robust scientific and informational infrastructure to support basic research. As a result they often cannot provide the academic and economic incentives to produce the associated research literature. Their journals generally have linguistic, financial, and production difficulties undreamt of by their Western counterparts, leading to irregular publication, indifferent aesthetic qualities, and poor editing and proof reading. Despite all these factors, and even though many of the journals are not subject to stringent peer review, they are nevertheless well worth exploring.

Another reason for the lack of Third World literature in global databases is the simple fact that it is very difficult to find. International services such as Medline or the Science Citation Index typically index some 3000 journals—98% from the First World and only 2% from the Third World. This is a starting point for the vicious cycle affecting Third World literature: journals that are not indexed are rarely stocked by librarians, hence rarely cited by authors, and hence rarely indexed.

Extreme complacency

The lack of interest in Third World literature is also a symptom of extreme complacency. Despite the acknowledged weaknesses of the Third World's abilities to collect and disseminate information can we believe that all knowledge lies in the West and, more particularly—since over 80% of all scientific research published in indexed journals is in English—in the English speaking part of the West?¹ Are we right in suggesting that the rest of the world adds nothing to the body of knowledge? Even if we should presume that most of the world's valid, important biomedical information originates in the West—and there is evidence (see, for example, Gaillard²) to suggest that this is wilful self delusion—what about at least a minority contribution from the rest? The 2% participation in international scientific discourse allowed by Western indexing services is simply too little to account for the scientific output of 80% of the world.

This is particularly true in disciplines such as medicine, for diseases are no respecters of frontiers, especially with increased air travel and the resurgence of communicable diseases such as measles and tuberculosis. These diseases, as well as unique information on such topics as AIDS, tropical biodiversity, and traditional medicine, are particularly well covered in the local journals—when they can be found: “Microbiologist colleagues at Jos . . . were busy forging links between traditional herbal medicines . . . and modern science. Few outside Nigeria were able to read about this work.”³

To countervail such closed systems of reference, projects such as *ExtraMED*, *ExtraSCI*, and *AgROM Extra* have been set up (respectively, by the World Health Organisation, Unesco, and the Food and Agriculture Organisation), presenting on a CD-ROM each month the indexed full text of articles from the best journals published in developing countries.⁴ But this is a drop in the electronic ocean.

Information from all sources should be accorded equal access, equal economic value, and equal rights. This credo does not insist that the balance of information flow should be equal but, rather, asserts the principle of equity. We should also recognise the mutual interdependence of our information needs. Thus, even if it is only out of self interest, the West should open the gates of major indexes and networks to the countries of the Third World and buy, disseminate, and study their information.

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- 1 Weiss P. *Health and biomedical information in Europe*. Copenhagen: World Health Organisation's Regional Office for Europe, 1986 (Public health in Europe No 27.)
- 2 Gaillard J. Use of publication lists to study scientific production and strategies of scientists in developing countries. *Scientometrics* 1992;23:57-73.
- 3 Kelly M. Academic double standards. *New Scientist* 1993 Jan 2:43.
- 4 Zielinski C. *ExtraMED—Third World journals on CD-ROM*. In: Raitt D. *Proceedings of the 17th online international meeting and exhibition*. Oxford: Learned Information Limited, 1993.

Reliability of the Snellen chart

Better charts are now available

Historically, visual function has been assessed by determining the finest spatial detail that the visual system can discriminate. A letter acuity chart, such as the Snellen chart, is commonly used. This type of test is simple to perform and is sensitive to the most common sources of visual impairment, such as uncorrected refractive error, cataract, macular disease, and amblyopia. A recent article in the *BMJ* identified some of the factors reducing the Snellen chart's reliability, such as failure to test visual acuity at the right distance and under recommended levels of illumination.¹ But other determinants inherent in the design of the Snellen chart also warrant consideration.

During the measurement of visual acuity only the angular subtense of the letters should change as the subject reads down the chart, which is not the case with the Snellen chart. Variation in the number of letters on each line presents the subject with a task of increasing difficulty rather than providing an equivalent task at all acuity levels. Typically, one letter is presented at the 6/60 level and up to eight letters are presented at the higher levels of acuity. This variation in

the number of letters per line creates additional problems. It is now firmly established that the legibility of a letter is impaired if contours (such as other letters) are placed in close proximity.² This phenomenon has been termed “contour interaction” or “visual crowding,” and many studies have shown that performance is better when letters are presented on their own. Careful consideration should therefore be given to spacing between both letters and rows to control contour interaction at each level of acuity.

Unfortunately, the effects of contour interaction vary throughout the Snellen chart. For example, “uncrowded” acuity is measured at the low end of the acuity scale (6/60) and “crowded” acuity at the higher end of the scale (6/6). The two are clearly not comparable. In addition, the legibility of test letters used in the Snellen chart varies,³ so nominally incremental steps on the chart are not equally capable of being discriminated. This is a particular problem at low levels of acuity, where only one or two letters are presented.

