ASBESTOS AND ASBESTOS-RELATED DISEASE IN SOUTH AFRICA

Jonathan Myers

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INTRODUCTION

Exactly how dangerous is asbestos to human health? Whether at the level of industry, the State, trade union organisations, academic institutions, civic bodies or interested individuals, many arguments are heard.

There is clearly a double question involved here. What precisely are the vested interests that are brought to bear when taking up any point of view?

Naturally one would expect industry to be biased in favour of playing down the dangers involved and of being most conservative in setting, often expensive, processes for protection of workers in motion. Likewise one would expect trade union and civic bodies concerned with environmental pollution to stress the risks of exposure to asbestos. Academic researchers, where they are not directly employed by industry or trade unions, whether at private or State institutions, may be expected to produce arguments that lie somewhere between these two positions. However it will be argued in this paper that, as is the case with the State (labour department or research bodies), academic institutions and their research workers generally lean more to the side of industry by virtue of a multiplicity of connections.

Essentially there is a state of industrial dispute in society. There is also generally an explicit acknowledgement of this division in most advanced industrial societies, which is enshrined in the law and various state structures. If then asbestos has been established as a carcinogen (a cancer-causing substance), the problem that immediately springs to mind is who is to take the decisions with regard to protection against the effects of this substance in a divided society?

One might think that those directly involved by virtue of their exposure should take the weighty decision, particularly when a notable feature of the whole asbestos controversy has been
that, with few exceptions, pressure from those most directly exposed to the hazards has historically been largely responsible for changes in the legislation and regulations governing exposure of the working and general public.

Alternatively one might think that academic research should be called upon to decide issues. In reality though the same conflict that divides society into opposing groups also appears in the narrower field of occupational health as opposing points of view. This opposition often takes the form of cost-benefit analyses by private or state researchers. Such analyses often conceal implicit decisions usually favouring industry (based on considerations of national productivity or the reduction of unemployment) while presenting a series of explicit choices which still leave the original problem unresolved. That is, who decides?

With a carcinogen, however, there can be no bargaining on the part of those irrevocably exposed to it from a medical point of view. From a social point of view, whether at the level of cost-benefit analysis or at the level of collective bargaining, society as a whole cannot decide for a few of its worker-members, that in terms of the general interest, they should die a premature, nasty death without raising all sorts of other issues. Problems of political democracy, industrial democracy and unemployment are posed. These issues are, moreover, only tangentially related to the narrowly medical aspects of the investigation into asbestos hazards.

In the end it is the conflict between contending parties to industrial dispute that decides the application and official interpretation of scientific research through a state pronouncement of safety regulations. This is illustrated by the fact that despite a common store of scientific research data, which sets the limits to possible interpretations, official interpretations and applications vary considerably. At one end of the spectrum is Sweden which banned the use of raw and
manufactured asbestos goods in March 1979. The United Kingdom is somewhere in the middle where the commission now sitting is expected to recommend the lowering of existing levels of exposure still further with a view to ultimately phasing out asbestos. At the other end of the spectrum are the Latin American and Far Eastern countries which have no official safety levels of exposure at all.

Having set out above the overall context of the problem of asbestos-related diseases (ARD's), I shall briefly sketch out the contents of this paper.

The first section will deal with facts about the asbestos industry with regard to production, manufacture, sales and labour. This will deal mainly with South Africa but also with international data where relevant.

The second section will attempt to explain the range of ARD's and discuss some of the problems involved. This will include an historical case study of the awareness of ARD's in the United Kingdom. It will also discuss some of the arguments revolving around the nature of the relation between asbestos and these diseases and the many interpretations and evaluations of this association that are current. Two theoretical problems will be raised in this section: (1) The problem of quantitative versus semiquantitative and qualitative information. (2) The difficulties in setting safe levels for industrial exposure which can only be proven safe at some future date.

The third section will deal in greater depth with the struggle of unequal parties over interpretation of research and for deciding the official safety levels. It will deal with the structural roles of industry, organised labour and the State. The role of the State raises certain theoretical issues concerning its neutrality. Comments on the role of research and scientific workers, civic organisations and private law suits will be made.
The fourth section will present the official determination of safe levels of exposure as the result of this conflict, rather than the result of strictly scientific considerations in the research laboratories. South Africa will be situated both historically and currently in this context and the different sectors of production will be examined in this light. Transnational corporations which operate locally and overseas will be compared internally between their branches to illustrate the effects of this struggle. Comparisons will also be made between national levels of exposure. The other aspect of official intervention – compensation – will also be discussed here.

The final section contains a resumé of the main arguments and attempts to project further trends and discusses the question of substitution with a safer substance than asbestos.
WHAT IS ASBESTOS?
Asbestos is a name for a number of similar materials. They are all fibrous silicates - a type of non-metallic mineral rock that splits into fine fibres when processed. There are two groups sharing similar chemical and physical properties and only three varieties are important from the point of view of this study.¹

Serpentine Group:
Chrysotile - known as white asbestos. Its useful properties are that it is easily spun into textiles and is very heat resistant. It is used for textile manufacture, brake linings, clutch facings, boards, insulation products and asbestos cement products. The USSR, Canada and Rhodesia are the main sites of deposits.

Amphibole Group:
(1) Crocidolite - known as Blue Asbestos has a high tensile strength and is very acid resistant. The longer fibres are used for lagging (heat insulation), acid resistant packings and battery boxes, gaskets and gasmark filters. The shorter fibres go into asbestos cement pipes. Crocidolite is mainly found in South Africa and, to a lesser degree, in Western Australia.

(2) Amosite (called Brown Asbestos) has the longest fibres and is used for felted insulation in blankets, covers for heavy duty jet engines, in lightweight insulation board for partitions in ships. It is found in South Africa only.

It must be stressed that there are upwards of 3 000 uses of asbestos in manufacture. I have mentioned only a few of the more important usages.

HISTORY IN SOUTH AFRICA:
Asbestos was first discovered in South Africa in about 1803 near Prieska in the North Western Cape by Lichtenstein.² In 1893 cape blue asbestos was first exported to the United Kingdom from Cape Asbestos Co. Ltd. In 1905 chrysotile was first noted in the Kaapsche Hoop area in the Eastern Transvaal near Swaziland. Amosite was discovered nearby in Sekhukhuneland in 1907.
SECTION A.
SOUTH AFRICAN PRODUCTION AND OWNERSHIP OF THE MINES

A.1
GEOGRAPHICAL LOCATION OF ASBESTOS DEPOSITS IN SOUTH AFRICA

A.1.i
OWNERSHIP OF SOUTH AFRICAN MINES

At the time of writing (early 1980) there were three major companies owning most of the mines. Recently (May 1979) there was a change of hands which reduced foreign based ownership of the mines from two large international corporations of major significance to one.

At present there are the following mine owners:
1. General Mining and Finance Corporation Ltd. which was responsible for 42% of South African production of asbestos of all types in 1976. More than 90% was exported. Genmin owns 48.46% of the shares of two holding companies.
a) Griqualand Exploration and Finance Company Ltd. Sentrusted owns a further 12.48% of the shares of this company. G.E.F.C.O. mines only blue asbestos and owns the following mines and mills 100%.

i) Coretsi Asbestos Pty Ltd which has 1 mine at Kuruman.

ii) Merencor Asbestos Mine Pty Ltd with 1 mine and 1 mill at Kuruman.

iii) Griqualand Asbestos Pty Ltd with 1 mine at Kuruman.

iv) Riries Farm with 2 mines and the main mill at Kuruman.

v) Griqualand Mines Pty Ltd with Bute mine near Vryburg.

b) Msauli Asbestos Bpk\(^7(a)\) owns 100%

i) African Chrysotile Asbestos Ltd and

ii) Msauli Krisotiel Asbestos Ltd which jointly operate 1 mine for white asbestos at Barberton.

In addition GEFCO owns 100% of the following selling organisations.

a) Asreco Forwarding Agency SA Pty Ltd

b) Central Asbestos Co Ltd (UK)

c) Central Asbestos Co Ltd (SA)

d) Pattens Asbestos Co Ltd Pty (SA) and

e) General Mining and Finance Corporation have an asbestos marketing division too.

2. The Barlow-Rand Group as recently as May 1979 through their subsidiary, the Transvaal Consolidated Land and Exploration Co Ltd, bought out the mining interests of the Cape Industries Group based in the United Kingdom. Cape Industries is a subsidiary of Charter Consolidated and owned the following mines prior to May 1979. 100%

a) Cape Blue Mines Pty Ltd which mine only Blue Asbestos and operate

i) the Pomfret Mine and Mill

ii) the Groenwater Mine at Postmasburg

iii) the Koegas mine which at the time of writing is inoperative.

b) Egnep Pty Ltd which mines Amosite at Penge.

Both are now 100% owned by TCLE. In 1971 Charter Consolidated owned more than 20% interest in TCLE. No later information appeared in company reports.
3. Everite is the last of the big three mineowners and is part of the large international Swiss-Belgian Eternit Group, which is 28.12% Swiss owned. 11.8% is Panamanian owned. Eternit has wide interests in the asbestos industry world wide.

Everite owns 46.3% of Asbestos Investments Pty Ltd (Asbesco) which operates mines in South Africa and Zimbabwe. Asbesco owns 100%.

a) Kuruman Cape Blue Asbestos Pty Ltd which operates
   i) the Bosrand Mine and Sorting Mill
   ii) the Corheim Mine and Sorting Mill
   iii) the Whitebank (Whitedale and Whitekloof) mill, crusher and central plant.
   All these are at Kuruman and only blue asbestos is mined.

b) Danielskuil Cape Blue Asbestos Pty Ltd which operates
   i) Klipfontein mine and mill
   ii) Warrendale mine and mill
   iii) Owendale mine
   iv) Noordhoek mine
   all of which are near Postmasburg and which are mined under tribute to KCBA Pty Ltd.

c) S.A. Asbestos Trading Pty Ltd which is a selling organisation.

4. A much smaller operation, only from the point of view of raw asbestos production of course, is Lonrho who own 86% of Duiker Exploration Company which owns 100% 

i) Emmarentia Asbestos Pty Ltd which operates a mine and mill near Postmasburg. This mine has closed recently.

ii) Wandrag Asbestos Pty Ltd at Kuruman has one sorting mill and two mines - Etric and England.

Duiker is expanding at Danielskuil and Kranskloof and all its sales are via GEFCO.

5. There remains a series of small one man operations (single ownership) producing very small quantities of asbestos, such as:

a) Jebolo Asbestos Pty Ltd at Kuruman which mines blue asbestos at one small mine and sells via KCBA Pty Ltd.

b) Kaapsehoop Asbestos which mines white asbestos near Barberton.
c) The Stella mine for white asbestos in the Eastern Transvaal.

d) Hoogenoeg mine for amosite at Bewaarkloof (Eastern Transvaal)

e) Beatrice mine and mill for white asbestos (Eastern Transvaal)

Each separate entity mentioned above corresponds to a unit of management.

A.1.ii

PRODUCTION OF RAW ASBESTOS IN SOUTH AFRICA

To give an idea of the relative production figures of the different companies is quite difficult as only General Mining gives production figures in their annual reports. The other large companies, viz. Everite (ASBESCO) and Barlow-Rand (Cape Blue Mines) do not provide any information on tonnages produced.

Presumably the production figures appearing in the General Mining Annual Reports could also reflect the market situation in that they could be inflated or deflated from stock.

Overall production figures are given by the Department of Mines for the country as a whole. In 1978 a total of 261 770 tons was produced of which 54% was crocidolite, 30% chrysotile and 16% amosite.

In 1976 the total was 369 842 tons comprising 48% crocidolite, 30% chrysotile and 22% amosite.

