to actually theorise this falling of fruits. A Newton, a Archimedes become great, they are remembered and honoured. No doubt they have done great work as individuals. But that they too are a part of society is forgotten and is lost. With time the only memories that are retained are of one Newton, one Archimedes! That it was the society at that time and the understanding developed until then that led to this kind of a formulation of laws and principles by Newton is a fact that is forgotten. It does not get the same kind of emphasis as Newton as an individual gets. Seen in this kind of a social context there is no question of Newton's laws being good or bad. Fruits keep falling and we continue standing straight on the earth. It is the same with Newton's laws. (Of course a fallen fruit may be bad because it affects its appearance. Yet it also declares the ripeness and the sweetness.) So it is just specific situations and individual perceptions that actually qualify anything. Also these then are as much a part of the truth and reality as the concerned individuals.

Making an overview of the relationship of science with society, with persons, with experts; realising the limitations of science as a body of knowledge trying to understand life; accepting that science and its principles have a validity in a specific regime and re-examining the subjective paradigm of science in newer situations -- all this does not in any sense imply rejecting of science. In fact all this leads to a greater maturity to this cultural expression of society. These efforts help to make scientific knowledge stronger and more complete. The purpose of these efforts is not finding new principles and theories or finding `a' answer. It is just an effort at trying to make our questions multi-dimensional.

For this it is necessary that we relook at earlier ideas and concepts -- even those that seemed to be unchangable eternal truths. They also have to be looked at once again and tested once more. One such effort has been in the study of `evolution' of life.

*********************** * * * *   * * * *   * * * *   * * * *

The changes in our face in ten years are immediately noticed by us. They can easily be linked to one's growing age and other changes in our life. But to understand changes in life forms that have taken place through centuries, one has to resort to the theories of evolution.

In various ways, we have learnt and imbibed the principle of `survival of the fittest.' This natural law explains or is also used to explain the hierarchial charcter of society prevalent almost everywhere. These principles of evolution are actually laid down by a western scientist Darwin. His theory was based on his observations of nature. In that sense at that time these ideas were revolutionary. Within the very Christian theory and understanding of genesis, linking human beings to apes, chimpanzees and gorillas was an idea that required courage to be put forward. In fact, at around the same time another scientist Wallace too had arrived at similar principles. In a sense the time was ripe for receiving such ideas and many other thinkers and scientists picked up these ideas and developed the theory of evolution.

The superiority of human kind was maintained and even emphasised. As compared to `life' on earth, the human species was a very late entrant. `Life' had existed on this planet for the last 40 million years but the human species had come into existance only a million years ago. Other species that existed today, or have vanished or are on the verge of extinction have not only fortified the principle of `survival of the fittest' but also made way to further claim that the most dominant species today viz the human beings are the most superior of all.

This very concept of identifying someone as more superior than the other, assumes a hierarchy and comparision. Almost a hundred years before Darwin, Lino had tried to do a classification of all life forms. His classification however, had got philosophical backing only after Darwin's theory was propounded. Interestingly while stating the basic principles Darwin seems to have been influenced by the theories of economics and Malthus' calculation and connection of population growth and natural resources. Natural resources are limited and so ensure availibility for all human beings and to avoid poverty, hunger, misery etc. it was necessary according to Malthus to keep the population of human beings also under control. Darwin almost picked up this thread in his argument and developed it to put forth his theory of evolution.

To deal with scarcity of natural resources, nature took resort in competition and only those who succeeded in this competiton survived. A law very much based and drawn from the then social reality is today being forced down as `the law of nature (or of the jungle)' to explain human society! There have been of late, many who have questioned the universality and validity of this generalisation. There are many who have tried to look afresh at `nature' also. We could examplify the newer attempts by the efforts of two western feminist women.

According to them Darwin's theory came to be in a specific social context. It has further been nurtured by specific production relations and social structures. The limitations of this theory can hence also be seen in this social situation.

`Competition' and `scarcity' are the two basic elements of this theory. `Nature' and its dynamics can, however, be looked at in a totally different manner. Nature is the best example of `co-existance' and `plentitude'. The various cycles in nature -- that we have been studying since school -- are a good example of these principles of co-operation. The photosynthesis done by trees and plants while preparing food for itself and the intake of carbon dioxide and release of oxygen into the atmosphere thereby is one such example. These trees also give us humans and other life forms leaves, fruits, flowers. Needless to say that today their very existence is at stake. We have learnt of other such complementary cycles that forests have maintained. Today forests are a different issue. The adivasis, as forests dwellers had some understanding and respect for these cycles and had evolved cultural practices that did not destroy these natural ways of co-operation. Today, ofcourse, the adivasis are considered to be `the' cause for depletion and destruction of forests. Commercial interests and destruction caused by them are not questionred. So much so that we have stopped seeing these various cycles of co-operation and sustenance all around us.

If however, we were to make this as the elements of the basic philosophy there would be no rationalisation for competition. This theory of evolution and its basic principles, then seem very inadequate to understand life and nature. In fact, this new outlook questions and shakes the foundations of many hitherto accepted facts. When looked at with this outlook the whole philosophy of hierarchial relations, gaining control over the other, of competing for what is available all seem redundant.

****

Science can and does get new directions. But for this it is essential to accept that social conditions and subjectivity of scientists both determine and define society and science. Once again if we could link society and science the old definitions would look different. For this it is essential that much in the same way that science and technology shape and influence people's lives, science be open to people's experiences, expressions and subjectivity.
Actually, before this body of knowledge got identified as science, things were different. Then this, what is known as science today, grew out of daily happenings-activities and observations. The first technology has been use of stones to make tools by early humans. Technology was not used only to gain control over. When from this we move ahead then issues of control, benefit, domination all raise questions about technology and its perspective.

The questions raised by that group of women in Tamilnadu are hence important. We want knowledge and we want information on contraceptives but how, when and who is to use them has to be our decision. And the choice and strength of making these decisions can come only if we are aware and knowledgeable. Our experience and this knowledge would give us a new self confidence to lead our lives.

These ideas of ours on science, society and the person, although arising from a woman centred perspective are surely not anti-men. They definitely are anti patriarchal values.

This according to us is not a question of struggle. It is a question of widening of the vision. This might sound like running away from confronting. But truly what is this struggle for? It is the struggle for all human beings. It is not a question of class alone. There are no distinct lines between enemies and friends. Hence subjectivity of the individual is important to us. Do we negate hierarchy in society? Today it is an inseperable part of society. Developed, underdeveloped, black, white, high caste, low caste, male, female, at every step there is a hierarchy and there is no question of accepting or negating it. But we give this existing differetiation greater credence when we use it to gain control over the other and when we accept it as the unchangeable truth and structure of society.

In moving away from these hierarchial concepts of caste, sex and nation and while actively trying to demolish these existing structures science can be useful. More important, however, is the fact that questioning its own premises along these lines would enrich and help science grow, widen and flourish.

Article written by
Swatija and Chayanika
9, Sarvesh; Govindnagar,
Thane (E). 400 603.

(Article written for a Marathi annual magazine *Stri Uvach* in 1992).

Biology, Medicine and Women -- Some thoughts

Science which ought to be another cultural expression of society at large has on the one hand remained the expression of those with power within the society and on the other with its universal characters in some sense helped to reach out and help those disadvantaged by society on the whole. Women represent a large section of the marginalised doubly oppressed within their own caste, class, community positions. Their relationship with science as it is practised has been particularly ambiguous. Science has been understood to be a very male discipline, controlled totally by reason and intellect -- both abilities that society believes women lack in.

At the same time women differ from men in their biology, in their body's ability to reproduce. This has led to a very typical relation between women's roles in society and their overall social status. It has also resulted in a typical viewpoint in science. These attitudes of society reflect very clearly in the way biology and medicine have in particular looked at women and have been exposed and discussed by many feminists since the decade of the 70s. Some of these aspects will be the focus of this article.

Health care had been women's domain dominated by knowledge that women had about the body and about nature and its resources. The advent of modern medicine in a way liberalised this knowledge from the hands of the practitioners to make it more accessible to many more people but at the same time discredited the knowledge that women had generated over their years of experience. Along with this there was an active attack and aggression on women healers on those women who were strong enough to have power of knowledge.

Medical science or modern medicine has its roots in the massacre of lakhs of witches and the systematic killing of traditional healing methods. This is a well known and explored fact about Western society of the 17th Century. In the Indian context there is no such history of witch hunting but erosion and systematic exclusion of traditional knowledge has been an experience here too.

A group `Shodhini' working in seven Indian states has been involved in collecting information about herbal and other remedies practised by women healers. The women practioners working in the rural area, having knowledge about the herbs have prepared the herbarium sheets of the herbs. They have also created nurseries for the plants which are rare in particular areas or in danger of getting lost. Exchanging knowledge base from different geographical areas and also trying out the remedies along with self-help clinics where women also could do their own examinations has been another part of the project.

It is an effort to reclaim the knowledge base of women. It is an effort to ratify the age-old held beliefs and knowledges of women. It is an effort to empower through knowledge that has been acquired over the years through a great deal of observation and skills. It is also an effort to make health and health care more accessible, within reach and in tune with our cultural context.