Perhaps the most important problems with the design of the Snellen chart are the irregular progression of the size of the

letters on the chart and the lack of an accurate or standardised scoring system. The variation in the ratio of the sizes of the letters between successive lines is somewhat arbitrary. The relatively large gaps between acuity levels at the lower end of the acuity scale on a Snellen chart (6/60-6/24) can result in gross overestimation and underestimation of visual acuity. This makes the assessment of change in visual acuity difficult. An irregular progression in the sizes of the letters also introduces changes in the scaling factor of the chart at reduced test distances that can alter the acuity score. The tradition of scoring Snellen acuity as the smallest line at which a majority of letters is correctly identified has recently been shown to restrict the sensitivity of the test to detecting changes over time.⁴

New charts

These problems⁵⁻⁷ have led to the development of alternatives to the Snellen chart.^{8,9} The most notable innovations are the use of a geometric progression in the size of the letters (that is, the change between lines occurs in uniform steps) and the introduction of an equivalent task for all acuity levels, ensuring that the only variable is the change in the angular size of the letter. This is achieved by using a set of letters that are equally legible and by presenting the same number of letters on each line of the chart.

These charts have been shown to provide accurate and reliable measures of visual acuity¹⁰ and have become the gold standard for measuring visual acuity in research.¹¹ Furthermore, their design allows the use of interpolated scoring systems that significantly improve doctors' ability to detect changes in acuity.⁴ In such systems equal weighting is given to every letter on the chart, and the score for each letter is incorporated in the overall acuity score. An important advantage of this type of chart is that it allows low levels of acuity to be measured with the same precision as higher levels

of acuity—a feature that the Snellen chart lacks. Indeed, a reliable measure of visual acuity may be more important in patients with reduced vision as they are likely to require treatment.

Gibson and Sanderson reported that the repeatability of measurements of visual acuity made with a Snellen chart was extremely poor, with up to 13% of subjects displaying discrepancies of two lines or more on repeated testing.⁶ Taking these results into consideration, doctors must be extremely cautious when assigning clinical importance to changes in acuity of two lines or less as these differences may simply reflect the inherent variability of the Snellen chart.

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- 1 Pandit JC. Testing acuity of vision in general practice: reaching recommended standard. *BMJ* 1994;309:1408.
- 2 Flom MC, Heath G, Takahashi E. Contour interaction and visual resolution: contralateral effects. *Science* 1963;142:979-80.
- 3 Bennett AG. Ophthalmic test types. *British Journal of Physiological Optics* 1965;22:238-71.
- 4 Bailey I, Bullimore MA, Raasch T, Taylor HR. Clinical grading and the effects of scaling. *Invest Ophthalmol Vis Sci* 1991;32:422-32.
- 5 Lovie-Kitchin JE. Validity and reliability of visual acuity measurements. *Ophthalmol Physiol Opt* 1988;8:363-70.
- 6 Gibson SA, Sanderson HF. Observer variation in ophthalmology. *Br J Ophthalmol* 1980;64:457-60.
- 7 Wick B, Schor CMA. Comparison of Snellen chart and S-chart visual acuity assessment in amblyopia. *J Am Optom Assoc* 1984;55:359-61.
- 8 Bailey IL, Lovie JE. New design principles for visual acuity letter charts. *Am J Optom Physiol Opt* 1976;53:740-5.
- 9 Ferris FL, Kassoff A, Bresnick GH, Bailey IL. New visual acuity charts for clinical research. *Am J Ophthalmol* 1982;94:91-6.
- 10 Elliot DB, Sheridan M. The use of accurate visual acuity measurements in clinical anti-cataract formulation trials. *Ophthalmol Physiol Opt* 1988;8:397-401.
- 11 Sheedy JE. Standards for visual acuity measurement. In: *Eye care technology forum proceedings*. Bethesda, Maryland: National Institutes of Health, 1993.

Genetic traits in common diseases

Support the adage that autoimmunity is the price paid for eradicating infectious diseases

An important current topic of medical research is the localisation of genes implicated in the susceptibility to common chronic diseases such as insulin dependent diabetes, rheumatoid arthritis, and multiple sclerosis. This has been greatly facilitated by the use of the polymerase chain reaction to characterise polymorphic microsatellite markers and the advent of automated technology and computer software to construct high resolution genetic maps covering the entire genome.

A recent example of the success of these methods occurred in the genome-wide search in families for genes conferring susceptibility to insulin dependent diabetes.¹ Population studies, based on epidemiological principles, test the association of disease with specific genetic markers, and recent advances have also been made with this approach.

Most of these common diseases are clearly polygenic, involving several loci, and many population association studies leave little doubt that an appreciable genetic component of immunopathology lies in the major histocompatibility complex. This is a four megabase stretch of DNA (about 0.1% of the human genome) located on the short arm of chromosome 6 and containing up to 200 genes, many of which

are immunologically relevant. Within the major histocompatibility complex lies the gene for tumour necrosis factor α , a potent proinflammatory cytokine implicated in the pathogenesis and clinical manifestations of many inflammatory and infectious conditions.² In view of its chromosomal location and biological effects there has been speculation that polymorphism within the gene for tumour necrosis factor α may play a part in the genetic association of the major histocompatibility complex with at least some of these diseases.³

A biallelic polymorphism has been described in the gene for tumour necrosis factor α in a region that controls transcription.⁴ The rarer allele, TNF2, is part of the HLA A1-B8-DR3-DQ2 haplotype,⁵ which is associated with many autoimmune diseases.^{6,7} A preliminary study in coeliac disease, which is strongly associated with HLA-DQ2, found carriage of TNF2 in 96% of patients compared with 21% of controls, suggesting that a second susceptibility locus on this haplotype may lie close to, or within, the locus for tumour necrosis factor.⁸

In malaria high plasma concentrations of tumour necrosis factor α are associated with more severe disease, with the highest concentrations occurring in fatal cases of cerebral