An attempt to construct contributions by individual company will be based on information in an article in the Financial Mail 20/5/79 and the 1977 Annual Reports of GEFCO and Msauli Asbes. The figures apply to 1976 production.
### TABLE I: SOUTH AFRICAN ASBESTOS PRODUCTION BY COMPANY AND TYPE OF ASBESTOS

<table>
<thead>
<tr>
<th>COMPANY</th>
<th>TOTAL ASBESTOS</th>
<th>BLUE</th>
<th>WHITE</th>
<th>AMOSITE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Metric Tons</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. General Mining—GEFCO</td>
<td>60 000</td>
<td>15,3</td>
<td>60 000</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>MSAULI</td>
<td>100 000</td>
<td>25,5</td>
<td>—</td>
</tr>
<tr>
<td>2. Barlow Rand—CAPE BLUE</td>
<td>60 000</td>
<td>15,3</td>
<td>60 000</td>
<td>—</td>
</tr>
<tr>
<td>(formerly MINES Cape Industries)</td>
<td>80 000</td>
<td>20,4</td>
<td>—</td>
<td>80 000</td>
</tr>
<tr>
<td>3. Everite—KCB</td>
<td>77 000</td>
<td>19,6</td>
<td>77 000</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>DCBA</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>4. Lonrho—DULKER</td>
<td>8 000</td>
<td>2,0</td>
<td>8 000</td>
<td>—</td>
</tr>
<tr>
<td>5. Consolidated African Mines</td>
<td>7 000</td>
<td>1,8</td>
<td>—</td>
<td>7 000</td>
</tr>
<tr>
<td>(now inoperative)</td>
<td>312 000</td>
<td>100,0</td>
<td>205 000</td>
<td>107 000</td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td><strong>312 000</strong></td>
<td><strong>100,0</strong></td>
<td><strong>205 000</strong></td>
<td><strong>107 000</strong></td>
</tr>
</tbody>
</table>

It will be seen that there are slight discrepancies with the official figures (Mining Statistics). With respect to total Asbestos production:

1) General Mining led the field with 41% production  
2) Barlow-Rand (Cape Industries) produced 36%  
3) Everite (Asbesco) produced 20%

With respect to Blue Asbestos production:

1) Everite led the field with 38% of the total  
2) Barlow-Rand (Cape Industries) and General Mining each produced 29% of all blue asbestos mined.
11.

**A.l.iii**

INTERNATIONAL PRODUCTION OF RAW ASBESTOS\textsuperscript{14}

Table II shows world asbestos production by country, type and ownership in 1978.

**TABLE II: INTERNATIONAL PRODUCTION OF ASBESTOS BY TYPE**

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>% WORLD PRODUCTION</th>
<th>TYPE OF ASBESTOS</th>
<th>OWNERSHIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. USSR</td>
<td>48</td>
<td>White only</td>
<td>State ownership</td>
</tr>
<tr>
<td>2. Canada</td>
<td>26.6</td>
<td>White only</td>
<td>Johns Manville Corpn. (30%)</td>
</tr>
<tr>
<td>3. S.A.</td>
<td>5</td>
<td>Blue, White, Brown (3,5:2:1)</td>
<td>Turner and Newall (3%)</td>
</tr>
<tr>
<td>4. Rhodesia</td>
<td>5</td>
<td>White</td>
<td>Turner and Newall</td>
</tr>
<tr>
<td>5. People's Republic of China</td>
<td>5</td>
<td>White</td>
<td>State owned</td>
</tr>
<tr>
<td>6. Brazil</td>
<td>2</td>
<td>White</td>
<td></td>
</tr>
</tbody>
</table>

Source: Footnote 14

**A.l.iv**

SOUTH AFRICA, OTHER PRODUCERS AND THE WORLD MARKET

In 1975/76 there were strikes in the Canadian chrysotile mines due to complaints about the health and safety conditions at work. The resultant disruption of production was a windfall for South African chrysotile producers and production and export of chrysotile was at an all time high persisting after the Canadian situation returned to normal.\textsuperscript{13} Nevertheless chrysotile production is only a small percentage of total production.
At prices current for chrysotile, in 1978 about 92% of production was exported. Export sales for all asbestos in 1978 were valued at R107,48 million. Domestic sales for all asbestos in 1978 were valued at R5,72 million. Domestic sales account for less than 5% of production. It is not possible to produce a precise figure because actual tonnages exported are kept secret. Domestic sales are split 50/50 between chrysotile and crocidolite.

As far as export sales are concerned, 65% of the value comes from crocidolite, 20% from amosite and 14% from chrysotile.

It may be noted that the bulk of export revenue comes from crocidolite (65%) and almost entirely from amphibole asbestos (crocidolite and amosite) (86%). That this does not mirror production figures may be due to the fact that only South Africa produces amosite and crocidolite and that on the other hand there are other competitors for chrysotile production in particular the USSR which is often accused of causing a glut on the market, thereby depressing the prices for chrysotile. Although mine working costs are lower in South Africa than Canada enabling South Africa to remain on the market, it would be interesting to compare these between South Africa and the USSR.

After 1977 there has been a sudden downturn in demand. This has been put down to legislation limiting the use of all types of fibres because of health risks.

In financial terms for South Africa asbestos is the second most important non-metallic minerals mined, after coal, and is
the fifth most important mineral including metals. At sales valued at R137,8 million in 1977, this represented 2,4% of all mineral sales. Over 95% of these sales were abroad. Asbestos is, therefore, an important earner of foreign exchange.

A.2 MANUFACTURED ASBESTOS PRODUCTS

There is a high degree of vertical integration in the asbestos industry. The owners of the important manufacturing companies are the same as those of the mining companies. In South Africa Cape Industries (UK) which is 69,6% owned by Charter Consolidated operated asbestos mines until 1979, and continues to operate a subsidiary manufacturing asbestos goods. The worldwide Eternit group of companies to which Everite (SA) belongs mines blue asbestos and is the major asbestos-cement producer in South Africa. Turner Brothers (UK), which is a world giant in asbestos also has manufacturing interests in South Africa. The big international companies dominate the manufacturing scene.

More than 3 000 products contain asbestos in some form or other. The more common manufactured products in:

1. Asbestos-cement products, which account for more than 70% of world consumption of raw asbestos. These products are used as building materials like asbestos-cement roofing, cladding, tiles, boards, gutters and ventilation ducting and contains about 12% asbestos. Sewerage and other heavy duty pipes are also made from a 20% mixture of asbestos and cement. Asbestos-cement, with an even higher asbestos content, is used as an insulation material. All types of asbestos are used here.

2. Paper, felts, yarn, which are used to insulate roofs, cover pipes and in electrical systems. Generally only chrysotile is used here.

3. Friction materials made of chrysotile for clutch facings and brake linings.

4. Packings and jointings, especially those required to be acid-resistant. All three varieties are used.
5. Vinyl-asbestos floor tiles using chrysotile.

6. Asphalt products also using chrysotile such as roof coatings (bitumen), sound insulators, caulking compounds and spray.

7. Caulking compounds containing chrysotile and crocidolite.


Of course many finished products ranging from heaters to hair dryers contain asbestos. In South Africa, however, the range of manufacturing is somewhat restricted. Less than 5% by value of locally produced raw asbestos goes into South African manufacture. Of this, over 90% ends up as asbestos cement products. There is some limited manufacture of brake linings and clutch facings, floor tiles, battery boxes and jointings. Asbestos textiles and gaskets are all imported.

A.2.1 ASBESTOS CEMENT

The major raw asbestos producers also produce asbestos cement (a/c).

a) Everite (SA) is the largest producer of a/c, with four factories. According to the annual report (1978) the a/c division is the major contributor to company profits. There are two big factories employing about 1,000 workers each, one in Johannesburg and one in Cape Town. A smaller factory in Port Elizabeth employs about 400 workers and a small one in East London 100 workers. A mixture of crocidolite and chrysotile is used.

b) General Mining Corporation has a subsidiary, Superoclala, which produces a/c pipes in Pretoria on government contract. These pipes are used for sewerage. Company reports comment on a decrease in profits after 1976 due to the cessation of township development.

c) Turnal Ltd which is a subsidiary of Turner and Newall Holding Ltd operates an a/c factory in Durban. The parent company is Turner and Newall UK. About 1,000 workers are involved in the manufacture of a/c sheeting using chrysotile only.

d) Unipipe (Pty.). Ltd in Bloemfontein has been manufacturing a/c pipes since 1976, and is a joint venture between Superoclala (51%) and Turner and Newall Holdings (49%).

Altogether about 4,200 workers are employed by the a/c industry in these eight factories.
A.2.ii OTHER MANUFACTURED PRODUCTS

Due to the undeveloped nature of manufacturing technology in South Africa, many of these products are imported. The major firms operating in South Africa are:

a) Cape Insulation Products (Pty) Ltd. This is one of the largest insulation contractors in the country and belongs to the Cape Industries Group in the United Kingdom. It has a large factory in Benoni and manufactures (i) asbestos heaters for domestic, industrial and farming use; (ii) insulation material such as millboard, plasters, binders and heat resistant slabs; (iii) brake linings and clutch facings. At the factory fibres are cleaned, degritted and blended after which they may be added to plastics, paint, epoxy resins and glues.

The company consumes about 800 metric tons of raw asbestos annually, excluding asbestos used for brake lining manufacture. It employs 382 workers at the factory of whom 250 are African, 130 white and 2 Indian. Another 500 Africans operate countrywide doing insulation work.

The Charter Consolidated annual report (1979) gave decreased demand for asbestos as the reason for the sale of the South African asbestos mines belonging to Cape Industries (UK). The report also commented on Cape Industries' intention to diversify away from asbestos goods manufacture in the United Kingdom. It is interesting to consider the possibility that initial resistance by the asbestos industry to substitution may now be giving way in the face of increasingly restrictive health and safety regulations. 17

b) Bestobell Engineering SA Ltd manufactures insulation compounds which are dry mixtures of asbestos, clay and kaolin. This is mixed with water and packed onto surfaces. The mixing plant for the products for the whole of South Africa is in Johannesburg and employs about 200 workers. The other branches are not involved with production. A limpet spray that used to be made by the company was banned about 5 years ago. This spray liberated enormous numbers of asbestos fibres into the air when used.

c) Vedder and Moffat are insulation contractors and manufacture asbestos cement and rope lagging for insulations.

d) Gallo, Ferodo (Durban) - a subsidiary of Turner Brothers (SA) and Clinger Springs manufacture brake linings.

In 1975 the Erasmus Commission 18 reported that a total of 6 000
workers were employed in 34 factories producing asbestos goods in South Africa. The firms above represent the more important lines of production. It is apparent that most raw asbestos consumed locally goes into the a/c industry which in turn employs the majority of workers exposed to this substance outside mining.

A.2.iii IMPORTED ASBESTOS PRODUCTS

Some firms selling asbestos manufactured goods are:

a) Asbestos and Engineering Supplies Co Pty Ltd.
b) Asbestos Grading Equipment Co SA Pty Ltd.
c) Scantex Pty Ltd import yarns, cloth and rope lagging made from asbestos in the United Kingdom.
d) Stag Packings Pty Ltd sell packings for pumps and valves and also manufacture packings employing a labour force of 100 Africans and 10 whites.
e) Fraser and Chalmers Equipment Pty Ltd are a subsidiary of Turner Brothers (UK).

Until very recently the market in South Africa has not justified production of asbestos textiles, gaskets etc. and these products are all currently imported.

A.3 ASBESTOS SALES

Selling and packaging of raw asbestos is done by the marketing divisions of the big producers like S.A. Asbestos Trading Pty Ltd (Everite), Rand Mines, and the General Mining and Finance Corporation's asbestos marketing division.

In addition there are the following firms:

a) Petrow C.J. and Co Pty Ltd who export raw asbestos from Kaapschehoop Asbestos, Cape Asbestos (blue and amosite) and the Rhodesian mines (white) in quantities of 100 to 150 thousand metric tons per year.
b) Southern Asbestos Sales Pty Ltd export thousands of tons of raw blue and white asbestos and also supply S.A. manufacturers. Their asbestos comes mainly from Rhodesia. It is not clear who their holding company is and exact tonnages were not obtainable, presumably because of the then delicate Rhodesian situation.
A.4 LABOUR FORCE EXPOSED\textsuperscript{18,19,20}

A.4.i MINING

TABLE III : LABOUR FORCE

<table>
<thead>
<tr>
<th></th>
<th>Number of Operative Mines</th>
<th>Total Workers</th>
<th>White</th>
<th>African</th>
<th>Coloured</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Surface U/Gnd</td>
<td>Surface U/Gnd</td>
<td>U/Gnd</td>
</tr>
<tr>
<td>Transvaal</td>
<td>10</td>
<td>7 235</td>
<td>267</td>
<td>137</td>
<td>2830</td>
</tr>
<tr>
<td>Cape Province</td>
<td>21</td>
<td>14 430</td>
<td>573</td>
<td>191</td>
<td>7022</td>
</tr>
<tr>
<td></td>
<td></td>
<td>% surface &amp; U/Gnd workers</td>
<td>Subtotal</td>
<td>840 (72%)</td>
<td>328 (28%)</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>% of total workforce</td>
<td></td>
<td>(100%)</td>
<td>(5%)</td>
</tr>
</tbody>
</table>

Source: 1977 Mining Statistics.