Yet in the era of intellectual property rights this effort too has its drawbacks. Where knowledge itself is losing out on collective and social aspects and is becoming the property of individuals, there is a need to be cautious. Today a supremacy is being given to the intellectual abilities of individuals, the social situation and contribution to the evolving of that knowledge is being ignored all the time. At such a time a process of documenting a lost heritage of ages, a treasure of information gathered and enriched by many women, compiling of such material has become problematic. With the kind of material interests the drug companies have, any such initiatives could lead to further snatching away of knowledge and practices from those who have cherished and treasured it for so long. Such is the situation of the knowledge base today which denies the historicity and social development of the old civilisations.

It is within this scenerio that women have been struggling to regain their lost knowledges. The efforts are individual and collective in the broad and fluid framework of what can be called the women's movement. Along with reclaiming what is lost there are efforts at analysing and understanding what is replacing this. A critical look at the way in which the so-called objective and rational sciences are looking at women and women's issues. Understanding of biology and research conducted within the discipline has been the main focus of many Feminists.

The issues have been at various levels. The social status and position given to women has biased the way in which theories of biology have evolved and developed. The methodology has also obviously accepted the norms of society and worked itself out within the given framework. In medicine, in particular, this has meant a very lopsided and incomplete treatment of what are considered to be issues of women's health. We give below some examples of each of these.

There have been various myths that have been propagated and perpetuated with validation from the method of science. For example, women are weaker was attempted to be explained off through theories like women had less muscle power. Intelligence and mathematical abilities have been linked to differences in brain size and brain anatomy and thereby it has been hypothesised that women are fit to do only certain kinds of work. Even today research is undertaken to in a sense biologically and scientifically prove certain trends in society like women are fit for certain skills and not at all equipped for some other skills.

The tendency to use this kind of `approved' scientific knowledge to give a sanction to oppressive norms has been a practice of modern times. Earlier it was God's word that was the final authority. Today many times science and the scientific knowledge are being accorded demi-god status and used in similar attempts at justification. Most of these deductions made from biased outlooks have been challenged and the biases exposed. In general sociobiology or attempts to use biology to validate and justify social behaviour, has been questioned by various women and men.

In particular for women gender and equality between the sexes as understood in evolutionary biology have made crucial contributions to this process of re-looking. The primary basis for this questioning also comes from an assessment of reality itself. For example, the whole question of women's muscle power. A large percentage of India's reality, which is the rural parts of the country, have women bearing the brunt of the most arduous of tasks and which is related to fuel, fodder and water collection. This is a task that requires tremendous tenacity of muscles and yet that has been considered to be women's task alone. No concern has there been shown to women's `weak' muscles.

The research based on biases of the scientists and their ivory tower models of research has missed out on these various basic characteristics of life. The research model for lateral brain development theory (which is at the basis of allocating certain gender based skills) also does not take into account the normal and social norms which have been otherwise proven to be the cause of brain development or rather ability development. The trauma and the change in the life of girls after menstruation does hence play a remarkable role in their abilities to do mathematics. As far as language abilities and rational thinking goes this does have lot to do with the social and family atmosphere. All these factors are conveniently missed out and wrong methodologies evolved to arrive at results that suit the status quo structure of society keeping both men and women trapped in manhood and womanhood respectively.

The concepts of masculinity and femininity and the associated traits with each have been imbibed in the understanding of knowledge systems. Somehow lack of feelings, rationality, objectivity, and so on have been assumed to be masculine characteristics and modern science -- which was developed not only by men but within the patriarchal paradigm has been assigned these basic concepts. The stress has been on facts, on objectively put together pictures of reality. All biases on the part of the researcher are ignored and scientific theories proclaimed to be the only truths. At times this means negating other points of view and observations that do not fit into this mould of gathering facts and sometimes it has meant limiting the very growth of knowledge in a particular direction.

Evolution, the most basic theory of biology, has been full of such a subjective vision of a victorian mind,that of Darwin. Progress and development were being defined and understood through values like competition in society. These also became the values and the basis of the theory of evolution. Accepting the supremacy of human species and the resultant androcentric vision also is part and parcel of such a Victorian attitude. The difference between the sexes and the accepted hierarchy between them was also an outcome of the prevalent world view in society in the Victorian era. Later theories have pointed out these connections between the basic concepts of the theory and the societal attitudes and structures. Yet there is also a trend to justify the very same social practices using the theory which has been evolved based on them.

The other aspect that has been questioned has been that of the Cartesian model, the mechanical view point. Most of modern medicine has developed in this fashion and based on a rationale where the body is looked as a machine and hence treated accordingly in a very mechanistic way. An example of this is how women's bodies are looked at. The human body is a male body and the woman's body appears as an anomaly with different organs related to reproduction.

The implications of this are manifold. Women's bodies appear in text books only when there is any mention of reproductive organs. These representations are also very alienating. The experience of health group working in Rajasthan as part of Women's Development Programme has revealed that the women wanted to know about their bodies and menstrual cycle, many questions and experiences of women were not there as part of the medicine books. There were no pictures and also no proper treatment in the text books. This had compelled these women to work on their own book called `Sharir Ki Jankari'. Eighty women have worked on this book and have attempted to find answers to their own questions.

Special attention to women which also is very limited and unrepresentative of women's actual experiences is paid only as far as reproduction goes. That this specific biological and social function could alter women's biological responses and would warrant special attention is something that does not even occur as a question in the whole approach. Drugs are tested only on male bodies. The justification for this is that since women reproduce no risks can and should be taken with their bodies. The argument is totally fallacious.

On the one hand the very reason that women reproduce and hence perform a special function their bodies might react very differently to chemicals than what men's bodies would do. Hence they need to be given special attention and study. On the other hand this great concern for women's capabilities to reproduce is not at all reflected in the way their bodies are made the testing ground for every technology related to reproduction. This special function is then looked at very mechanistically and attacked in every possible way with total disregard for the overall impact on women's bodies and lives.

This understanding of the woman's body and the reducing to reproductive organs does not stop at that. It goes further in reductionist approach where the understanding of the menstrual cycle has been seen in a mechanistic way as a product of few hormones and their cyclical interaction. That with the world politics of population control and societal norms there has been a great stress on women to opt for contraceptive methods which are harmful and long acting. With total disregard to women's experiences and needs their fertility has been tampered with, their bodies have been experimented upon and their roles further entrenched into those of being reproducers.

Where knowledge should have the power to make things easier for more number of people the way that science has developed today it has led to accepting and in a sense justifying women's role in society through particular representation of their biology. This has necessitated a questioning of the knowledge and more importantly the process by which it is being acquired.

The women's movement has also moved on. Evolving our own approaches based on women's experiences and enriched with knowledges acquired over the ages there have been attempts at self determination. The attempts in Rajasthan through writing and depicting in ways familiar to women to the work done on traditional knowledges related to medicine by `Shodhini' are just some of the examples. There are others too scattered over the country. It is these attempts that give hope that the future would have an emergence of a new way of looking at biology and women's bodies and that this would help evolve a positive relationship of women with their bodies. Something that would help to counter social pressures and not get further bogged down in stereotypes.

Article written by
Swatija and Chayanika
9, Sarvesh; Govindnagar,
Thane (E). 400 603.

(Article written for **AVEHI** newsletter in 1996).

Some thoughts on Reproductive Health

Medico Friend Circle has taken issues of women and health at all levels. It may be campaigns like high dose estrogen and progesterone preparations or injectable hormonal contraceptives. Bhopal has also remained one of the major concerns of MFC. There have been continuous inputs coming from MFC to various campaigns like sex-determination, long-acting contraceptives etc. But to have a meeting on reproductive health is a welcome step ahead.

At this initial presentation I would like to put before you some thoughts on how reproductive health has been looked at, and at the same time in what ways has this view been challenged. What I shall speak will surely not be new for most of you. I as a representative of FFWH am putting here before you facts and ideas that have emerged from all our work for the last so many years. This work is the legacy of all of us present here. It is just an effort at a recapitulation, at putting everything together so that we begin the deliberations of the next few days starting from a common ground and hope to move ahead together.

Generally it is important to identify what one means by reproductive health. As we all know biology constructs societal norms and it has been a major force in constructing man woman relationship. At the same time reproduction may be a biological phenomena but it is very much a social construct. So any understanding of reproductive health would have to move between these two arenas of all our lives.

In fact, when talking of reproduction, the first that comes to one's mind is women's fertility cycle. This has remained an issue of of awe at times and has also acted as identification with nature and other natural cycles. Old cave paintings depicting menstrual cycles have been found in almost all ancient civilisations. Fertility has been understood in different ways. The different remnants of fertility rites still exist in our culture and menstruation remained a taboo. It is looked upon as dirty and inauspicious by society. The identity of woman and change in her personality after menstruation is a well studied social issue. Puberty of men and the changes in their own bodies and creation of a myth of manhood also happens at about the same age but this area has remained unexplored. We feel when we are talking about reproductive health we must really talk about these aspects of woman and man, how their physiological body changes affect their person. Physical existence constructs their respective personalities. Here we want to emphasise this point because identifying reproduction as women's responsibility is a social construct. We want to identify reproductive health by identifying it with both men and women.