Africans constitute 92\% of the total labour force and they are distributed half above and half underground. Much of the surface work is dry, as in the mills, and therefore even more hazardous than underground work. The percentage of risk workers in the various mines varies from a 63\% low to a 98\% high. Africans do 96.4\%\textsuperscript{21} of the risk work\(^*\) but only 44\% of the non-risk work when the figures for risk and non-risk are averaged for all the major asbestos mines in the country.\textsuperscript{3}

\(^*\) Risk work is defined by the Occupational Diseases in Mines and Works Act 1973 and is all work performed underground and in certain surface activities specified by the Inspector of Mines.
### TABLE IV: CHARACTERISTICS OF THE RACIAL DISTRIBUTION OF THE MINE LABOUR FORCE

<table>
<thead>
<tr>
<th></th>
<th>Transvaal</th>
<th></th>
<th>Cape</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>White</td>
<td>Coloured</td>
<td>African</td>
<td>White</td>
</tr>
<tr>
<td>% of Labour Force</td>
<td>6</td>
<td>0.2</td>
<td>94</td>
<td>5</td>
</tr>
<tr>
<td>% of Risk Workers</td>
<td>3.6</td>
<td></td>
<td>96.4</td>
<td>3.6</td>
</tr>
<tr>
<td>% of Total Remun-</td>
<td>35</td>
<td>0.3</td>
<td>65</td>
<td>32</td>
</tr>
<tr>
<td>eration received</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Index of Salaries</td>
<td>9</td>
<td>2.5</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>(African salary = 1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Monthly</td>
<td>915</td>
<td>250</td>
<td>100</td>
<td>911</td>
</tr>
<tr>
<td>Wage (to the</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nearest rand)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Salary</td>
<td>10,974</td>
<td>3,000</td>
<td>1,196</td>
<td>10,935</td>
</tr>
<tr>
<td>per Year (to the</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nearest rand)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


#### A.4.ii MANUFACTURING

We have seen that the a/c industry employed about 4 200 workers, of whom 1 000 were white and 3 200 black, in 1978. Other manufacturing industry employed at least 1 082 workers of whom about 900 were African. So leaving aside small untraceable firms there are about 5 280 people exposed in manufacture of whom 78% are African. In 1976 the Erasmus Commission of inquiry into occupational health reported a total of 6 000 workers employed at 34 factories in South Africa manufacturing asbestos products.

#### A.4.iii IMPORTED GOODS AND SALES

As one proceeds through the various sectors of the asbestos industry, it becomes more and more difficult to be precise about
the number of those exposed. The further in the production process one gets from underground mining the worse the exposure of workers to asbestos because of the dry nature of the processes (e.g. milling) or the more concentrated or refined nature of the product. The number of those exposed while mixing and using insulation compounds, doing building work, working with asbestos textiles, repairing brakes and clutches etc. is indeterminate. There is also little chance of knowing the level of their exposure - incidental or continuous, heavy or light. Yet all these people, including those who work packaging asbestos, storage and transport workers on the railways or in the docks, shipyard workers and others, could be significantly exposed. There is no possibility of most of them being picked up in statistical studies, which leads to underestimation of the risks involved.

A further factor leading to underestimating those industrially exposed is the migrant character of labour, especially in the mines. The high labour turnover means that a large number of people (including many from outside the country) are being exposed at some stage of their lives to a potent carcinogen in substantial quantities. Altogether one can estimate a minimum of 40 000 people who are currently industrially exposed in South Africa.

A.4.iv OTHER TYPES OF EXPOSURE

ENVIRONMENTAL EXPOSURE. This type of exposure is especially pertinent to the risk of getting Mesothelioma but may also be associated with lung cancer and even asbestosis. For instance, household members of the families of exposed workers have been found to have significantly increased chances of contracting mesothelioma and asbestosis. One study found 35% of healthy household contacts of amosite workers to have X-ray lung abnormalities. Because less asbestos exposure can produce cancer without asbestosis the danger of household contact exposure is thrown into sharp relief.
People who live in the vicinity of asbestos factories have been found to experience a higher risk of mesothelioma than expected. Construction, demolition work and wear and tear leading to disintegration of asbestos products in buildings may expose many people. Those living in the vicinity of mines and works also have an increased incidence of ARD's. Asbestos tailings were used to make roads and school playgrounds. In the series of over 100 cases of mesothelioma collected by Wagner et al. almost all were connected with the area of the North Western Cape asbestos fields. In some cases the exposure was only for a period of days or weeks.

Rock which is being mined for other minerals may be contaminated with asbestos resulting in exposure for miners and the general public. Then there is a large range of household goods, such as hairdryers and toasters, which emit small quantities of asbestos fibres. The use of asbestos filling compounds may be a source of contamination in the home.

In the U.S.A. elevated levels of asbestos fibre in the air have been demonstrated on motorways. Water flowing through asbestos cement pipes may contain low levels of fibres. In general, however, there are few satisfactory studies showing what these levels of exposure are, and as environmental exposure is so difficult to quantify or document, little that is definite can be said about it.
SECTION B:

DISEASES RELATED TO ASBESTOS, HISTORY OF ASSOCIATION.

In Section A the extent of production, manufacture and utilisation of asbestos was presented together with an estimate of the workforce exposed. In this section the risks to health consequent on exposure to asbestos will be discussed.

The point has already been made that the further away from production of raw asbestos, the greater the degree of exposure for those handling asbestos' products. For example, the thermal insulator who removes asbestos lagging from a boiler or pipe is much more heavily exposed in this work than is the miner digging ore underground. Those working in sorting and crushing mills are subject to an intermediate level of exposure. Because the difficulty of ascertaining the population exposed increases with distance from mining, the basis exists for a serious under-estimation of the true dimensions of Asbestos-Related diseases (ARD's).

B.1 THE NATURE OF THE HEALTH HAZARD

There are three main diseases associated with exposure to asbestos.

B.1.1 ASBESTOSIS

This is a process whereby the lungs or the linings of the lungs are scarred by asbestos fibres inhaled from the air. The fibres irritate the lung tissue resulting in damage from scarring. When the lung itself is scarred (Parenchymal Asbestosis) it does not function as well as it should. Depending on the degree of damage done, the person will have various degrees of difficulty in breathing, especially on exertion. If exposure has been heavy or prolonged (even if the person is removed from exposure) the damage may become progressively worse with time and result in heart failure and ultimately failure of the lungs.

If only the lining of the lungs is damaged by scarring (Pleural Asbestosis), the person will not show signs of disease such as breathlessness. Only special tests like X-rays will show up the damage. However with time this damage also becomes more marked and the risks of developing other ARD's are statistically increased.

Often both parenchymal and pleural asbestosis are found in the same person. The incidence of both cancer of the lung and mesothelioma
is significantly increased for these people, irrespective of the type of asbestosis, and most studies show that between 20% and 50% of people with asbestosis die of lung cancer or mesothelioma.  

**B.l.ii LUNG CANCER**

It was noticed as early as the 1930s in the U.K. that many people suffering from asbestosis died of lung cancer. Some estimates put death from lung cancer at more than 50% of the deaths in asbestosis cases. It was only in the 1950s, however, that the association between lung cancer and asbestosis exposure was scientifically demonstrated and definitely accepted.

There is no treatment to cure lung cancer and sufferers die within months, sometimes one or two years, of developing it.

Lung cancer may, of course, also be associated with exposure to other substances notably cigarette smoke and other industrial pollutants like coke oven emissions, and so is not specifically associated with asbestos exposure. Studies examining the effect of asbestos alone on the risk of developing lung cancer, show elevated incidences varying from 1.5 to more than 9 times the expected incidence rate in the unexposed population. This means that someone exposed only to asbestos may have a 9 times greater chance of getting lung cancer than a similar person who is not exposed.

**B.l.iii MESOTHELIOMA**

This is a type of cancer of the lining of the lung and less frequently of the lining of the abdomen. Asbestos exposure is practically the only known cause. In asbestos-exposed populations the incidence of this illness is infinitely higher than in the general population. This is because it is a very rare cancer in the general population. For instance in Canada for the decade 1960-1970, there was an annual incidence of 1.4 cases of mesothelioma per million population. Yet in certain asbestos-exposed populations it may account for more than 7% of all deaths. In most mesothelioma registers up to $\frac{2}{3}$ of the cases are found to have been exposed to asbestos.
In the 1950s in South Africa, mesothelioma was found by Dr Wagner to be associated with exposure to asbestos, particularly the variety found in the North Western Cape. When investigated further it was established that not only occupational exposure, but also environmental exposure was associated with this disease. Although in many of the cases the exposure was quite heavy the disturbing feature was that in some exposure was only transient and slight. There is no treatment for this disease and it too is rapidly fatal.

It can be seen then that all three conditions associated with exposure to asbestos are serious and chronic conditions. Asbestosis progresses, possibly even after removal from exposure, and once advanced is not reversible or subject to cure. Lung cancer and mesothelioma are always rapidly fatal.

After initial exposure to asbestos, lung cancer and mesothelioma take between 15 and 30 years to develop. With heavy exposure asbestosis may develop within one or two years. Once the indestructible asbestos fibres are present in the lungs (after initial exposure) there is no possibility of prevention, particularly not for lung cancer and mesothelioma. In particular, mesothelioma may be caused by slight and incidental exposure leading to a fatal disease many years later.


Historically the first of the ARD's to make a public impression was asbestosis. The very high levels of exposure to asbestos in the 1890s and the early 20th Century caused an overwhelming majority of workers so exposed to develop asbestosis in a short period of time. The severe nature of the asbestosis produced in very dusty conditions led to early deaths from lung failure or other complications of asbestosis, thus masking the other ARD's. It was noticed that a disproportionate number of those with asbestosis also died of lung cancer, but it was only later when the levels of exposure were reduced that the cancer-producing effects of asbestos were fully unmasked. Lower levels of exposure caused milder forms of asbestosis compatible with a longer life. People then lived long enough for lung cancer to develop and to manifest itself as a problem.
The incubation period for cancer from initial exposure to the carcinogen is anything from 13 to 30 years. Today in countries where the level of exposure is relatively low, lung cancer is the principal problem and the major contributor to excess deaths from ARD's. How the changing pattern of ARD was obscured and how the long time lag to develop cancer was confused with safe levels of exposure will now be discussed.

From the turn of the century ARD in the form of Asbestosis was noticed in the U.K. and reported to the 1906 U.K. Government Inquiry into compensation for industrial diseases. Little was done at the time and by 1928 studies conducted by the factories inspectorate revealed a very high incidence of asbestosis amongst asbestos workers. One study in the asbestos textile industry showed as many as 28% of the workers to be suffering from scarring of the lungs (i.e. Parenchymal Asbestosis alone). As there are usually more people with Pleural Asbestosis and a few more with both types, one can see how high this incidence of 28% really is.

B.2.i ARBITRARY DUST REDUCTION

All this time there were no official safety regulations applicable to asbestos factories. A commission was set up in 1930 to investigate ARD's and this resulted in the Merewether and Price Report which formed the basis for the 1931 Asbestos Regulations. These were put into effect in 1932. As levels of exposure prior to 1932 were not known (no dust measurements were in fact performed until the 1950s), it was difficult to do anything other than arbitrarily postulate safer working conditions than had hitherto prevailed. These regulations reduced dustiness in factories.

We have seen that the effects of pre-1932 exposure were obvious in terms of Asbestosis. Those affected were also observed for other effects. Yet in spite of this 'the existence of a carcinogenic effect was still disputed 20 years later, although we now know that men employed for more than 10 years before 1933 suffered a 10 fold increased incidence of lung cancer'. Despite the high incidence of asbestosis and the intended observation of other ill effects, there were no stringent follow-up studies to check on the effects of the new regulations until much later.
Indeed the results of the 1931 regulations were only to become manifest after a long time lag. In 1947, 14% of all deaths in which asbestosis was mentioned were due to lung cancer, and by 1969 the figure was over 60%. And asbestos workers still experienced 10 times the expected death rate from cancer of the lung. Workers in an asbestos mill belonging to Cape Industries (formerly Cape Asbestos UK) at Hebden Bridge which operated from 1939 to 1970, experienced high incidences of the ARD's and marked excess mortality. It was no longer sufficient to abide by an arbitrary improvement in working conditions as the passage of time since 1932 had unmasked the ill effects of asbestos that survived the 1932 improvements.