When we say that physical existence also constructs persons, this division along sex becomes very important. So also does expression of one's sexuality get dominance. But societies are existing in such a way that there is a very strict control over this `natural' expression of all human beings. The following equation is upheld in all structures and institutions of society.
Normal Sexuality = Heterosexuality = reproduction = male child (only in marriage)

Human beings are considered to be evolved beings who have a rich culture and civilisations with evolved communication methods. In such a situation identifying normalcy to such limited expression is in itself a problem. The story, however, does not end here.

It is only heterosexuality within marriage that has acceptance. Further a primary motive in establishing monogamy within the confines of the institution of marriage is to ensure paternity and patrilineality -- it is to ensure that woman bears the child of only a particular man. Naturally, then the emphasis is on reproduction and so heterosexual relations which would lead to conception alone are stressed. Finally again it is the male child who can supposedly carry on the lineage of the man and so bearing sons seems to be the only option.

Since women's fertility needs to be controlled, it is their sexuality which is controlled. They bear the child and so their body becomes a reproducer preferably of male progeny. This biological reality is translated in society to mean very different things for men and women. All responsibility for reproduction is on women. Men have none. Hence automatically contraception becomes women's responsibility. Sexual interaction for women is equal to responsibility; for men it is fun and pleasure. Simultaneously stereotypes of sexually inactive women and overactive, virile men are also constructed. This justifies and supports the practice of prostitution as an oldest profession. Men's virility is the excuse under which gross violation of women's bodies and persons is carried out.

Similar is the situation of rape or other kinds of sexual abuse. There is some unwritten sanction by society to men's lust and even assaults and acts of showing their power are waved off as a consequence of this lust. The range of these myths and their expression thus ranges from prostitution to rape to less number of vasectomies. All are related with notion of virility of men which is uncontrollable and is in many senses not evolved, `uncivilized'.

This equation sets the norms of behaviour in society. It gives a model along whose lines each individual tries to mould herself. The institutions in society are created to facilitate this process. Naturally, reproductive health also gets defined only as women's health in their role as reproducers within marriage. All other aspects of women's lives are totally negated and so a large number of women who do not fall in this category of `normal' woman and who may or may not be struggling to become normal.

This model prescribes the behaviour pattern for men and women. Men are supposed to be virile and aggressive. Women have to be most protective about their chastity and virginity. To preserve their body for that one man, they have to constantly behave in ways that would protect them from the naturally aggressive and lustful men. This is what creates stereotypes of female as well as male and makes us into the persons that we are. This constant fear of aggression has made women coy and shy, and fearful of their very existence. These abnormal stereotypes -- can they be called healthy? Shouldn't this also be part of reproductive health because it is related to the social construct of reproduction? At least while looking at a person's health we have to take into account these pressures that are operating on her/him.

In reality women are producers and reproducers. Their role as producers is no doubt affected by the overwhelming societal responsibility of being reproducers. The kind of training and jobs that women get and the opportunities that they can avail of while satisfying their societal role as reproducers, affects the rest of their life. So issues about occupational health should come under reproductive health.

Widows or deserted women do not have so called protection to their existence and so their reproductive health does not get catered to. If they have any problems it is considered to be certificate of their immoral activity and so they are forced to choose quacks and other treatments even if they are unsafe. These many women do not come under strict category. So we have to define reproductive health as concern of all women of all age groups.

Science, medicine health care system all have been aspects of this social construction, motivated and developed in the context of societal norms and values. These have been the agencies responsible for looking after reproductive health and so naturally they have accepted and adapted themselves to the above conditions of normalcy. Health itself is looked upon as ill-health or absence of ill-health. It is not looked upon in holistic perspective of socio-political economic and geographic existence of men and women even though technically this is the definition accepted by WHO. In case of reproductive health especially this is vital because whatever health care is prescribed is not to unhealthy persons but to supposedly healthy individuals especially in case of fertility control methods. The societal taboos do not allow women to talk about their problems of ill- health with respect to their reproductive tract especially the constant threat of STDs and now AIDS. This further has increased the silence in women to talk about their problems. This fear has made them more and more docile and also fearing type. In any case as far as women are concerned any problems related with their health are any way considered to be secondary, less important. Only when it becomes impossible for them to carry on with their work, then only they talk about their problems, but it is not necessary then also that their problems will be taken seriously.

As we all know, the knowledge of medicine in most of the systems in the form of theory and at the level of practice has been kept away from women. Allopathy has aggressively curbed the existence of medicine women. We do not have sufficient studies about those practices in our society and no clear cut formulation on this issue but attempts of groups like Shodhini who have been working with medicine women in a few states in India are helping to trace in some sense all that is getting lost. The massive work done by this group is coming out soon in form of collection.

Scientists have always said that intervening in women's body to achieve control over fertility is much easier because of the cyclical nature of the menstrual cycle and hence of their fertility. Yet, whole aspect of menstrual cycle and its effects and affects on women and their body functions has been neglected by biology by considering only man's body as biological entity. World over, women are raising voice against it and separate research norms have come up in recent years.

Biology as a science developed in this society has the same biases and anti-women perspective.

The consideration of reproductive system being only associated with reproductive organs is good example of the overall attitude of science. The reductionists approach does not look at the process of reproduction as it being a function of the whole body. Babies are now being forcibly produced by menopausal women and even the comatose women. Brain is otherwise considered to be master of the body. But when it is question of reproductive system of women, the brain, one of the major actors in the process is not considered at all. The reproductive system is reduced to the so called reproductive organs.

One may find this a very simplistic, generalised and polemical argument but the role of other physiological and biochemical changes related to the reproductive cycle which are happening every moment in the body is not researched beyond a limited interest. Irregular menstrual bleeding and its effect on women's life is not an important question for scientists. Whether it is experience as dysmenorrhoea during a regular menstrual cycle, or the effect of a contraceptive method or the experience during menopause.

Thus a general trend that seems to be followed is to negate existence of women and progressively reduce them to their ability to reproduce and identify their body with just their reproductive organs. At the same time reproduction and reproductive health are becoming issues of women's bodies, and within it of course of their reproductive organs alone. So the whole development and progress is towards achieving control over fertility.

We do not see much difference in the plight of women in urban and rural, developed and underdeveloped countries. The availability of facilities to rural women are less and they do die because of the non-availability of proper health personnel but then urban women have facilities at their doorstep but in monetary terms the facility remains at distance. The loss of control over their own bodies is brought about through control over their reproduction and it is true for all societies universally.

In all our minds, questions of contraception or controlling fertility and handling infertility have become questions of technology -- of getting the right method. The social aspects are totally lost. But can any technology however, efficient, harmless and good -- alone solve or attend to the issue which itself is based in society. Technology can just be an aid in handling a situation, it can not ever provide the total solution.

We would like to share our experience in the sex determination campaign. We had initially asked for a punishment to be stated in the legislation for both the givers of the technology as well as the marital family of the woman who went for the test. The state responded with a law in which the woman was also punished. The Central legislation also had the same clauses. Our experience at the State level, and also some amount of thinking led us to take a very different stand. We said that this law is for regulation of technology. The doctors are responsible for providing it. Whatever be the demand of the persons who come to them, the doctors were in a position to refuse access to the technology. So our stand was that the punishment should be confined only to the providers of the technology.

The clarity came with a more clear realisation that neither technology nor legal reform alone can stop these practices of discrimination between boys and girls. This history of campaign has helped evolve an understanding today on contraceptives as well. We cannot just have a safe, efficient contraceptive method unless we are willing to talk about basic changes in the man-woman relationship itself.

These issues are more important today when technologies are today being developed to meet interests of certain sections. This is evident in case of assisted pregnancies and technology which is evolved and has national pride in such successes. When there are women who have been suffering due to ignorance, their subordination and their physical illnesses which is most important cause of their infertility are negated but attempts are to develop IVF as in case of India. Indian sate is providing funds for both anti-fertility and pro-fertility research and its development. In developed countries it is more so because of the threat of extinction. In Japan during last 1 or 2 years, 150 In-Vitro- Fertilization clinics have been opened and with the nation's fear of getting extinct stated in these many words.

The biological ability to reproduce is tampered with as and when wanted according to the nature of the demand. These demands are determined at International levels especially in case of anti fertility technologies. We have felt in FFWH we should build up an opinion and campaign not against Norplant or anti-fertility vaccine but the basis of such contraceptives which are long acting and do not leave any control in hands of its user. In case of anti-fertility vaccine in particular there are larger issues involved. The basic contentions of it, many of you must be aware of. Mainly what it means to tamper with sensitive immunological system at a time when AIDS is rampant and the general pattern of diseases is changing rapidly and there are increasing outbursts of auto-immune conditions. Apart from that, the nation state boundaries which have been created in this century, are the rationale on the basis of which we have been campaigning for years together -- such as the use of contra-indicative drugs in third world without any regulation and warning given. But in this case of AFV, Indian scientists being the pioneer workers the question has to be addressed in different way. We have reacted and had very strong rationale of multinational industries profit motive and use by them of developing world's people as experimental animals in case of drugs especially. But now something is produced in India which is more harmful and is developed with its abuse potential being stated as its virtue, as one of the positive aspect of the anti-fertility vaccine. In this campaign we felt it is important to see the development of such harmful contraceptives in the larger context of development and population politics of control. The need of women to control their fertility has been exploited by the politics of population control policies outright.

Science has been proved to be rational and has appeal of universalisation, generalisation. Science has that appeal over traditional systems which are specific and localised. But progressively science has lost its appeal to have value free, rationalist approach. Today science is involved in providing contraceptives which supposed to be giving a wider choice to women to choose in their malnourished, anemic conditions to save them from maternal mortalities and abortion related complications. Here we are not going into numbers and we do not want to base our argument in statistical method but we want to stress again one point that women want contraceptives because they do know the difficulties in their lives at all levels. They want to use contraceptives as a rebel and want to use contraceptives without knowledge of their husbands and in-laws who are not bothered for their lives anyway.

This need for contraception is met in society mainly by the health care system. In India, this task has been carried out by the Family Welfare Department initially called Family Planning Department. This history of the FP programme in India most of us are aware of. A programme that began as a birth control programme and had education and awareness raising as its main support has today become a family welfare programme with greater emphasis on using all available technology to achieve population control and hence reduce population growth. It has supposedly taken care of women's health because once again it is just this reproducing ability which is to be given any special attention so the only progress we had was MCH. This too has been now taken over by the FP programme. The Family welfare programme has constantly rising budget and even in times when there is reduction in overall primary health care and preventive health services, this is programme into which more and more money is being put.

Recent developments in the programme are even more disturbing. There are efforts at involving NGOs at all levels to ensure implementation of the programme. Within the programme itself while on the one hand there is stress on long acting, provider controlled methods, on the other hand there is a greater emphasis on women's development and empowerment. This to us appears to be a two pronged attack on women's autonomy and independence vis-a-vis their reproductive health.

One is the consistent, physical, invasive attack of technology and the other is taking over by the state all the terminology and concepts with which women have begun to unite and redefine themselves. Women's empowerment, development and organisation is all being geared to one goal, that of achieving population control without changing the basic parameters and definitions of reproduction or womanhood or manhood for that matter. Without allowing a new approach to reproductive health, it now appears that other areas of her life be it literacy, employment or other such aspects all are just being reduced to reproduction.

Finally to be able to look at reproductive health differently, it is divisions between women and men, between laypersons and experts, between women and women, between persons and their bodies, between individuals and society that we want to minimise because in reproduction and in determining reproductive health each of these contribute and because each one of us reflects many of these apparently contradictory categories simultaneously.

(Presentation by Swatija for Forum for Women's Health at Medico Friend Circle Annual Meet on Reproductive Health held at Sevagram 13 - 15 January 1994)

Ethics in Contraceptive Research

The campaign against harmful drugs and devices related to fertility control has been going on for a long time. This campaign has challenged existing research methods and designs and has also asked for a radical reorientation of such research. In the process has emerged the new understanding of looking at contraception and all new developments in its technology as such.

Long acting contraceptive methods like the injectables and the implants have been at the centre of controversies for a long time now. Most of the times the case against these contraceptives has been fought on technical grounds. The safety, efficacy and to an extent the need for such methods were questioned. The focus was also on either the method of the research trials or the interpretation of the research results that had been obtained. In fact as the campaign grew the nature of the demands and the issues that we could connect have also become more complex and complete.

History of the campaigns in India

In India one of the major campaigns has been that against high dose EP drugs. These were banned by the efforts of various kinds of health groups and drug action networks with active support from women's groups and consumer groups. The major issue highlighted was the redundancy of the drug and its harmful misuse as an abortificient. The issue was more at the level of proving that other treatments were available for the state of secondary amenorrhoea, that this drug was misused and that its effect on the fetus was harmful if the abortion did not take place.

The question was `Is it ethical to sell a drug that can easily be replaced when we know of its rampant misuse?' The demand was for a ban on its sales and we were successful in getting a ban on the sale of the high dose EP pills. The injections of the same formulation were not banned and now we realise that high dose estrogen and high dose progesterone are separately available meant to be consumed together for the same purpose for which high dose EP was banned, namely as an abortificient!

Later the drug that was focused on was the injectable Net-en. This contraceptive was being tested on women without their consent and so the issue of informed consent at the time of the clinical trials was highlighted. It was proven through an actual action that women would not `volunteer' for such trials if they were told all the facts. This time a ban was sought on the introduction of such contraceptives in the family planning programme. The ethics of the trials were questioned by objecting to the way in which women were being recruited for it. The trials, however, continued.

The facts about the injectable were also gathered and its harmful effects stressed upon. The fact that such long time disruption of the cycle would be very harmful to women's health was also emphasised. An objection was also raised to the long acting character of the injectable stressing more on the fact that the woman had no control over it. The understanding of issues such as safety and extent of side effects were also raised. In spite of the case the injectable was allowed to be marketed and its actual sale began in 1994.

The next major campaign has been against the implants. Once again the issue was of the lack of informed consent at the time of the trials but this time the whole design of the trial was also questioned. The incompleteness of the research was pointed out in not doing a proper long term follow up of the women and the progeny born to them. The subjectivity and the anti-women bias in disregarding menstrual disturbances and other such side effects was also pointed out. The basis of arriving at the 20,000 menstrual cycle observations were also questioned for such a long acting method that was meant to be used for 60 months by every woman.

Questions were also raised about the ethics of having such a long acting contraceptive on which the user had no control and for whose removal the woman was dependent on the provider. The fact that there was resistance from the provider to remove the device even at the time of the trial and the possible misuse in the coercive family planning programme was also emphasised. The tremendous loss to follow up at the trial stage itself was also pointed out to stress the futility of this method in the Indian context.

In the meanwhile Depo was cleared by the US FDA after being at the centre of a controversy for a long time. The results of the animal studies have apparently been refuted by a WHO study with Depo for carcinogenicity. This was preceded by the revised WHO guidelines for research on hormonal contraceptives in which results of animal trials were considered to be ineffective in gauging the extent of the problem. As a result they were said to be unimportant and redundant to an extent.

Further it had been said that the only way in which any estimate about the nature of the side effects could be made with certainty would be through the large scale use of the contraceptive itself and so post marketing surveillance was said to be very important. In fact to justify this stand the example of the oral contraceptives was often given. The OCs were introduced without much research. For the last forty years in which they have been used they have, however, now become the method most used and hence most researched with a lot of facts coming to light about the harmful side effects. In stead of this being a lesson of having to complete the research before its introduction, this has been taken to mean that there can be no comprehensive data on any method unless there is widespread use of the method!

A result of all this was the introduction of Depo in the Indian market apparently with a condition to carry out a post marketing surveillance. The details of the surveillance are not included in the packet insert and nor are doctors prescribing the injectable aware of the nature of the surveillance. In any case in a society where there is no system of any kind of check at the time of distribution, is a surveillance ever going to be possible? In such a situation can this be considered an ethically right step?

For the last two years moving on from this stage, there has been an international campaign asking for a halt to all research on the anti- fertility `vaccines'. The question is not at the level of whether the testing is being done adequately or not, or whether the women who are being tested upon are being informed or not but the question has been raised at the level of the ethics of developing such methods of contraception at all.

We have recaptured this historical context briefly here because it very neatly sums up the situation vis-a-vis contraceptives in India and also raises the issues of ethics as raised by the campaigns at various levels. It is also the backdrop from which we are arriving at an understanding of what really should be the ethics of contraceptive research or at least the questions that need to be asked to assess the ethics of contraceptive research.

Contraceptives are not only `drugs'

The issues of ethics for research into any drug can be roughly categorised into three stages and the above history shows the campaign against harmful contraceptives successively taking up the issue at a different stage each time. These three stages can be said to be as follows:

(a) Ethics of the actual conducting of the trials
(b) Ethics of the design of the research including the clinical trials
(c) Ethics of the direction of the overall research in the area.

Although the criteria for ethics for any drug research can be similarly categorise there is something specific about contraceptives being looked at as drugs and that too we would like to emphasise and highlight at the outset.

Contraceptives do not treat a state of illness. They are not curing a disease, they are in that sense not being taken by people whose `normal' and `natural' functioning of the body is impaired. Contraceptives are used by persons who might be otherwise healthy or ill but who do not use the method as a cure. In fact whether the user is healthy or ill in both cases the contraceptive method has to take note of both these conditions and research has to be particularly directed keeping this fact in mind. In fact it has to be borne in mind that not only is the contraceptive not getting rid of any disease, it is used because most people especially women need it. This is an important factor because the need would force many people to accept whatever is available. Seeing to it that the need is not exploited by others hence becomes an important criteria.

Further the contraceptives are used over a long period of time on a continuous basis. This means that if the method intervenes into the usual functioning of the body then this intervention is over a very long period of time, a fact that again has to be taken care of and looked into when determining the safety and the harmlessness of the method. Any contraceptive is also used in the reproductive age group of the population and it does obviously affect the reproductive cycle leading to the possibility of it also affecting the next generation -- a fact that also has to be ethically cleared when clearing a contraceptive method at any stage.
Most importantly the situation that contraceptives deal with is not really `medical'. There are social solutions available and in a sense it is a social situation that is being catered to by the medical science. This is an important aspect that keeps getting lost in today's context when every thing is being handed over to experts and technology. The ethical questions raised in the case of medicalising of a social situation are naturally going to be different from those asked when treating a situation that demands and can be looked at primarily from a medical point of view.