B.2.ii A NEW APPROACH - THE THRESHOLD

The example of another factory in the U.K. owned by Turner Brothers (UK) at Rochdale demonstrates the new approach to the hazards of asbestos taken at the end of the 1960s. This was to be that of the safe level of exposure or threshold below which there was no hazard to health.

In 1968 a study of workers employed for at least 10 years since 1933 showed little evidence of excess deaths. (See Table V). In this table results from this group of workers in the years 1966 and 1974 are given to illustrate the argument. Information from this study was used by some of the researchers as the evidence on which the British Occupational Hygiene Society (BOHS) standard was based. This standard was in turn enshrined in the new Asbestos Regulations of 1969 which came into effect in 1970.

The BOHS assumed from the Rochdale study that there were no excess deaths from asbestosis or cancer of the lung or mesothelioma to be expected from levels of exposure since 1933 and that the only problem was clinical asbestosis. Having reconstructed the levels of exposure in the period since 1933 (i.e. 13f/cc from 1933 to 1950 and 5f/cc after 1955), and worked out individual exposures, they related these to the incidence of asbestosis in
the group studied. They then assumed a mathematical relationship between cumulative exposure and the incidence of the disease. This enabled them to extrapolate backwards from the current rate of asbestosis among the workers to what levels of cumulative exposure over a 50 year working period would result in only 1% of such workers developing clinical asbestosis. These assumptions produced the exposure level of 2 fibres per cubic centimetre of air breathed by those exposed (2f/cc). Such an exposure in a person who worked for 50 years would result in a 1% chance of developing the earliest signs of asbestosis. This level of 2f/cc is currently the U.K. safe level for an 8 hour working day and a 5 day week for white asbestos. The important point here is that people exposed for at least 10 years since 1933 had shown no excess deaths (i.e. the number by which observed deaths exceed expected deaths) by 1968. This phenomenon, which is evidence for the time lag for cancer to develop and for asbestosis to kill, was then interpreted as evidence for the existence of a safe level of exposure below which the risk of dying was not raised and that of developing asbestosis minimal. It also turns out that the risk of developing asbestosis was seriously underestimated for statistical reasons which will be discussed later.

**TABLE V. FOLLOW UP OF 678 MALE ASBESTOS WORKERS FIRST EXPOSED SINCE 1933: RESULTS IN 1966 AND 1974 IN THE SAME FACTORY**

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>1966 Follow up</th>
<th>1974 Follow up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total Deaths</td>
<td>Expected Deaths</td>
</tr>
<tr>
<td>Lung cancer or Pleural Mesothelioma</td>
<td>8</td>
<td>7.8</td>
</tr>
<tr>
<td>Respiratory causes (includes asbestosis)</td>
<td>9</td>
<td>10.0</td>
</tr>
<tr>
<td>Other causes</td>
<td>52</td>
<td>55.1</td>
</tr>
</tbody>
</table>
By 1977, follow-up studies of this same group by the same research team revealed that the death rate for both cancer and asbestosis was almost doubled. The larger contributor to excess deaths was cancer.

One of the members of this research team has revised some of the original assumptions to take account of these new facts apparent since 1977. Using these revised assumptions on the data he has estimated that exposure to 1f/cc (i.e. half the BOHS standard) over a 50 year period might increase the death rate by 25% after retirement. Subject to the same conditions as many as 1 in 14 workers might develop asbestosis. He also believes, along with most other agencies, that for lung cancer there is no definite safe level of asbestos exposure, below which there is no risk of developing it. With mesothelioma there is a considerable risk for truly trivial levels of exposure.

When the terrain of assumptions and extrapolations is exhausted it becomes clear that the real problem of the hazards of industrial exposures to asbestos is one of allowing sufficient time to elapse to complete the lag period before cancers develop before it is really possible to prove or disprove the validity of any argument relating to safe levels.

The current level of exposure below which there are supposed to be no risks to health has only been in official existence since 1971. The definite proof is still between 5 and 20 years away in the future. Taken together with the improbability of there being such a safe level for a carcinogen, a study in the USA of gold miners working in mines contaminated with amosite in concentrations of less than 2f/cc in the air is very disturbing. A significant number of excess deaths from ARD’s, was found amongst these miners.

B.2.iii NO SAFE LEVEL

It seems that the argument is inexorably moving in the direction of one where no safe level exists through a succession of attempts to create safe conditions which have all subsequently proved
unsafe. The pattern of ARD's has shifted to one where cancer deaths predominate. There is no cure or prevention of cancers. In other words, there is no safe level for asbestos exposure. The standards used to determine safe levels have related to non-fatal asbestosis and were based on the dominance of asbestosis in the pattern of ARD's, while not relating to cancer deaths at all. Many of the assumptions used in creating the standards are not valid.

The inability to prove the safety of any level however low, without waiting out the time lag, taken together with the history of successive 'safe' levels which proved dangerous, is the strongest argument of all for a safe level of zero, which would preclude yet another group of people being experimented with, with fatal consequences.

Having sketched out the historical trend in the UK, it is of considerable interest to examine the sorts of arguments that have been used by one or other party to the conflict in order to advance their particular interest with respect to asbestos.

The argument above has focussed on asbestosis and ignored cancer in developing safe standards. Despite the fact that most authorities agree that asbestos causes cancer and that there can be no safe level for a carcinogen, incontrovertible proof of these statements can only be furnished by the passage of time. Into this necessary gap industry leaps, seeking a further lease of life for asbestos production and manufactures, putting out positive propaganda for the duration of this time gap of uncertainty.

There are, in addition, many more arguments which set out to conceal the true situation with respect to health and asbestos.
B.3 OTHER ARGUMENTS CONCERNING ASBESTOS AND ARD's

Before discussing these other arguments in detail, it is necessary first to make a few comments about the way arguments are conducted in general in this field. That is, in what terms and by means of which techniques are these arguments constructed and utilised.

B.3.1 WHERE NUMERICAL DATA ARE ABSENT

A notable feature of present-day epidemiology is its heavy and one-sided reliance on quantitative data. Unless arguments can be expressed in precise numerical terms, there is a tendency to deny that there is a problem situation giving rise to these arguments; or to adopt the view that there is certainly no problem there which can be adequately or 'scientifically' dealt with. All this leads to a quiescence with regard to a problem which may be serious but difficult to address in the accepted quantitative way. Much is made of the fact that there are few good national or other records of ARD's, deaths from them, levels of exposure or numbers of people exposed. This is true for most countries outside the UK. In this way a real problem, about which much semiquantitative and qualitative information exists may be downgraded because it cannot be 'scientifically formulated' and therefore 'solved'.

There is a tendency to identify science with one of its techniques or aspects viz. statistical analysis. If then this 'science' cannot encompass reality adequately, it must become more appropriate to reality, rather than reality ignored because 'scientific techniques' do not fit it very well. The practice of quantification first is not just the peculiarity of academic researchers but is given concrete embodiment by the operations of the State in modern society. This becomes an increasingly important aspect of the language of the State, which is used both within and between its various branches. The resources that the State can mobilise in wielding this quantitative language are considerable. Access to data, statisticians, computers etc. create a monopoly together with powerful private interests over the elaboration and use of this language. This shared language constitutes an essential aspect of the structural bond between industry and the State. All this prodigious social weight
results in a convincing statistical package which, by its very structure, is blind to areas which cannot be described in its language, and with which the language of qualitative impressions, semiquantitative observations and individual experience cannot communicate and therefore not compete. Here the latter language is dominated and excluded from validity.

For example, it is true that South African cases of mesothelioma gain access to the register in a highly irregular way. This register does not reflect the real situation with respect to mesothelioma. The cases appearing on it cannot be used to establish the numerator of an incidence rate and the population at risk for this disease, the denominator, cannot adequately be quantified. However, that does not mean that the number of cases in the register cannot be compared with that in other registers.

**TABLE VI : BREAKDOWN BY RACE FROM THE MESOTHELIOMA REGISTER 1979**

<table>
<thead>
<tr>
<th></th>
<th>Cases</th>
<th>% of total cases</th>
<th>% composition of workforce on the mines</th>
<th>% population in South Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>357</td>
<td>51,8</td>
<td>5%</td>
<td>18%</td>
</tr>
<tr>
<td>African</td>
<td>193</td>
<td>28,0</td>
<td>92%</td>
<td>68%</td>
</tr>
<tr>
<td>Coloured</td>
<td>138</td>
<td>20,0</td>
<td>3%</td>
<td>10%</td>
</tr>
<tr>
<td>Asian</td>
<td>1</td>
<td></td>
<td></td>
<td>3%</td>
</tr>
<tr>
<td>Subtotal</td>
<td>689</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>712</td>
<td>100%</td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: (33)
From the table we can see that the ratio of white to African cases is very different from the usual composition of the workforce in the mines or in manufacturing, and different from the population composition in the country as a whole, or that in the North Western Cape asbestos fields. So this table is quite useful. It allows one to pinpoint semiquantitatively that there is certainly a significant underestimation of African cases in particular. So one can say that the overall number of cases is an underestimation in general.

We know that in South Africa about 25 to 30 cases are added to the register each year. The United Kingdom with more than twice the South African population registers about 60 cases annually. Yet the United Kingdom is more heavily industrialised implying that more people are exposed to asbestos. In addition, the health services infrastructure is much more developed and one would expect more cases to find their way onto the register. So the South African figures again seem to underestimate the true situation despite the fact that they are proportionately as high as in the United Kingdom. The relatively high South African figures might be explained by exposure to high levels of asbestos at work and in the environment, control being worse than in the United Kingdom.

The tendency to say that where there are no numbers there are no facts excludes much useful information. On the other hand, when the figures do exist other difficulties arise.

**B.3.ii WHERE NUMERICAL DATA DO EXIST**

Association equals causality?

B.3.ii.a. The question has been raised as to whether the association between asbestos and ARD's is a causal one. With regard to asbestosis there is no doubt that asbestos causes scarring of the lungs. This has been proved in many animal experiments, post mortem examinations and X-Ray studies. The causal relation is relatively straightforward because nothing else causes the type of lung damage characteristic of asbestosis.
For a long time the ability of asbestos to cause cancer was denied despite overwhelming evidence. However today asbestos is accepted as an indisputable cause of cancer by most scientific workers; and officially, by the Minister of Labour in South Africa, the British T.U.C. and the American National Institute of Occupational Safety and Health (NIOSH).

The case for mesothelioma is more like that of asbestosis as it is a specifically asbestos caused disease which in any group other than workers with asbestos has a negligible incidence. Amongst asbestos workers in the UK, as many as 7% and more of the total deaths have been due to mesothelioma.

Smoking and Lung Cancer

B.3.ii.b The relation between asbestos and lung cancer, which today is the main problem, has been subject to the most dispute. It has often been said that it is some other carcinogen acting alone or in conjunction with asbestos that causes lung cancer. The other carcinogen most often mentioned is cigarette smoke. However it is clear from many studies that asbestos causes cancer in non-smokers and whatever the smoking level exposure to asbestos will increase the risk of cancer too.

A seminal article by Selikoff claimed in 1968 that the risks of smoking and those due to asbestos multiply each other. If one has 10 times the risk for each carcinogen separately then if one smokes and is exposed to asbestos, the risk would be 100 times the expected incidence. Selikoff's risk was 95 times. The result was eagerly accepted by industry and used to insinuate that either asbestos alone did not cause cancer, or smoking was the principal factor in the combination of smoking and asbestos exposure. (It then became possible to deny or decrease compensation to those suffering from ARD's). These results were not repeated in any other major studies and there is no hard statistical evidence for assuming multiplication of risks over addition of risks. Meanwhile there is evidence that industrial exposure is an important cause of lung cancer for asbestos and other carcinogens whatever the level of smoking.
Another fact of this argument is that for a long time now smoking and social class (i.e. industrial exposure to carcinogens) have been collapsed as causes of cancer. Does smoking kill workers (by causing lung cancer)? or does working (industrial exposure) kill smokers (lung cancer)? Investigations in the US and the UK both revealed that smoking was most common among the lower social classes by occupation. Individuals in manual and dirty jobs smoked the most. Miners and quarrymen were at the top of the smoking scale while professionals and managers smoked the least. Those in the lower occupations not only smoked more but also smoked stronger cigarettes and more plain cigarettes.

Smoking habits correlated highly with deaths from lung cancer for all the people in these studies. When the effect of social class was statistically removed, smoking habits correlated poorly with lung cancer mortality rates. This strongly suggests that it was the occupation of the person that accounted more for the cause of lung cancer (i.e. industrial exposure to carcinogens) than smoking.