In general the practice of medicine is becoming more and more `technical'. The solutions, the diagnostic methods and the cure are based on a very technology oriented mindset. The practice of medicine is being governed more so by the profiteering attitudes of the market and predominantly by the pharmaceutical industry. The same holds in case of contraceptive methods too. Only here too there are some additional factors.

The population control lobby has been not only a major force that directs all contraceptive research but their propaganda has affected the mindsets of most people including the researchers. Scientists like Prof. Talwar, pioneer in the AFV research openly claim these concerns to be the guiding force for their research and concern in this area. A more sophisticated method used by some other scientists is that of talking about reducing the high rate of maternal mortality by introducing more contraceptive methods because apparently the `risk of pregnancy' is much higher than the risk due to the contraceptive method!

Population control means controlling the numbers of certain populations and in that sense it is racist and against the poor. But along with these biases of population control, the implementation in practice involves a very strong anti woman attitude well entrenched in the overall social mind. Women are considered responsible by society for reproduction, at times that is their only accepted role and contribution in society. Achieving control over this reproduction process and their fertility is also considered their responsibility and the research which further stresses on women taking on this role and responsibility in a way pressurises women to continue playing this role many a times with a total neglect of their own health and well being.

Contraception : a different way of looking

When looking at any issue related to medical research into contraceptive methods, this has to be the background and understanding. The differentiation between any drug research and contraceptive research has to be highlighted and borne in mind. Along with this we also need to really understand what we mean by contraception.

Contraception is defined as prevention of conception. Since conception cannot take place if there is no fertilisation and the latter cannot occur if the ova and the sperm are prevented from mating with each other the simplest method of contraception would seem to be that which prevents the sperm and the ova from meeting. It could be through prevention of the mating between the man and the woman or through ways in which the sexual interaction takes place without the possibility of such a mating or again it could be simply by use of barriers in the path of the ova and the sperm.

Traditionally people have used many such methods. It would have been a step forward to emphasise these kinds of methods and develop them so that they become easily accessible and usable by most people on their own. The direction of development that contraceptive research has presently taken, however, has been through prevention of the formation of the egg and (theoretically) the sperm. This has meant intervention in the natural hormonal cycle of women disrupting their normal body behaviour. It has meant long term disruption of the natural functioning of the body. It has meant consuming chemicals all the year round for preventing fertility of two days in a month.

Including men

Besides the damage done to women's bodies and health, this has also resulted in emphasising the biased social norm that reproduction is on the whole women's responsibility. Men's responsibility in contraception has been ignored by freeing the process of contraception from the act of sexual intercourse and locating it in the control over women's bodies. So much so that even the campaigns against harmful contraceptives have been made out to be `women's issues' and dealt with accordingly. Contraception has remained women's needs and this need has been exploited by the various agencies to have long term impact and effect on the whole population.

Basic ethical concern would demand that we take cognisance of the fact that reproduction involves both the man and the woman and hence give them both the joint responsibility of contraception. Considering and acknowledging the equal role played by men in the process of conception and ensuring their responsibility in the process would be a step forward for biology and medicine. This would be going beyond the norms of society and hence probably help change or affect the norms of society also. At present technological `advances' condone the regressive attitudes and norms in society and in a way strengthen them.

Society looks at men's contributions and involvement in a very limited manner. Unwed mothers are taunted at and not accepted in society. The man in that case never comes to the forefront. When it is the question of fathering within the norms and institution of marriage, however, the man becomes the natural guardian with the assumption that the child borne by his wife is his. In this situation as far as the child goes the man is fully responsible in the socio-legal sense. Determining or acting to have or prevent conception of that child, however, remains woman's task. The cafeteria of methods is available only for her. This is medicine's contribution to maintaining the discrimination in society.

The methods do not rely on men's co-operation and hence do not dare to intervene in the sexual act. Here men are looked upon as persons with uncontrolled sexual desires and passions incapable of taking responsibility and restrained action. This is not a very enviable condition to be in but that is what is propagated in society and accepted by not only science but also all people be they men or women. This kind of uncontrolled lust associated with men does not allow them to grow as persons, as humans. Society either thrusts all responsibility on men or believes that they are incapable of accepting any responsibility and that is not a very respectable understanding of oneself as a human being.

Ethics of a process also in a sense determine the norms of the process. In the ethics is incorporated the vision of the society. Believing that contraception has to place equal responsibility on women and men is setting the norms for what is ethical and ensuring that all methods are accepted, rejected, developed or ignored after having been tested on this norm of ethics would be the minimum that could be demanded from any ethical review of contraceptive research.

Beyond preventing conception

Sexual interaction as is considered the norm in society today has another biological expression other than fertility and that is increased exposure to or proneness to sexually transmitted diseases. It is obvious and yet important to note that methods that help gain protection from STDs also help prevent conception. When this is the case it is but essential that the contraceptive method be such that it not only help prevention of conception but also provide protection from STDs.

The present day researchers and contraceptive research funders have a very queer understanding of the issue. Recently some representatives of the campaign against the anti-fertility "vaccines" had a meeting with the IDRC, a Canadian organisation funding research in India and to the Population Council on the anti-fertility "vaccines". When the women from the campaign questioned the IDRC officials about AFV users not being protected from STDs and AIDS, their health scientist replied, "For that condoms can be used!" "But then why use the AFV?" To this question there was no reply. This is not only carelessness on the part of the promoters of such research but also a callousness towards people in general and women and their health in particular.

For women there is a particular dimension of the STDs. The socio- economic situation affects the overall health of women making them more prone to the diseases. The cyclical nature of the fertility cycle also has its own role to play in greater susceptibility of women to these diseases. Attention is anyway being paid to STDs because of the danger of AIDS to men. Here too after having looked at the issue of `Women and AIDS' by just blaming the sex workers, now it is being realised that more women are getting infected by AIDS due to the constant exposure to it through unprotected intercourse with their lawfully wedded husbands.

Not able to have any control over their bodies, or on their relations with their partners, suffering from ill-health in the bargain, women are the ones who are most disempowered by the use of such contraceptives. Use of contraceptives should be a process of acquiring some control and understanding of one's body and life. If any method makes the process disempowering, can such a method be ethically allowed?

`Providing more choice' is the catch phrase under which the introduction of many similar methods is justified. Having more methods to choose from is made out to be empowering even though most of these methods are such that they can be used without the knowledge of the partner by a woman totally at her own initiative and responsibility. In fact this is an argument used in favour of the method. We do not think that being able to prevent pregnancy by a method that cannot be seen by anyone else is any positive achievement for a woman. It does not help her gain any autonomy and nor does it offer her any real choice as far as her life goes.

Can any method of contraception that merely prevents pregnancy give any strength to women just because it claims to provide `more choice'? How can a method that results in a woman bleeding for twenty days in a month and further being penalised by her partner for not being able to satisfy his sexual desires, be even considered as a contraceptive? How can a method whose reversal in case of problems is not possible until the effect wears off be considered empowering? How can a method that disrupts her normal cycle and patterns and affects her overall health and the family's routine in the process be passed ethically?

Contraception is women's need. It should equally be men's need. And medicine should contribute towards meeting this need of women and men through an understanding that is guided and moulded by the above concerns. All methods, new and existing have to be evaluated for their ethical validity on the basis of such criteria which arise purely from the point of view of how we look at contraception. A proper selection at this stage and a clear understanding about why at all there is a need for contraceptives will automatically reduce the problems that then arise at the level of the design of the research and the actual conducting of the clinical trials or even at the stage of distribution of the method.

When the safety, integrity and respect of women and their bodies is at the core we can never have research designs that look only at prevention of fertility as the major achievement and the return of fertility as the yardstick for gauging the safety. We will not have a reductionist viewpoint which believes that all effects of the synthetic chemicals on the body can remain very localised and specific and hence there is no need to look at anything more than the effect on fertility.

When safety of women would be the primary criteria, research designs would not be altered through steps like elimination of animal trials and intensive clinical trials. In fact the stress would be on conducting research to as much depth as is possible before introducing them for large scale use. A proper follow up of the participants in the trials, detailed information to them about the possible effects, compensation to them in case of any problems, proper selection of `volunteers' -- all of these would get included automatically.

The concern for safety would also mean that instead of interfering with the cyclical reproduction, its knowledge would be used to help women understand their body and gain co-operation from men to have safe and efficient methods of contraception. Distribution would be part of the research and so also would be the methods of dissemination of all the information that is collected to the would be users of the method. There would be no question of not taking informed consent, in fact instead of hiding facts the emphasis would be on letting women and men know as much as is known so that they become participants in the process and not mere objects of hi-fi scientific research.

In essence we wish to state that it is the understanding and view of contraception that determines the nature of contraceptive research. And we do believe that for an ethical approach to contraceptive research this understanding has to shift from its population centeredness to becoming people centred. The emphasis has to shift from the technology and the aggressive attitude of gaining control over fertility through it to a co-operative understanding of not only human bodies but also towards human relationships as well.