Standardisation of measurement techniques for asbestos dust

Another line of argument has been that levels of exposure to asbestos are inaccurately recorded, thereby not allowing anything useful to be said about the role of asbestos in relation to cancer. It is true that there are many problems with measurement of levels of asbestos exposure. Historically, the levels have had to be reconstructed experimentally. Many different instruments are used to measure the dust - the Konimeter, Thermal Precipitator, Midget Impinger, and the Membrane Filter. Their measurements are not always easily convertible. In the past different components of asbestos dust were measured from those currently measured. Old measurements in terms of particles are not convertible to current ones in terms of fibres. Then there is the problem that different production processes result in dusts of different compositions. Yet another difficulty is that many of the fibres are too small to be visible using the light microscope.
There is considerable uncertainty as to which components of asbestos dust cause which ARD. It is currently thought that the submicroscopic particles mentioned above cause mesothelioma. It is not established whether continuous average exposure to dust or peak exposures are more important from the point of view of ARD's. Average levels measured by fixed sampling techniques are lower than the peaks recorded by personal samplers.

In this maze of uncertainty one is forced to fall back on the international convention which is that only fibres longer than 5 microns in size are measured. Here is another example of the old pattern of ARD's dominating measurement techniques. The long fibres are thought to be responsible for asbestosis. But despite the lack of precision alluded to, many useful facts have emerged from the use of this standard. Dose-Response relationship have been established for asbestosis and lung cancer. This is also true for mesothelioma, even though unmeasurable slight exposure may result in mesothelioma.

Past exposures, current exposures — a difference in order of magnitude

B.3.ii.d It is often argued that exposure in the past was much higher than anything known today and that the risks to health are no longer a problem. This is of course the argument for the existence of a low level of exposure below which there is no risk of disease which has been dealt with above. (It is addressed to asbestosis and not lung cancer). We have seen the evidence against this in the UK study and the US mining study. In any case, the levels given in the UK study since 1933 were comparable to levels current on the South African mines today, especially surface conditions at the mills.

Arbitrary nature of the international standard for fibre levels

B.3.ii.e There is much argument about the feasibility of reducing the limits from say 2f/cc to near 0f/cc. This is said to be neither technically nor economically feasible. This highlights the arbitrary nature of measurement conventions. What does zero f/cc mean? It means no long fibres per cc of air. We know that for each long fibre there are many more shorter fibres visible even under the light microscope. Moreover there are many even smaller fibres which can only be seen using the electron microscope. Long fibres are thought to cause asbestosis, the shorter ones particularly those that are not visible under
the light microscope are thought to cause mesothelioma and possibly lung cancer. So why the argument around 0 long fibres/cc? (1 f/cc is the same as 1 million fibres per cubic metre).

We know that excess morbidity and mortality are related to the degree of exposure. We also know that no safe levels have been historically demonstrated. So why should we accept that the current conventions of measurement have any good relation to a threshold limit for disease at all, assuming that one exists? However if there can be no threshold limit for a carcinogen, then surely it becomes important to ensure that there are no other fibres in the air where there are no long fibres, by routine use of electron microscope.

**Progression of disease after removal from exposure**

B.3.ii.f Does ARD progress after removal from exposure to asbestos? The evidence is incomplete. Pleural asbestosis gets worse after removal from exposure. Whether parenchymal asbestosis progresses or not is subject to some dispute. However, for both types there are significantly increased chances of progression to mesothelioma and lung cancer and this is what is important. Those exposed with pleural asbestosis have 2.5 times the risk of lung cancer compared with those exposed without such pleural asbestosis.

Naturally for mesothelioma and lung cancer there is no question of preventing the advent of disease after removal from exposure to asbestos. The argument has been heard with respect to pleural asbestosis that the lack of physical impairment is ground for denying compensation to those so affected. The bulk of those entitled to compensation or in fact exposed to asbestos have only pleural asbestosis. Of those with ARD's in the asbestos cement industry in 1975, as many as 78% of them had pleural asbestosis only. Likewise of those with compensable ARD on the mines, 58% (white) and 43% (Africans) had pleural asbestosis only. What is forgotten is the reality of progression of the disease after stopping work and the increased incidence of cancer in later life.
Different types of asbestos equal different hazards

B.3.ii.g There have been attempts to distinguish between the different types of asbestos, in terms of danger to health. Blue and brown asbestos were said to be dangerous and, white proclaimed safe by the asbestos industry, especially in the U.K. There was, in fact, some basis for assuming that blue asbestos was more carcinogenic than white, particularly for mesothelioma. There are also more smaller fibres in proportion to long fibres in blue asbestos dust, and these are suspected to be the causal agent in mesothelioma. The UK adopted a safe level for blue asbestos of 0.2f/cc in 1971 and this amounted to an effective ban on its importation. Of course the main type of asbestos used there was white asbestos.

By 1980, however, there are well-documented cases of cancer caused by all types of asbestos used and there is no question of white asbestos being safe either in terms of lung cancer or of mesothelioma.

The question of individual susceptibility

B.3.ii.h Are there workers who are especially susceptible to disease or exposure to asbestos? Is there an 'allergy' to asbestos? Most of the laboratory studies on animals and epidemiological studies show the inevitability of asbestos induced lung damage. The high proportion of those affected by some form of ARD given sufficient exposure in time and concentration of asbestos easily dispel such claims.

Some biases arising in the sources of data

B.3.ii.i Lastly some points about the use of quantitative information must be mentioned. Who conducts the research and which records are used seem to influence the results considerably. In Table VII, the source of the data analysed is related to the estimated risk of lung cancer.
TABLE VII: COMPARATIVE RISK OF LUNG CANCER BY SOURCE OF DATA

<table>
<thead>
<tr>
<th>Source of Data</th>
<th>Risk of developing lung cancer over that of expected incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company records</td>
<td>1.3 to 2.8</td>
</tr>
<tr>
<td>State data</td>
<td>1.2 to 3.4</td>
</tr>
<tr>
<td>Trade Union records</td>
<td>3.4 to 9.2</td>
</tr>
</tbody>
</table>

Source: (69)

Reasons for underestimation of comparative risk between work-exposed people and the reference population

B.3.ii.j The comparative risk is usually underestimated in one of several ways given the methods by which it is calculated.

The healthy worker effect

When a population of active workers is compared to the general population, which includes the elderly and the sick, they experience lower disease and death rates. This is known as the Healthy Worker Effect.

Poor follow-up of subjects

Poor follow-up of subjects due to retirement, exclusion from the study group through ARD, and in the case of South African migrant labour, means that many cases are never identified.

Long latent periods

The long latent period, while the disease develops, aggravates the effect of poor follow-up, and allows competing causes of illness and death to remove subjects from the study group.

Overlapping exposure and observation times

Overlapping exposure and observation times make it difficult to determine accurate dose-response relations for a group of people studied.

Poor information infrastructures

The lack of good information in most countries will lead to underestimation of the incidence of ARD's, and make it difficult to relate the number of cases to a population at risk for these diseases.
In this section then, the different ARD's have been discussed. The history of the association between these diseases and asbestos exposure has been presented along with the main arguments pertinent to this association. Some theoretical comments have been made about quantitative as opposed to semiquantitative or qualitative analysis. Where good quantitative data is hard to come by the sorts of arguments used to conceal the true relation between asbestos and disease have been mentioned. In well documented situations another set of arguments pertinent to this association, in particular some epidemiological ones, has been presented.
SECTION C.

THE CONFLICT BETWEEN UNEQUAL PARTICIPANTS

We have seen the sorts of argument that are likely to arise in connection with the relation between asbestos exposure and ARD's, both internationally and in South Africa. The position with regard to safety at work will now be viewed in terms of the general conflict between unequal participants over conditions at work. These parties are management, the State and organised labour although environmentalists and ecology movements together with independent researchers have also made significant interventions.

Before the outcome of this conflict in different countries, including South Africa, is discussed it is necessary to examine the structural roles of the main participants to see how these roles map out the range of possible interventions for each party to the dispute.

In Section B the arguments engaged in by researchers were presented. These were interventions of a type peculiar to the State, and expressed in the language or discourse of the State (viz. a statistical discourse). The form assumed by these interventions is that of a neutral, objective balancing of the facts, despite the attitudes of many researchers which belie any real neutrality. There are, however, other arguments and interventions which are more specific to management and labour. These are much truer representations of the direct interests of the two parties.

C.1 THE ASBESTOS INDUSTRY

The asbestos industry has been responsible for the dissemination of much information stressing only the beneficial use of asbestos and asbestos products. In the U.K. there is the Asbestos Information Committee which was set up for this purpose. In South Africa there is the S.A. Asbestos Producers Advisory
Committee which circularises information favourable to asbestos. The industry also commissions and funds research, either directly, or indirectly via contributions to private or public research institutions. Industry representatives may be able to exercise a veto with respect to research results by virtue of these connections.

In consequence of its social weight, management enjoys significant leverage at all levels of government. When it comes to the impossibility of proving the existence of a hazard precisely until sufficient time has elapsed for disease to develop, management reaps the statistical 'benefit of the doubt': It is also able to engage experts to make important interventions using this State language.

On management's terrain, profits are identified with the national interest. The weapon of structural unemployment is effectively wielded when management claims to be operating in the national interest by creating employment, however dangerous. The substitution of asbestos is argued to be neither technically nor financially feasible. Nevertheless the monopolistic position they occupy on the market allows the big asbestos companies not only to market substitute products successfully, but even to initiate substitution when under pressure from increasingly severe health regulations to do so. All these powers are brought to bear by management when safety measures reducing exposure are being debated.

When all pressures and arguments fail, management falls back on its ability to transfer production from areas where health regulations are strongest to those where they are not. As most of the big producers and manufacturers are transnational companies this is not too complicated a procedure.

C.2. THE STATE

Why analyse the role of the State? On the one hand the State is there to guarantee the conditions of production in any society.
On the other hand the State needs to have a relative distance from the particular interests of the other two parties in order to maintain national unity. The interplay of these two contradictory characteristics of the State determines the many different forms of State, and the international differences that

In countries where labour is organised and constitutes a strong social presence the State is forced to incorporate its interests. The interests of labour are embodied in the industrial relations structures of the State. These range from the collective bargaining apparatus to the industrial relations training institutes and research bodies.

Implicit in the role of the State as guarantor of production is the fact that it leans toward the dominant party viz. management. Other manifestations of the structural relations between management and the State are the reliance of the State on industry for revenue and the financing from profits (tax deductible) of research, the partiality of researchers for industry which may be evident in their assumptions, similar attitudes with respect to unemployment, and the shared belief that industrial profitability is equal to national prosperity. There are often close economic relations between the State sector and the private sector of production. The inclusion of management representatives at high levels with important powers in State research bodies has been mentioned. As most of the research is conducted on private property (in some cases industry even provides its laboratory facilities), management may be allowed the right to suppress research findings. Some countries have secrecy clauses in their legislation, pertaining to the results of inspection of working conditions, which keep essential information from labour.
Nevertheless one can clearly see the relative distances between the State and management when one compares their respective interventions in the debate. Industry research is overtly biased, that of the State more subtle and even-handed. The factory inspectors are not the same as managers and even if they lean to their side, this merely underlines the structural distinctness of the two.

The doctors and biostatisticians who produce and analyse the data are almost always employed by either industry or by the State, directly or indirectly (e.g. through the universities). Those employed by management may be expected to adopt biased positions. Nevertheless State researchers, who are not the same as management employees, generally can be seen to lean towards the position of management, by virtue of the general connections between State and management alluded to above. However with State researchers the possibility does exist for individual academics to take up positions strongly supportive of labour or the general public. This is particularly the case when these groups are strongly represented in the very structures of the State, as is the case with trade unions and environmental lobbies.

State research in the field of occupational health is often characterised by cost-benefit analysis in the sense of the cost to industry and hence national prosperity weighed against individual risks. This is the dynamic behind the 'objective' weighing of the facts. But this is merely the transformed form of the unequal dispute between management and labour rather than an opposition between the national interest and that of individual citizens. The interests of management are thus presented by the deliberation of experts as the general interest, while the particular and subordinate group, labour, pay the costs under threat of censure for behaviour detrimental to the society as a whole. Those who pay the costs, labour as a whole, are represented as susceptible individuals by this same process. Here the experts seem to decide in a more palatable form, what is already decided by management. In the process they give labour the opportunity of abiding by this decision by presenting them with choices which mask the real alternatives.
Another aspect of the role of the State is policing of the safety regulations by the factory inspectorate once safe levels and practises have been defined by State research. Transgressions of regulations are punishable by law and compensation exists for injury, ill health and death. In these areas the phenomenon of the State bias towards industry, while being separate from it will be discussed in Section D.

C.3 THE UNIONS

The unions do not have a homogeneous position. Where the membership is totally involved in asbestos production, the principal concern may be with unemployment. In the case of dockworkers contacts with asbestos may only constitute a small aspect of their work and may be associated with more militant responses. The positions of the labour movements in various countries have varied from demanding a total ban, to progressive phasing out of asbestos while finding alternative employment for those made redundant in this process.

The unions rarely have the power or finances to compete effectively in terms of the State discourse and are therefore at a considerable disadvantage. The structural alignment of researchers with State or management makes the unions' position even more difficult should they employ professionals for scientific research and debate. It is difficult for the unions, then, to check up on State or industry activity.

Despite all these structural disadvantages the labour movement has been increasingly successful where it is strongly organised in demanding and obtaining improvements in safety at work. Concerted pressures from labour have resulted in concessions where the 'safe levels' are successfully downwardly revised. This pressure has also produced the impetus for substitution which has hitherto been resisted by management. The labour movement has also been able to use its own embodiment in the State to advance some of its aims. It is this embodiment through the existence of the unions and the collective bargaining apparatus which is a material basis for the relative separation of the interests of State and industry.
It goes without saying that where there are no forms of labour organisation at all, the position of the individual exposed at work is likely to be grim indeed and the possibilities of intervention minimal.

In summary then, principal participants in the dispute are the State, management and labour. The inequality in the power of these parties is manifest and simultaneously hidden in the peculiar nature of the State's intervention, which takes the form of academic arguments presented as neutral.

But this 'neutrality' often rests on a whole series of implicit assumptions shared with industry. Analyses based on these assumptions, phrased in the State language, then appear as choices within a range of possibilities that does not damage the essential interests of industry, conceived as the national interest.
SECTION D. RESULTS OF THE CONFLICT

D. THE OFFICIAL SITUATION WITH REGARD TO SAFETY MEASURES AND POLICING OF MEASURES

D.1 SOUTH AFRICA

There are no statutory limits to levels of exposure whether on the mines, factories or in the local environment.

D.1.1. EXPOSURE ON THE MINES

The government mining engineer at the Department of Mines lays down guidelines internal to this department which are policed by the air quality section inspectorate.

Asbestosis was first looked for and found in the 1950s, when a high prevalence was discovered. Since 1954 all asbestos mines have been controlled under the Pneumoconiosis Act of 1946, which after 1973 was replaced by the Occupational Diseases in Mines and Works Act. This means that regular and compulsory medical and X-ray examinations of miners take place and that dust measurements are made in the course of routine inspections of the mines by officials of the Department of Mines. Historically the mining engineer made guidelines for dust levels on the main mines in South Africa - the gold mines. It was assumed that on asbestos mines a fixed percentage (15%) of total dust measured consisted of fibres. So 15% of the guideline for dust in the gold mines was taken as the guideline for asbestos mines. This was 45 fibre/cc until 1975 when it was decreased to 12 f/cc.

The ventilation engineers employed by the mines take samples to investigate compliance with the guidelines. The state inspectors work closely with these ventilation engineers and carry out periodic surveys. Counts of asbestos fibres from State samples have been made at mining company laboratories. All blue asbestos counts were done at the Anglo American laboratories until May 1979.
The only enforcing legislative body is the risks committee of the Department of Mines. It has the power to increase the risk rating of the mines which means that the levies contributed by the mines to the compensation fund can be increased. However, this does not apply to the asbestos mines which have a maximum risk rating of 100% to begin with.\textsuperscript{72}

Table VIII shows the history of asbestos dust levels on the South African mines. The international measure of long fibres (greater than 5 microns in length) per cubic centimetre of air is used. It must be remembered that there are many more short fibres and particles in this same unit of air, not to mention submicroscopic particles and that the ratio of these other components to long fibres is higher for blue asbestos than for the other varieties.\textsuperscript{73} About 0.54 to 2.83% of blue asbestos dust is visible under the light microscope.

The current guidelines for the 4 spot Konimeter readings are 5 long fibres per cc. and 200 short fibres and particles/cc underground. The surface guideline is 10f/cc, which represents a concession to the asbestos producers, to be reduced to 5f/cc after December 1981. The Konimeter reading is a static reading and it is claimed that the average recorded exposure using a Casella personal sampler is about 3 times higher than the static reading. (Variation of 1 to 6 x higher).

All these figures are means over all areas in the mine. Some processes, especially surface ones, are very dusty and produce much greater exposure. Evidently levels underground are generally within the guidelines while those on the surface are not when measured by Konimeter or Thermal precipitator. When measured by the Casella personal counter in 1976/77, however, many of the major mines had surface levels above 10f/cc and underground levels above 5f/cc. There is an awareness both in industry and amongst officials of unhealthy conditions in some of these mining operations.
TABLE VIII Although there has been a remarkable reduction in dust levels over the years it can be seen that current levels are still unsatisfactorily high.

TABLE VIII: AIRBORNE CONCENTRATION OF ASBESTOS
(long fibres/ccm in the mines overall averages)

<table>
<thead>
<tr>
<th>Years</th>
<th>Crocidolite (Cape)</th>
<th>Amosite (Transvaal)</th>
<th>Chrysotile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Surface</td>
<td>Underground</td>
<td>Surface</td>
</tr>
<tr>
<td>1940-45</td>
<td>430</td>
<td>23</td>
<td>234</td>
</tr>
<tr>
<td>1946-50</td>
<td>248</td>
<td>10</td>
<td>91</td>
</tr>
<tr>
<td>1951-55</td>
<td>166</td>
<td>8</td>
<td>103</td>
</tr>
<tr>
<td>1964-66</td>
<td>28</td>
<td>4</td>
<td>85</td>
</tr>
<tr>
<td>1967-69</td>
<td>19</td>
<td>10</td>
<td>90</td>
</tr>
<tr>
<td>1970-71</td>
<td>12</td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>1972-73</td>
<td>12</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>1974-75</td>
<td>9</td>
<td>4</td>
<td>23</td>
</tr>
<tr>
<td>1976-77</td>
<td>6</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

Source: (3)

D.1.ii DISEASE ON THE MINES

Many studies demonstrate a high prevalence of ARD's among miners. The overall prevalence of abnormality has been found to increase from 4% in men with exposure for 1 year or less to 47.9% in those with more than 15 years exposure. Research has established an increasing risk of asbestosis for white miners ranging from 2% after 5 years service to over 35% for over 20 years service, together with a high incidence of minimal asbestosis in black miners exposed for only a short period of time. Given that a large proportion of slight and moderate cases of asbestosis are not picked up by X-Ray examination, the numbers recorded above may even be underestimated.
For mesothelioma the incidence is significantly raised in the mining population. Nevertheless the incidence must be considerably underestimated because of the absence of statutory follow-up of miners after they have left the mines. Poor diagnostic and treatment facilities at that stage along with general unawareness in the medical profession would further reduce the pick-up rate of such cases. Ascertainment of exposure to asbestos may be impossible. Access to the mesothelioma register is therefore haphazard. The doctor certifying a death will send the post-mortem material to the National Centre for Occupational Health as a courtesy rather than as a routine measure, should the deceased be a miner. Only if compensation is sought for illness or death, after ceasing employment, will these cases appear in the register. All these arguments apply a fortiori to the black work force on the mines, most of which is migrant in character.

As for lung cancer, there is no provision for registering cases in those exposed occupationally to asbestos.

The Medical Bureau for Occupational Diseases which is constituted in terms of the Occupational Diseases in Mines and Works Act of 1973, examines white miners yearly by means of X-ray checks. Blacks are examined every 9 months also by X-ray, but at the mines themselves, not at the bureau. These X-rays are interpreted by non-specialist mine medical officers who are usually local general practitioners. In order to check up on the quality of interpretation, a random sample is regularly taken of the X-rays, taken at the mines, and the sample is read by the radiologist at the bureau. The sample size is about 7,500 out of 500,000 miners.

In addition to these screening examinations, the bureau performs compensation examinations for all races. The N.C.O.H. does the post-mortems for workers in controlled mines and works. Although obligatory for people in controlled mines and works, only about 35% come to post-mortem in the end. Ex-miners who die after retirement seldom come to post-mortem. The system of compensation is different for blacks and whites. This will be elaborated shortly. Once certified as suffering from a compensable disease, a miner may no longer perform risk work on the mines.
In the 1978 Report of the Medical Bureau for Occupational Diseases, the following table of all certifications made in the preceding year is given. These are both new certifications and upgraded certifications.

TABLE IX: NEW AND UPGRADED CERTIFICATIONS

<table>
<thead>
<tr>
<th>Type of Pneumoconiosis</th>
<th>Whites (all grades of compensable disease)</th>
<th>Blacks (all grades)</th>
<th>Blacks without TB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silicosis</td>
<td>201</td>
<td>1701</td>
<td>688</td>
</tr>
<tr>
<td>Coal miners pneumoconiosis</td>
<td>11</td>
<td>95</td>
<td>64</td>
</tr>
<tr>
<td>Asbestosis:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Pleural</td>
<td>140</td>
<td>139</td>
<td>103</td>
</tr>
<tr>
<td>- Parenchymal</td>
<td>36</td>
<td>117</td>
<td>82</td>
</tr>
<tr>
<td>- Both</td>
<td>57</td>
<td>57</td>
<td>43</td>
</tr>
<tr>
<td>- Mesothelioma</td>
<td>8</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>241</td>
<td>323</td>
<td>238</td>
</tr>
<tr>
<td>Other pneumoconiosis</td>
<td>-</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>GRAND TOTAL</td>
<td>453</td>
<td>2131</td>
<td>996</td>
</tr>
</tbody>
</table>

Asbestos related pneumoconiosis as a % of total pneumoconiosis: 53% 15% 24%

Source: (76)
The high proportion of asbestos-pneumoconiosis is underlined when only new certifications for whites are examined.

TABLE X: ASBESTOSIS AS A PERCENTAGE OF ALL NEW CERTIFICATIONS

<table>
<thead>
<tr>
<th>Year</th>
<th>% of all New Certifications (not including TB certifications)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>15</td>
</tr>
<tr>
<td>1976</td>
<td>22</td>
</tr>
<tr>
<td>1977</td>
<td>31*</td>
</tr>
<tr>
<td>1978</td>
<td>36</td>
</tr>
</tbody>
</table>

Source: (76)
* White asbestos miners as a % of all mine workers are 1.3% in 1977.
Table IX shows that of all white miners compensated for pneumoconiosis in 1977/78 as many as 53% were compensated for an asbestos-related condition. For African miners the figure was 15% and for Africans excluding those compensated for T.B. it was 24%. But in the case of whites, only 1.3% of the total mine labour force are asbestos miners. For Africans, the figure is 3.1%.

Table XI contrasts the percentage racial composition of the asbestos mines labour force with that of those compensated for ARD's.

| TABLE XI: RACIAL COMPOSITION OF ASBESTOS MINE LABOUR FORCE AND ARD CERTIFICATIONS 1977/1978 |
|---------------------------------|----------------|---------------|
| % composition of asbestos       | White | African       | Total        |
| mine labour force               | 5%    | 92%           | 97%          |
| % composition of ARD            | 43%    | 57%           | 100%         |
| certifications                  |       |               |              |

Sources: (76) and Mining Statistics 1978.

The point has been made that these figures in Tables IX and X represent an accumulation of cases from a time when asbestos exposure was greater and less well controlled. Nevertheless, we have seen that no comforting assumptions can be made about current levels of exposure on the mines, which in terms of UK standards are still high.

The fact that access to compensation (Table XI) is more certain for whites than for blacks leads one to suspect significant underestimation of the magnitude of the disease burden borne by Africans.

It should be noted that there are no unions for African mine workers. The African Mine Workers' Union was suppressed after a period of labour unrest in the 1940s. There are a number of white unions
operating on the mines, most important of which is the White Mine Workers' Union. Nevertheless, it can be inferred from some of these figures presented that conditions for labour as a whole are not very satisfactory with respect to ARD's. In some areas, e.g. compensation, it can be seen that there is substantially better remuneration for white labour. But the overall context is that of a weak and divided labour situation with uneven organisation of mine labour as a whole.

Most research activity is done by the State and industry. There is no independent or union-funded research into these matters. Not even the White Mine Workers' Union representatives sit on the research bodies' editorial boards, although they do get to participate in commissions of inquiry.