Starting from reacting to and agitating against one method after the other, the campaign has matured and grown and is striving to arrive at an overall understanding. While we continue to evaluate the merits and demerits of the technical cases of each of the various contraceptive methods, it has also become urgent today that all of us women and men concerned about the issue individually and collectively help towards evolving and strengthening this understanding further.

Article written by
Swatija and Chayanika
9, Sarvesh; Govindnagar,
Thane (E). 400 603.

(Article written for the MFC Bulletin in 1995).

From informed consent to no consent
In the name of meeting the 'unmet need'

The process of research in contraceptives in India has undergone a major change in the last few years. A country that built its independence on the concepts of self-reliance and ventured to develop the expertise necessary for it in every field, today finds itself at a major turning point as far as contraceptive technology goes.

In the early years, even up until the late sixties, research and introduction of new contraceptives was not very systematised all over the world. The oral pill, for example, was introduced without carrying out sufficient clinical trials. With large scale consumption of the pills as contraceptives, many of the ill effects of this new hormonal contraceptive were brought to light. The developments since have been more systematic and uniform all over the world. International bodies like the WHO have tried to maintain this uniformity and standardisation all over the globe. In whose favour this uniformisation has finally worked is something on which we comment later in the article.

Self reliant India also adopted a procedure of introducing new contraceptive methods and other drugs through intensive clinical trials, while at the same time also concentrating on original research in some new areas like the so-called non-hormonal pill `Centchroman', a different kind of IUD and absolutely new concepts like the anti- fertility "vaccine" and so on. The clinical trials were conducted on poor, needy women. Advantage was taken of their need and dependent situation. The trial procedures were not followed. Yet there was some effort to try and examine how women from India would react to and accept new contraceptive methods.

At the same time with the demographically motivated family planning programme, women were considered to be human beings with no independent and free will of their own, incapable of understanding any technical information, and also those who cannot even decide on their own what contraceptive method would be good for them. In the first half of this decade, however, our country and its policies have made a major turnaround.

The process of globalisation has suddenly made people, particularly women, responsible for their own actions. The same system that had looked upon women as those with no value and inconsequential, suddenly chose to see these same women as the most informed persons, able to make a free choice and participate equally in decisions related to their reproductive health. Whether or not a woman can decide about anything else in her life, it is assumed that given a wide range of choice of contraceptive methods she would be able to plan her family. And this is most clear in the case of the introduction of the hormonal injectables.

In 1986 when different women's groups joined hands to launch a legal campaign against the introduction of the injectable Net-en, one of the major issues was that of informed consent. In a trial being conducted near Hyderabad city women activists found that information about the injectables was not being given to the women volunteers who had been selected for the phase three trials of the contraceptive injection. The activists challenged the trial and insisted on giving the group of women available information on Net-en. The medical professionals in charge of the trial were shamed when the women who had been herded together with misinformation refused to take the injections.

This action formed a basis for the subsequent litigation filed by three groups from Delhi, Hyderabad and Ahmedabad, where the plea was that a stay be brought on such unethical trials and also that such a dangerous injectable not be allowed to be given in the family planning programme. The case lies in the Supreme Court awaiting hearing, as do most litigations, and in the meanwhile everything seems to have changed as far as injectables and introduction of new contraceptives goes.

The injectables have been permitted into the Indian market since April 1994 despite protests from women's groups all over the country. One thing has been taken care of which is that the injectable is not being given in the `menu card' of the cafeteria offered by the Family Planning programme. It is available on sale for women to buy and use of their own `free choice'. Women have to take it at their own risk. They might of course be given these free, if not through the government programme, then through the less accountable structure of NGOs who also are said to do it keeping women's best interests in mind. Whether women's interests are taken care of or not, the government doctors are surely saved of any further humiliation of the kind that they had to undergo in Hyderabad.

From 1986 to 1994 many things changed nationally and internationally and it is important to recount them along with a critique of what exists in India today. As per the earlier model the phase three trials were to be followed up by a phase four trial, also called the pre-programme introduction trial. A phase three trial was multi-centred and involved a large number of volunteers who were selected from the health centres when they came for contraceptive or obstetric advice. These women had to be followed up for the given period of the study and the results of the trial were to indicate if the particular drug or contraceptive was acceptable or suitable for the Indian population that would be using it.

The phase four, or the pre-programme introduction trial, as the name suggests were much larger trials especially designed to ascertain if the programme infrastructure was capable of handling the consequences of introducing such a drug. This phase was also to give a better idea of the impact of the drug on many more women. It is this phase of trials that has been totally negated and eliminated. And this has happened systematically.

In the case of the injectables, the fact that the injections were being given the license to be sold in the open market instead of being provided in the Family Planning programme, obviously there was no need to check out the public health infrastructure. We in India are heading slowly towards an erosion of the public health care system. We now do not have users of the health system, what we have is a growing concept of consumers. And as consumers each individual is free to make her choice, there is no holding back. The choice may cause trouble to her but she is responsible for it not anyone else.

The other factor which has particular bearing on the case of Depo Provera is the role of an international body like WHO. In 1976 the US FDA had upheld the ban on sale of Depo Provera as a contraceptive injection in the US on the basis of findings of carcinogenic potential of the drug during trials on beagle dogs. The company Upjohn that manufactured the injectable made many representations but did not succeed then. It found its own ways of circumventing the export rules of the US by manufacturing the drug elsewhere and continuing to market it in other countries, especially those from the so-called third world.

The apparently independent, objective status of bodies like the WHO is exposed in the story of Depo Provera. That these bodies also cater to certain interests is obvious from the role that the WHO played in the introduction of Depo. After a 26 year old controversy, it was a multi- centred trial conducted by WHO that gave a chance to the US FDA to revoke its ban on Depo. But the trial was not all. The story begins earlier in 1986 when the WHO changed its guidelines for research in hormonal contraceptives.

The two major changes that it made related to animal trials and extensive clinical trials. After years of quoting results of animal trials to justify introduction of new drugs, it suddenly changed the guidelines to say that animal trial results were not reliable and hence were unnecessary. In fact, their logic was that it was mere waste of time and only delayed introduction of new methods. The same logic applied to reducing the clinical trials. Again it was said that even large scale clinical trials cannot give enough information about the ill effects of a contraceptive. Only a general use by women at large can really help find out everything about the drug.

As a justification the example of the oral contraceptives is cited. OC pills which are the most researched and studied contraceptive today. The first warning signals about problems related with it came about twelve years after the pills were first marketed. The pills were not completely tested before they were marketed and it was the widespread use by women all over the globe that really brought out the problems. This is extended to say that to have information to this extent it was necessary to have many women use the drug. There could be no other way in which such information can be reliably learnt.

As a result of this the suggestion of having a post marketing surveillance (PMS) was put forth. Again in the name of getting information that will help women at some time, what was being assured was that the contraceptive would be available in the market and with the help of a few women who were buying the drug, the PMS study would be conducted. Essentially the PMS, however, is an eyewash to help the pharmaceutical companies who had apparently invested so much into the contraceptive. In the case of Dep particularly it was for Upjohn to get back some of the losses that it incurred because of the controversy created by the regulation and ban imposed by the US FDA.

WHO obliges FDA who in turn oblige `poor' Upjohn and it will all happen at the cost of women. Women who will pay the cost because it seems that they have learned enough and are strong enough to make the choice, they are rich enough to buy illness along with the contraceptive effects for three or more months. Women are not able to take OCs regularly because they are illiterate and non-committed but they can spend money and suffer for their own decisions. This is the use of the power by international politics, commercial interests, and gender discrimination in society -- all in the name of being concerned about women and their health.

And what are the implications for women in India. The minute the US FDA gives a green signal to Depo, immediately in countries like India the Drug Controller who had resisted introduction of injectables, passes an order allowing its sale in the market. In keeping with the WHO regulations there is a clause asking for PMS. The results of the earlier phase three trials, which for India were not very encouraging, were ignored and for the first time contraceptives were introduced in this manner. The biggest farce is that of the PMS.

About a year back we had been to meet the doctor who is the principal investigator for the PMS study of Depo Provera. This `scientist' believes and said in no uncertain terms that he feels that there is no need for any more studies with Depo. It is, according to him, a completely researched drug and this task entrusted on him by the Drug Controller was unnecessary. He also said that the Drug Controller was responding to `irrational' demands made by women's groups who in turn were coming in the way of women's needs at large. With such a sincere conviction this reputed doctor is carrying out the PMS study.

The methodology adopted also has much to be questioned. The selection of the sample is women who come to the distribution centres of a large NGO, Family Planning Association of India, which distributes injectables free of cost along with other contraceptives. The doctor kept questioning us as to what could be problems when the woman is buying the injectable. "Would a woman not stop using it if she had problems? And if she wants it of her own free choice who are you to stop her from exercising her rights.". This same doctor is the head of the Family Planning Association of India which is distributing

Depo free of cost all over the country. What can be expected of such researchers and their research!

And all this is happening in India where even a well done PMS would have had problems. This is the same country where mosquito repellent coils were marketed for ten years without having any registration with the food and drug administration. At the end of this period the market of the coils was well established and the regulation of the coil for safety was given to the manufacturers themselves. This is the situation at one level and on the other is the fact that all kinds of drugs are sold over the counter without the necessary prescriptions.