The penalty for infringement of the regulations under the Occupational Diseases in the Mines and Workers' Act, 1973, is a maximum fine of R400 which is a small sum of money.

D.1.iii MANUFACTURE : LEVELS OF EXPOSURE

The position with respect to asbestos exposure is complicated in manufacture. Exposure at the workplace is covered by two acts of parliament. Asbestos workers fall under the list of scheduled processes in the Atmospheric Pollution Prevention Act No. 45 of 1965. An air pollution control officer attached to the Department of Health is responsible for setting guidelines for asbestos fibre levels and for enforcing this limit. The level is agreed upon by the factory owner and the officer and applies both inside and outside the factory and is a condition for issuing a certificate of registration in terms of the act. The principle of the 'best practicable means' of reducing pollution is applied to the determination of the asbestos level. The cost to industry in reducing pollution is taken into account when determining the 'best practicable means' and this highlights the arbitrary nature of exposure levels from the point of view of health and safety.
The monitoring of these levels is actually left to the factory owner who employs hygienists to measure the dust. The factories are subject to inspection by the air pollution control officer. When one considers the fact that there is one such officer in Cape Town, for instance, who covers 200 scheduled industries stretching from Okiep to Port Elizabeth, the frequency of these inspections can be expected to be very low. The penalties for overstepping the agreed levels of exposure could be withdrawal of certification which is an unlikely extreme measure, a R500 first fine which increases to R2000 or a prison sentence for a further offence.

In terms of the Factories Act No. 22/1941 processes involving asbestos are specified activities. Theoretically pre-employment medical examinations are obligatory and further periodic health checks are discretionary for workers in specified activities. These examinations are the responsibility of the factory owners and in reality such examinations do not often take place. In addition the chief inspector of factories in the Department of Manpower Utilisation is supposed to lay down limit values of asbestos levels. These are currently 5 fibres/cc for long fibres and 200 f/cc for short fibres (the same as the mines underground levels). These levels are also discretionary and not statutory. They depend on the initiative of the chief inspector. There is a fine of R600 for overstepping the level. The position with regard to inspection of factories in order to police this level is not encouraging. The Erasmus Commission reported in 1975 that there were a total of 29 factory inspectors for occupational safety covering 30 097 factories. The number of posts available for factory inspectors was 66.77a

The National Centre for Occupational Health will assist with research but the results of such research are not available to the general public or the workers involved and may be withheld by industry.78
What is striking about the legal situation in manufacture is that the setting of safe levels is discretionary in terms of the powers of the inspectors. There are no statutory levels, and factors such as cost to industry to reduce pollution are taken into account. Actual monitoring of dust measurements are performed by industry and only occasionally inspected by the State authorities. The monitoring of the health of employees is laid down in general terms statutorily but the specifics of these health checks are discretionary and once more to be performed by industry. Most of the information concerning the actual levels of dust measured, the state of health of employees and the results of any research done on factory premises is secret and can be withheld either from the workers or the general public. The overburdened nature of the factory inspectorate means that the veracity of monitoring of 'safe levels' or health by industry is not subject to meaningful inspection. Lastly the penalties for overstepping nonstatutory regulations are paltry.

D.1.iv LEVELS OF DISEASE

What about the actual situation in the factories? In 1976 the Erasmus Commission spoke of industry following the lead of the mines. At this stage the level was 40 fl/cc and there was an expressed intention to lower it to 5 fl/cc in 1976. The Commission report produced some interesting tables showing the incidence of asbestos in the a/c industry. (Table XII).

<table>
<thead>
<tr>
<th>Factory</th>
<th>No. of Workers</th>
<th>Parenchymal Asbestosis</th>
<th>Pleural Asbestosis</th>
<th>Calcified Mira</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>528</td>
<td>13</td>
<td>81</td>
<td>6</td>
<td>100</td>
</tr>
<tr>
<td>B</td>
<td>583</td>
<td>5</td>
<td>43</td>
<td>-</td>
<td>48</td>
</tr>
<tr>
<td>C</td>
<td>372</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>D</td>
<td>152</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Totals</td>
<td>1 635</td>
<td>28</td>
<td>125</td>
<td>7</td>
<td>160</td>
</tr>
</tbody>
</table>

This table shows that 10% of all workers have ARD's in the a/c industry.
Another study of the a/c industry showed 180 out of 1 400 workers (that is 12.9%) to be suffering from pleural asbestosis. This compares with a 3% prevalence in the Canadian asbestos mines in Quebec, quoted in the same review. 77

Yet another study of a/c workers showed high levels of asbestosis in those with more than 3 years service.

TABLE XIII: ASBESTOSIS IN WORKERS WITH MORE THAN 3 YEARS SERVICE

<table>
<thead>
<tr>
<th>Source: (79)</th>
</tr>
</thead>
</table>

The same study reports a 43.5% prevalence of pleural asbestosis in a group of 69 people in one of the a/c factories who were considered to have been exposed to low levels of asbestos only.

Most manufactured asbestos products in South Africa are a/c products. One of the big producers of a/c, Everite, which is part of the world wide Eternit group, claims to have a voluntary agreement with the Air Pollution Control Officer dating from the mid-sixties. The current agreed level is 2 f/cc. It should be noted that their factories use crocidolite for which the legal limit in the United Kingdom is 0.2 f/cc (i.e. ten times less). They also claim to operate a voluntary company scheme whereby employees undergo pre-employment X-ray examination which is followed up 5 yearly to 10 years, then 2 yearly to 15 years of service and then yearly thereafter. 79a Should any abnormalities be detected on X-ray examination the worker is examined yearly but is not necessarily barred from risk work, as is the case on the mines.
As for other asbestos manufacturing, one can only guess at the conditions at work. Cape Industries in the U.K., for example, would have to keep to a limit of 2f/cc for white asbestos and 0.2f/cc for crocidolite if it operated there. Here at the subsidiary Cape Insulation Products (Pty) Ltd it would be interesting to know the actual level of exposure to white and blue asbestos in the absence of statutory regulations and where the non-statutory level is as high as 5f/cc.

In the manufacturing sector there is no official union representing African workers. TUCSA when approached for their attitude to asbestos exposure declined to comment in view of the current deliberations of the commission of enquiry into compensation for occupational diseases.

Because most of the information in South Africa generally is about asbestosis only, and there is no cancer registry, we do not know the true dimensions of the disease burden. The migrant nature of the working force makes collection of statistics especially difficult.

D.2 INTERNATIONALLY

It is worthwhile briefly to compare conditions at work with asbestos in some other countries where the relative position of labour and environmental pressure groups has been stronger.

1. The U.K.

The statutory threshold limit value for chrysotile asbestos is 2f/cc for an eight hour day and five day week. For crocidolite this level is 0.2f/cc which resulted in an effective ban on using it since 1971. There have been no imports of raw blue asbestos since 1971. As a consequence of information presented in Section B, the TUC is pushing for a standard of 0.2f/cc for chrysotile which will last for ten years, to be followed by a total ban.
The Advisory Committee on asbestos which was set up in 1976 to examine health risks by the UK government has recommended in its most recent report that the legal limit be reduced to 1f/cc for chrysotile, 0.5 for amosite and 0.2 for crocidolite and that the import of blue asbestos be formally banned. The committee says that there is no safe level for asbestos and that substitutes should be used wherever possible. The new levels should not be called hygiene standards but control limits as they are not safe. It expresses concern over the presence of asbestos in food and drink and calls for investigation into the link between gastrointestinal cancers and asbestos. In addition to further medical checks, information campaigns directed to those exposed and controls on protective clothing and breathing equipment are recommended.

There has been some dissatisfaction with the efficiency of the factory inspectorate, and the General Maintenance Workers Union have called for a workers' inspectorate. The new Health and Safety at Work Act provides statutory rights for employee organisations to be involved in discussion of measures taken in the factories. The government agencies, have statutory obligations to inform employee organisations of their findings, if called in by them to investigate working conditions and dust levels at factories.

2. **Sweden.**

Sweden banned blue asbestos in 1976 and instituted a ban on working with a/c products at the same time. The ban was lifted for certain a/c pipes under pressure from industry later in 1976. The ban on other a/c products led to the closure in mid-1977 of the biggest Swedish a/c factory which was owned by Eternit.

In May 1979 a total ban on all asbestos containing products was instituted along with stringent regulations for handling residual asbestos.

3. **Norway.**

Norway is expected to follow the Swedish example at some time in 1980.
4. **Denmark**

Denmark has given an ultimatum to Eternit to demonstrate the harmlessness of their Danish operations by 1985, or stop production.

5. **Germany**

Germany has a national standard of 2f/cc for all types of fibres, which will decrease to 1f/cc by 1/7/82.

6. **The U.S.A.**

The U.S.A. has a standard of 2f/cc for all fibre types. The OHSA believes that there is no safe level for a carcinogen. A report by the National Cancer Institute and the National Institute of Environmental Health Services\(^83\) states that at least 20% of all cancer cases are caused by industrial exposure. It claims that (a) 20 to 25% of people heavily exposed to asbestos die of lung cancer, while (b) 7-10% die of mesothelioma, and (c) 8-10% die from cancer of the gastrointestinal tract.

It also anticipates 2 million deaths from asbestos cancer up to the year 2000. An average of 60,000 to 70,000 people per year are expected to die of asbestos cancer, which is estimated at 17% of all cancer cases in the U.S.A. The bulk of these 2 million deaths result from the heavy exposure of shipyard workers during the Second World War.

**The E.E.C.**


**The I.M.F.**

8. The International Metal Workers Federation quotes the American report above and is also pushing for a total ban under the slogan 'Zero is the only TLV'.

The employers generally see pressures for lower levels, substitution and bans as emanating from organised labour\(^16\) and indeed it is apparent that where the Trade Union movement is strong the conditions at work are safer than where it is not.
D.3 COMPENSATION

What happens once the damage has already been done? Industry and the State in varying degrees bear the cost of compensation in South Africa.

The Mines

D.3.1 On the mines compensation depends on the risk rating of the mine. In the case of asbestos mines, all of them have a 100% risk rating and the owners must bear all the costs of compensation. Compensable disease (CD) in terms of the 1973 act are asbestosis, mesothelioma, and lung cancer in asbestos miners. For whites and 'coloured' people there is compensable disease in the first degree which is less than 40% damage to the function of the lungs. Compensable disease in the second degree is either first degree compensable disease plus TB, or more than 40% damage to the lungs. For Africans there are different categories for a compensable disease. There is a category for compensable disease plus TB, and also one for TB alone. The following tables show the monetary awards for the different categories.

**MONETARY AWARDS BY RACE AND DEGREE OF COMPENSABLE DISEASE**

<table>
<thead>
<tr>
<th>TABLE XIV</th>
<th>TABLE XV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>White</strong></td>
<td><strong>Coloured</strong></td>
</tr>
<tr>
<td>First degree compensable disease</td>
<td>R 12 000</td>
</tr>
<tr>
<td>Compensable disease</td>
<td></td>
</tr>
<tr>
<td>Second degree compensable disease</td>
<td>18 000</td>
</tr>
<tr>
<td>TB</td>
<td>5 000</td>
</tr>
</tbody>
</table>

Source: 1973 Act on Occupational Disease in Mines and Works.

In the case of whites and 'coloured' people these amounts are paid out in a lump sum on detection of compensable disease. Should the person entitled to compensation have died the dependants are entitled to the full amount. In the case of blacks for CD
or CD and TB only two-thirds is paid out to dependants. In the case of TB only one half is paid out.

**Manufacturing**

D.3.ii The Workmens' Compensation Commissioner (WCC) deals with compensation for manufacturing industry, but only mesothelioma and asbestosis are included in the schedule of specified diseases compensable in terms of the Workmens' Compensation Act of 1941. Mesothelioma was added to the schedule on 5/10/1979. There is no provision for lung cancer cases. In terms of this Act where there is total disablement the worker can draw a lifelong pension from the WCC to the value of 75% of monthly earnings before disablement, provided this is less than R400 per month. Should the person die from the cause of disablement a lump sum equal to 2 monthly salaries or R300, whichever is the lesser, is paid out together with 40% of the above pension on a monthly basis to the dependant. Should there be children an additional 20% of the above pension is added for each child provided this amount does not exceed the pension the worker, if alive, would have drawn.