Already it has been shown that Depo is available over the counter in all the big and small towns of this country. Also who is keeping the records of all the women who have been injecting themselves with this drug? If any of the problems were even acknowledged at a later date, how would it help or how would it be possible to help all the women who have been exposed to the drug? In such a situation it is just a game being played with women's health exploiting their acute need for a method of contraception.

And for this what the Indian government has relied upon is a massive `National Family Health Survey' that was carried out in the country to collect information on all kinds of data related to fertility regulations. The data from interviews with women revealed that many more women would have liked to use contraceptives than actually did. Instead of recognising this as the lack of the ability to take decisions in their life and the secondary status for women in the family and society, the inference drawn is that women have not been able to use contraceptive methods because there aren't enough kinds of methods available. This has been termed the `unmet need' of contraceptives of women. And to meet this `unmet need' an urgency has been created of getting new contraceptives into India as soon as possible.

The resistance being offered by women's groups is the only hurdle in the way. The nature of this resistance has changed in the last ten years. From raising the issue of informed consent at the time of the first trials in the 80s, today we are confronted with a totally new framework for the same problems. The whole milieu is changing with the changing economic and political scene and within it women and women's groups have to struggle harder to even retain earlier earned grounds of strength.

As in the 80s, the launching of the injectables in 1994 was also not an easy task. There were protests in all the four major cities where the launch was planned by Upjohn through their Indian marketing company Max Pharma. Besides this there was also a massive reaching out to women at large about the injectables and the problems related with them. Signature campaigns and other methods of protest were adopted wherever possible. Frankly we have not been able to maintain the tempo of the campaign through the years.

And yet we hasten to add that while the confrontationist actions are in spurts and occasional, there is a building understanding at least among women's groups of what kind of research in contraceptives we want. A strong critique of the existing clinical model is evolving. We have moved ahead from reacting to each method and have been able to develop a framework within which contraception has become a process and is not just an issue of technological methods.

Alongside has also emerged from the movement a process of trying to evolve alternatives. Understanding traditional methods of healing, learning more about the body, being in tune with the cyclical changes in the body and fertility, trying to regain our relationships with our bodies through use of methods that are friendly not only to our bodies but also to our whole integral selves and our relationships -- this has been a way ahead. We as a movement are struggling against all odds to redefine consent and choice for ourselves.

Article written by
Swatija and Chayanika
9, Sarvesh; Govindnagar,
Thane (E). 400 603.
(Written for the Women, Population and Environment Newsletter in 1996)

A Pill for Abortion -- Facts and Myths

The incident is of 1986. Public hearings were held in the four metropolitan cities of India for a controversial drug. Obviously there were two opinions being voiced. According to one this drug was unnecessary and dangerous while the other opinion held that this drug was needed for such a complaint that could have adverse effects on women's health.

The drug was high dose oestrogen progesterone combination pills and the supposed ailment for which it was to be used was amenorrhoea. The drug actually just gave symptomatic relief. Many a times it succeeded in getting rid of the problem of amenorrhoea without curing or even finding or indicating the cause for it. The two chemicals present in the drug -- oestrogen and progesterone -- are the hormones responsible for the regulation and maintenance of the menstrual cycle. The varying quantities of these hormones help formation of the endometrial lining which gets discarded as the menstrual flow when conception does not take place. If a high dose of these hormones is taken all of a sudden, then too there are chances that the lining could get discarded leading to menstruation.

When conception takes place then the endometrium is maintained and further developed through a different kind of balance of these and such hormones. So if after taking the drug also if there is no menstruation then it is assumed that the woman has amenorrhoea due to pregnancy. Some times even though there is a conception, the high dose of oestrogen can lead to an abortion. It is also a fact, however, that if there is no abortion then this drug could have an effect on the fetus and result in the birth of a malformed baby.

Hence the drug always is contraindicated for the condition of pregnancy. In spite of this because of its very character this drug was openly being used as both, a pregnancy indicator and also as an early abortificient. Further, although its a scheduled drug not to be sold without prescription, this drug could be bought from any drug store in even small towns and villages. This rampant misuse was one of the major reasons for opposition to this drug along with the reality that there were many ways for treating amenorrhoea in general.

In the public hearing on the one side were stories and voices of women who had consumed the drug during their pregnancy without knowledge of its dangerous side effects. The social situation had forced them in a way into getting rid of their unwanted pregnancy by consuming this drug quietly, unknown to others. As a result they were now bearing full responsibility for the handicapped children born to them. Along with them were activists and a few researchers stressing that the drug be evaluated technically and also in the social context within which it was being used or misused.

On the other hand were those who were all praise for the drug lecturing in tones that made it out to be a lifesaving drug. In projecting this drug as the most effective remedy they were also making out amenorrhoea to be the most dangerous of diseases. These experts refused to anyway acknowledge the social context. The only social context that was being raised by those upholding an opinion in favour of the drug was that of the workers in the factory manufacturing the drug who were made to worry about their employment if the company was stopped from manufacturing the drug.

We had participated in the hearing that took place in Bombay. Some things were very clear there. The social context in which the woman decides to retain her pregnancy or not go ahead with it holds her alone to be responsible for the decision. No effort is made to facilitate this decision making. Neither are early pregnancy detection kits easily available nor are there any safe and easily accessible abortion centres. It was also clear during the hearing that although there was a law regulating and allowing abortions, there was no social sanction to a woman's decision or right to decide about abortion. Hence there was need for secrecy and most often this also demanded doing it on one's own. In such a situation the cheap and easily available drug seemed very attractive.

The drug companies took full advantage of this fact for their profit making. To increase the sale of the drug they projected amenorrhoea as the most dangerous ailment of all. These same drug companies do not at all hesitate to say that amenorrhoea was a minor discomfort when they want to sell their injectable contraceptives. To the contrary they in fact project this as an advantage. It is said that most Indian women are anaemic and so less blood loss due to amenorrhoea would be a boon for them!

These aims of the company are achieved with the help of doctors who run businesses spreading the falsifications evolved by the company. These doctors advised women to use this drug although they were well aware that there was no drug for abortion. These are the same doctors who also unhesitatingly prescribe use of harmful contraceptives to women.

This was the situation in 1986. What is the change in the situation today in 1995? As a result of the testimonies at the public hearings, the Drug Controller of India banned the manufacture and sale of these pills. It was clearly stated in the order that this drug combination was unnecessary. It is also important to state here that the Drug Controller wanting to please the drug companies also only banned the oral pill -- the injection of the same combination was not included in the ban.

The misuse of the drug was one of the major reasons why the oral pill had been banned. That the drug was available without any prescription and was easily available to anyone were facts that had been taken into account. But this had no impact on the manufacturers and prescribers of the drug. From our experience and research we can say with confidence that even today doctors are prescribing pills for abortion and even today women are freely obtaining these from drugstores.

Most of these so called pills for abortion are said to be Ayurvedic preparations. Today there aren't as many restrictions on Ayurvedic drugs and so most companies try to introduce some herbs in their medicine formulations and get labels of Ayurvedic drugs for them. As far as our knowledge goes most of these drugs contain prostaglandins. Prostaglandins help in inducing uterine contractions and loosen the muscles of the uterus and the cervix and help in expelling the detached fetus.

Obviously there is no guarantee that the abortion would be complete with this drug. Whether the fetus would be fully disengaged or not, whether the endometrium would be completely removed or not, whether all the tissues would be expelled or not, or in everyday language whether the procedure would be successfully completed or not cannot be ascertained.

It is important to add here that prostaglandins have in themselves been controversial drugs. These are absolutely contraindicated in persons with complaints of asthama, epilepsy, and so on. When women consume these prostaglandins without getting a preliminary check up done, the consequences are not reported anywhere.

Then again these business minded doctors do not just stop at prescribing Ayurvedic preparations of prostaglandins. The drug companies and the doctors have found a novel method of getting past the ban on the high dose EP pill. Instead of the single high dose combination pill now drug companies manufacture two different pills. One is the high dose oestrogen and the other is the high dose progesterone. The doctors then advise the women to take both these pills together and thus obtain the effect of the high dose EP.

In our visit to the state of Madhya Pradesh we were told by most women that they took pills for abortion. The pills are easily available from most drug stores without any prescription. In any case getting a prescription from the doctors was also no problem. This in spite of the fact that all the drugs carried a warning `Not to be prescribed if suspected pregnancy'.

Such profiteering on the part of the pharmaceutical companies is well known. They have been consistently exploiting people's faith in modern medicine by introducing and marketing dangerous, unnecessary drug combinations and preparing drugs with low or high doses than actually required. It is important to look at these marketing strategies of the pharmaceuticals in the present context where on the one hand there is no change in the social attitude towards abortion and no effort to ascertain cheap and easily available abortion facilities while on the other there is an impending and ongoing change in the structure and nature of the public health care system. With the structural adjustment programmes, there is no question of improvement in the State run public health care system. In fact it is becoming difficult to even maintain the status quo.

Till recently we in India had confidence and faith in our procedures for testing and evaluation of drugs. Now the framework of testing is itself being changed and the introduction of new drugs made more lax, leading to our loss of faith in the system. We do not need to test new drugs in our context. Any drug that has been licensed for sale in other countries can be sold in the Indian market now. There is no need for specific testing on the Indian population. An example of this is the injectable contraceptive injection Depo Provera which is available in the Indian market although it did not undergo complete and careful testing. People are in a vulnerable situation when ill and do take the drugs even though there could be problems with them.

In the case of contraception, having some method for contraception is women's need. When not being provided with safe alternatives and options women themselves go ahead and use even the dangerous injections and also take the pill for abortion. Even though there is no pill available for abortion, it is being prescribed by doctors and used by women. It is in this environment that a new medicine specifically for abortion is being sought to be brought in for Indian women. Right now the trials are going on but looking at the situation one can never be sure when it would be freely made available in the market.

This pill is RU-486 -- its generic name being mifepristone. Roussel Uclaf, the company that has developed the drug claims that this is the first ever effective chemical method for abortion made available to women. In all other methods there is need for some kind of surgical intervention necessary.

This chemical method is said to have an advantage over the surgical method in that the woman is saved from the traumas and side effects of surgery. The other supposed advantage is that women do not have to get hospitalised, they can get the abortion done at home itself. When the social situation demands that abortions be done furtively, these do appear to be advantages. But before accepting these as advantages it is necessary to really evaluate this drug being sold as a pill for abortion. It might be useful to begin with the history of the drug.

The first claims at evolving this medicine for inducing abortions were made by the company Roussel Uclaf in April 1980. Ten years later the same scientists acknowledged ten years later that they were not actually looking for an abortion pill. RU-486 was actually a side product obtained as part of some other research. Yet just with seventeen months of research on rats, rabbits and monkeys, the first phase human trials were initiated in Switzerland. This is one stark example of initiation of human clinical trials with incomplete animal trials. Usually animal trials themselves take six to seven years. One of the scientists from the team that conducted the first clinical trials has given the information that the reason for this haste on the part of the company was the fear of competition from other drug companies which could lead to their loss of profits.

The first trial of RU-486 was conducted on eleven pregnant women in Geneva. These women with pregnancies of six to eight weeks were given a daily dose of 200mg of the drug to every woman for a period of three days. After five days of this treatment eight of these women aborted and one more had an abortion after nine days. Of the eleven women hence only nine had abortions because of the treatment. Of the remaining two one had to have a surgical abortion and the other had very severe bleeding that she had to not only undergo an emergency operation but also had to have blood transfusion.

In spite of the very limited animal trials and the ambiguous results of the first clinical trials, immediately after the Geneva trials trials were initiated in other countries like France, Sweden, Australia, Netherlands, USA, England, Finland and China. In all of these trials not only was the drug provided by the Rousell Uclaf, but all the research teams had at least one representative or employee of the company. The records of all the research are also being held with the company.

The results of these subsequent trials were also not encouraging. There was a lot of variation in the results of this chemically induced abortion. Some centres reported an efficiency of 90% while others said that that the efficiency was as low as 54%. All this just went on to show that RU-486 was not an efficient method for abortion.

As a result a different study was initiated by WHO under its leadership in 1984 in Stockholm, Sweden. Here the women were given prostaglandin injections along with the RU-486. Of the 34 women treated with this regimen, 32 had abortions (94%). After this study it was concluded that for chemical abortion with RU-486, it was necessary to give a prostaglandin injection as well.

This means that consuming RU-486 for three days is not enough for the abortion. Every woman will have to take the pill for three days and then go to the doctor for her prostaglandin injection. After this she just has to wait as the abortion could occur anytime in the next eight days. Even if there are no other problems it is advisable to go once to the doctor after a week to get a check-up to ensure that the abortion has been complete. So there goes the myth of it being a simple procedure being carried out in the confines of one's own home!

In the Geneva trials one woman had to suffer such excessive bleeding that she had to undergo blood transfusion. This is quite a frequent happening with RU-486, it does require some other backup support of this kind. In France where the drug RU-486 was initially given the license there is a regulation that blood transfusion facilities be compulsorily made available whenever the drug is prescribed.

In France there is one death also reported of a woman who had taken the pill. Besides on observing the experience of 30,000 women who had consumed the drug, some doctors and scientists from the Nature Hospital there had issued a warning against the drug. They had also asked the Health ministry to enforce a ban on the sale and distribution of the drug. Yet the sales are still going on.

The history of the development and introduction of RU-486 shows that its initial trials and introductions were conducted in developed countries. The pharmaceutical companies systematically used the anti-abortion lobbies in these countries to get support for their drug. The company popularised that this pill would make abortion very simple and easily accessible. This was enough for the anti abortion lobby to initiate a strong opposition campaign. The whole atmosphere was created in such a way that opposition to the pill was equated with opposition to abortion. As a result women's groups supportive of abortion started pressurising their respective governments to grant licenses to the company for the sale of the drug. A few health related women's networks were also set up for the purpose.
It is only recently that any attention is being paid to the myths and complications related to this pill. In November 1990 at the sixth international women and health meeting in Philippines conscious women's organisations from the so called developing countries could manage to get a resolution against trials and sale of RU-486 in the third world passed.

The health status of women from the `third world' is much worse. In particular anaemia is almost endemic in many countries. With a pill that induces this level of bleeding, the dangers for such women could be manifold. Also given this overall situation knowledge of other long and short term effects is also essential before there can be any kind of sale of the drug to women from these countries.

We further feel that the trials of any such drug cannot only be looking at the effect on the body and the health. The testing has also to be carried out keeping in mind the social and historical background within which this drug is to be introduced. For example, it has to be taken for granted that in situations like in India the drug would be available to any woman even without a prescription from a qualified doctor. Even if the drug regulating authorities insist that there would be monitoring of sales the reality is that it cannot be ensured that the drug would be taken only under medical supervision. When this is the situation can the safety of the drug be ensured for all these women?

Another important fact is that the pill is effective as an abortificient only in the first six to eight weeks of pregnancy. With the kind of services available early pregnancy detection is not possible. In this case would it be safe if taken after this period? Can our health services ensure that blood transfusion services would be made available to all concerned? In the absence of such facilities also how would we gauge safety of the pill? Maybe some of these questions might sound redundant to people who feel that clinical testing in ideal circumstances alone is required for testing the safety of the drug. But in our opinion these are vital questions which need to be answered and these are the reasons which make the drug absolutely unacceptable and unsafe for women from countries like India.

Hence we feel that it is necessary that women refuse use of this and such drugs. The question of their needs still naturally remains. There is probably no answer and no one solution to the helpless situation in which women find themselves. But the demand has to be manifold. There has to be a strong condemnation to the introduction of these drugs. At the same time there should be demands for easy, early and accessible methods for detection of pregnancy and unconditional availability of abortion to all women whether the woman is married or unmarried and whether it is her fifth, sixth or tenth pregnancy. Only in such an environment can there be a true opposition to drugs of this kind.

Pills available for abortion

The pills being prescribed today for abortion mainly have the compound `Ergot' in varying proportions and concentrations. Ergot is a prostaglandin. When doctors prescribe the drug they add two or three different kinds of Ergot formulations in the same prescription. The high dose oestrogen progesterone formulation initially used for abortions was called EP Forte. In keeping with this most of these new drugs also have Forte added in the name, maybe to be able to sell their drug using these past connections of the drug in public memory. For example one of the drugs is P Forte.

Besides this there are many Ayurvedic preparations about whose authenticity and effectivity we are not very informed. It is however a fact that even allopathic doctors prescribe these drugs openly and rampantly. These preparations also have the subscript of `Forte'. For example, there are pills like H.P.Forte, Shilpa Forte, Lunarex Forte, and so on.

The high dose oestrogen pill and the high dose progesterone pill which are prescribed together are called Cyclonorm E and Cyclonorm P respectively. These two are prescribed along with one of the Ergot preparations and also with some chloroquin prescription added in some cases. The latter drug has been said to have the side effect of inducing uterine contractions to pregnant women and is hence another drug contraindicated in pregnancy. All of these drugs are very dangerous and unsafe and we should refrain from using them.

RU-486 : Mechanism of action

RU-486 is structurally similar to the hormone progesterone. Progesterone is a hormone that is regularly produced in a woman's body and whose varying concentrations in a way determine the regularity of the menstrual cycle along with another hormone oestrogen. If there is a conception the concentration of progesterone goes on rising or the production of progesterone continues. This progesterone is necessary for the embedding and nourishment of the embryo from the uterine lining in the early stages of the pregnancy. If the hormone is not present in sufficient quantities then the fetus cannot attach itself to the uterus. It is this fact that is used by the drug RU-486.

This anti progestin which is structurally similar to the progesterone takes the place of progesterone in the uterus. It occupies the positions of the hormone giving an impression that progesterone has been produced in sufficient quantities. The anti progestin, however, does not have the same properties as the hormone and hence does not help the embedding of the fetus on to the uterus. The embryo cannot grow independent of the nourishment from the uterine lining and so gets aborted a few days after the consumption of the pill.

Article written by
Swatija and Chayanika
9, Sarvesh; Govindnagar,
Thane (E). 400 603.

Written in 1995 in Hindi for a science feature service `Srote' for Hindi newspapers and magazines.