Compensation (in terms of the Workmens' Compensation Act) for permanent disablement is fixed according to the degree of disablement. If this is 30% a lump sum equal to a maximum of R4 080 is paid out. This is worked out from a payment of 12 times the monthly salary (maximum of R40) and 10 times the monthly salary in excess of R40 up to R400. For someone earning R120 a month this is R1 280. If the degree of disablement is less than 30% the lump sum is proportionately reduced. If 100% then there is a monthly pension of 75% of monthly earnings up to R400 of such earnings. Between 30% and 100% the monthly pension is proportionately reduced from the value at 100% disablement. These payments for disability in general are pretty meagre. For severe progressive conditions like asbestos related diseases they are particularly miserable.

There is one important difference between manufacturing and mining. When a mineworker is diagnosed on X-ray examination
as having asbestosis, that miner is compensated and prevented from doing further risk work. A worker in an asbestos factory, however, even if fortunate enough to have regular and frequent examinations that will pick up early signs of asbestosis, is not in the same position. There is no statutory obligation that makes X-ray evidence of asbestosis, which is the most sensitive clinical measure, compensable. That worker may work on in conditions which will aggravate his condition. By the time there are complaints referable to advanced lung damage the worker may be compensated in terms of the WCA. Even then there is no obligation to stop that person performing risk work. At each stage then irreparable damage is done, and even if detected and/or compensated it is legally possible to continue to expose the affected person to yet further damage.

Any compensation paid out by the WCC may or may not be voluntarily supplemented by industry, although the absence of unions organising most of these employees does not make compensation easier to obtain. The Erasmus Commission was not keen to consider the question of compensation for occupational diseases, noting the expense that would ensue.

As has been noted the problem with diseases with long incubation periods is that by the time they develop or are discovered the sufferers are often no longer in employment. Even for whites, 'coloured' people and Asians it requires a good knowledge of the law to seek compensation after discovering illness. This is all the more true for Africans who are migrants or even come from other countries for short periods of work. This applies to all the ARD's but especially for the cancers which only develop many years later. Even for whites there is little chance of compensation in the absence of follow up and the number of cases deserving compensation must be underestimated. These arguments apply a fortiori for Africans.
TABLE XVI: SUMS OF MONEY PAID OUT IN COMPENSATION

<table>
<thead>
<tr>
<th></th>
<th>White</th>
<th>Coloured</th>
<th>African</th>
</tr>
</thead>
<tbody>
<tr>
<td>One sum benefits paid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>out on the mines 1978</td>
<td>R</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>1st Oct</td>
<td>6 354,157</td>
<td>618,836</td>
<td>)</td>
</tr>
<tr>
<td>2nd Oct</td>
<td>885,818</td>
<td>168,497</td>
<td>3 810,768</td>
</tr>
<tr>
<td>for ALL compensable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>diseases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>7 462,979</td>
<td>809,333</td>
<td>3 810,768</td>
</tr>
</tbody>
</table>


Payments for ARD's alone could not be disaggregated and neither is the number of recipients of compensation available.

TABLE XVII: DISTRIBUTION OF TOTAL COMPENSATION

<table>
<thead>
<tr>
<th></th>
<th>White</th>
<th>Coloured</th>
<th>African</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution of total</td>
<td>62%</td>
<td>78%</td>
<td>32%</td>
</tr>
<tr>
<td>amount of compensation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>on the mines</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


The sum total paid out in compensation is R12 083,000 which for all the mines (including the asbestos mines), is less than 10% of asbestos sales alone. This small sum cannot involve a massive expenditure for industry. Nevertheless arguments are heard for disqualifying people from compensation for pleural asbestosis alone because of the immediate absence of functional damage. It is noteworthy that of the range of ARD's, pleural asbestosis by itself affects more people than any other category. The Erasmus Commission gives a figure of 78% for the asbestos cement industry. The 1978 Report of the Medical Bureau for Occupational Disease gives a figure of
58% of white and 43.6% of African ARD cases. Another study shows that 17.7% of African workers in the Northern Cape Crocidolite Mines have pleural asbestosis only and that this was the largest disease category. 38

The small sum paid in compensation for fatal diseases like cancer speak for themselves. The structural linkage between the primary responsibility of the asbestos mines for medically examining African miners with a view to screening for or compensation and the fact that the mines are 100% responsible for compensation payments is also worth noting.

It is interesting to juxtapose the reluctance to compensate those with pleural asbestosis on X-ray and no clinical lung dysfunction, and the compensation in terms of the WC Act for clinical dysfunction only. It is possible that it may be cheaper for industry to compensate those who have sustained lung damage than to prevent this damage when they have the information necessary to do so.
CONCLUSION

In the preceding sections I have indicated the extent of production and manufacture of asbestos and asbestos products, and the labour force directly exposed to asbestos fibres. The various health risks were explained and the changing pattern of ARD's discussed. I attempted to give some background analysis to the general determinants of the specific policies of different sectors of industry and different countries. I then presented some idea of the current situation in South Africa with respect to health of those exposed, levels of exposure permitted and compensation for diseases caused by exposure. A brief international comparison with safety levels in other countries was included. An important gap in this paper concerns the question of pollution of water and foodstuffs with asbestos. Much of the world's water supplies reach the consumer via a/c pipes. Yet another is the problem of dumping industrial waste. Like radio active isotopes, asbestos is difficult to dump safely. Asbestos is indestructible.

What are the current world trends with respect to asbestos? There are two discernible trends.

(1) In the industrialised countries there is a strong tendency toward substitution of asbestos products with others less harmful to health. Substitute products in fact exist for most asbestos products. The commonest use of asbestos is in asbestos-cement. There is a ready substitute for asbestos in this product. The barrier is not technical but rather financial. The high degree of vertical integration in this industry means that mine owners have an interest in the continued usage of asbestos in asbestos cement. It is interesting in this connection that Cape Industries should have sold the mines in South Africa and that it is diversifying away from asbestos products in the United Kingdom. Provisional lists of asbestos substitutes for all products containing asbestos are available. 84, 85

In these countries there have been many pressures for the elimination of asbestos, usually from labour organisations and environmental groups objecting to asbestos pollution. It has
been suggested that these have provided the main impetus for downward revision of the exposure levels, substitution with safer substances and bans on asbestos imports and production where these exist. The exact details of this pressure in each country concerned have not been examined and the historical chronicling of the steps in this process would be an important area for future research.

(2) In the less industrialised countries the trend has been one of increasing manufacture of asbestos products as production is transferred from areas where health legislation is stringent to areas where few restrictions exist. In these countries labour is often less organised and therefore more docile and less informed. Of course the usual attractions still exist for foreign firms investing in less industrialised areas, such as cheaper labour costs, proximity to the sources of raw material and possibly a local market. Japan is the one heavily industrialised country where levels of exposure are not stringent and Japan in fact purchases most South African asbestos. South American countries can still produce asbestos products as can South Africa without the spectre of enforced substitution and ultimate bans on production. There is an increasing tendency for asbestos works to move to these countries. In the USA tightening up of levels coincided with the transfer of production to countries like Mexico, Brazil, Venezuela and Taiwan. Other countries are Columbia, Yugoslavia, the Arab countries and Eastern Europe.

A spin-off from the transfer of shipbuilding operations to these countries (e.g. Korea) is the increasing exposure of shipyard workers to the sorts of hazards European and American workers endured during the early part of the century with devastating results.

An illustration in the case of South Africa is the impending transfer of an entire asbestos textile factory from Hamburg in West Germany to Philippi in Cape Town. This factory will produce asbestos textiles for local consumption and for export.
The Argus (18/4/80) reports a Hamburg health and environmental affairs department spokesman, Mr. H. Davidson, as saying that asbestos was being phased out in West Germany and that the authorities had committed themselves to reducing the level of exposure to asbestos dust to zero. Regulations required that all materials available as an alternative to asbestos should be used.

A West German factory Deutsche-Kap-Asbest-Werke in Hamburg was forced to close down by the high cost of keeping asbestos dust levels at the increasingly stringent standards. (The current standard is 2 f/cc soon to be reduced to 1 f/cc). As much as one third of investment in this factory since 1969 was spent on dust extraction equipment. Consequent high production costs then resulted in losses since 1971. The company was then sold by the French owners to the current German owners in 1979. The equipment was dismantled by a Cape Town firm CIW (Pty) Ltd and shipped to South Africa in 1979. During the removal of the dust filters at the factory a cloud of asbestos dust was released necessitating the intervention of the fire brigade.

The South African firm, which bought this machinery from the Hamburg factory very cheaply, is Kapasit Asbestos (Pty) Ltd. It will use Deutsche-Kap-Asbest-Werke as a trade name for its exports. The managing director has said that labour costs would be lower in South Africa than in Germany.

The overall message both from academic research and from official state attitudes to asbestos in the industrialised countries is that there is no safe level for asbestos.

Here in South Africa there are obvious gaps in the legislation pertaining to exposure to asbestos. There is no overall statutory limit in the different sectors of production. The less formal 'safe levels' are produced within various state departments at the discretion of officials who consult with the employers on the basis of the 'best practicable means' of minimising hazards to those exposed. This includes the damage to profits of introducing expensive dust-eliminating machinery. There is no uniformity to the levels in the various departments illustrating the arbitrary nature of these limits from a strictly health point of view.
Monitoring of these levels turns out to be mainly performed by mine and factory owners instead of the more independent state departments concerned with health at work. Inspection of the self-monitoring activity of industry seems to be frequent only on the mines. Elsewhere the serious shortage of manpower in the factories inspectorate and the air pollution control inspectorate reinforce an already weak 'control' by the producers of pollution.

Research activities which bridge the gap between exposure and disease are shrouded often in secrecy and the results of monitoring are not necessarily available to those exposed.

Monitoring of health of those exposed is mostly in the hands of those whose factories and mines are the source of ill health for those working in them. Official State inspection of these activities is in general infrequent. There are pronounced racial disparities in this area with whites subject at least on the mines to more objective health monitoring than Africans.

Follow-up health checks are poor and ill-defined particularly in the manufacturing sector and there is no obligation on the management to remove workers from risk work once they have contracted an ARD. Health records are not kept for epidemiological purposes and there are no follow up examinations after leaving employment. A result of this is that many people seriously damaged by asbestos are lost from sight.

Compensation is derisory from the point of view of its pecuniary value and again reveals marked racial disparities.

It should be clear from the analysis in this paper that neither widespread substitution nor a ban on mining and manufacture of asbestos is at all likely in South Africa at the present time.
Areas relating to the legal situation and the inspection of conditions at work with asbestos as well as discrepancies in the compensation process are indicated. There is considerable scope for tightening up some of these circumstances in which people are exposed to a hazard and pay the consequences of this exposure. These areas of inadequate protection and compensation would require serious attention even were asbestos to be subject to an outright ban. This is because the effects of exposure may only become manifest many years after the last exposure. In addition the removal of existing asbestos products/installations would survive such a ban, as is the case with insulation work.
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80a The Argus, 29/10/79

81. (17) Page (i)

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To anybody interested in what is happening in Southern Africa at the present time, it is clear that an understanding of changes taking place in the field of labour is crucial. The whole debate about the political implications of economic growth, for example, revolves very largely around different assessments of the role of black workers in the mines and factories of the Republic. Many of the questions with which people involved in Southern Africa are now concerned relate, in one way or another, to the field generally set aside for labour economists to cultivate. The impact of trade unions; the causes of unemployment; the economic consequences of different educational policies; the determination of wage structures; the economics of discrimination; all these and more are matters with which labour economists have been wrestling over the years in various parts of the world.

At the same time there are many who would argue that these issues are far wider than can be contained within the narrow context of 'labour economics'. These issues, it is pointed out, go to the heart of the whole nature of development. In recent studies, commissioned by the International Labour Office, of development problems in Columbia, Sri Lanka, and Kenya, for example, leading scholars have identified the three crucial issues facing these countries as being poverty, unemployment, and the distribution of income. Thus the distinction between labour and development studies is becoming more blurred as economists come face to face with problems of real life in the Third World.

It is here too that an increasing number of people are coming to see that study of the political economy of South Africa must not be done on the assumption that the problems there are absolutely different from those facing other parts of the world. Indeed it can be argued that far from being an isolated, special case, South Africa is a model of the whole world containing within it all the divisions and tensions (black/white; rich/poor; migrant/nonmigrant; capitalist west/third-world; etc.) that may be seen in global perspective. Be that as it may, the fact remains that the economy of Southern Africa (for the political and economic boundaries are singularly out of line with each other) is one of the most fascinating in the world. It is one on which far more research work needs to be done, and about which further understanding of the forces at work is urgently required. It is in order to attempt to contribute to such an understanding that Saldru is issuing these working papers.