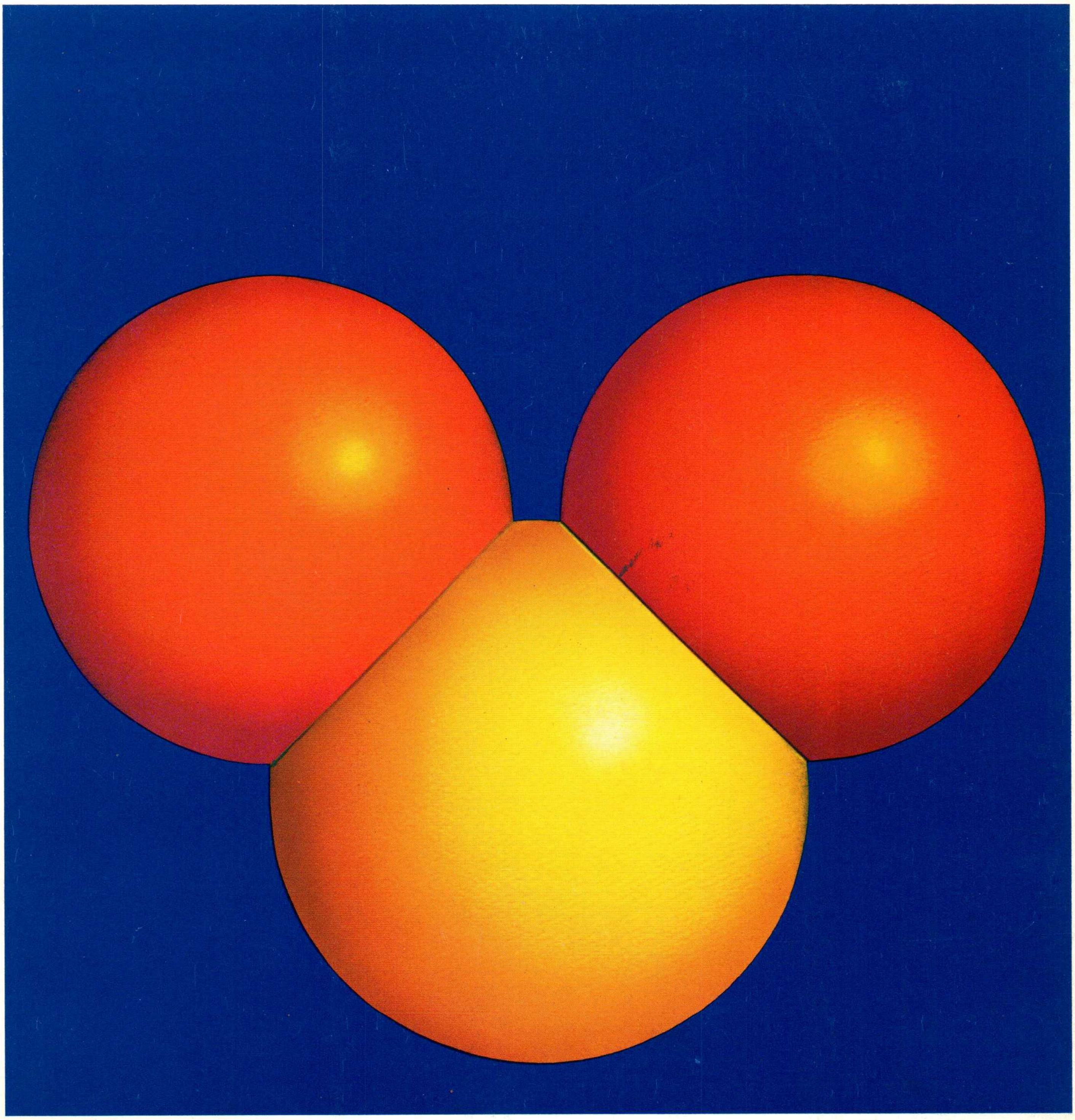
Professional Profile

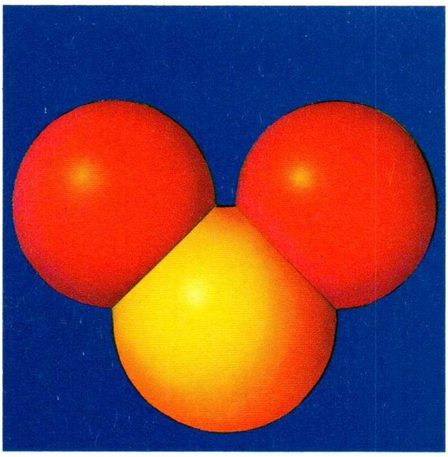
PHILIPS



vol. 1 no. 1 1974

Professional Profile

A periodical review of Philips industrial, professional and scientific products, projects and systems



Model of an SO_2 molecule. SO_2, which becomes sulphuric acid when picked up by water droplets, is probably the most destructive air pollutant. Its concentration over a whole country is measured for the first time by a monitoring network in the Netherlands (see page 12).

Editorial and Publishing Office:
NV Philips' Gloeilampenfabrieken,
GAD, EM2,
Eindhoven, The Netherlands

Professional Profile

PHILIPS

From the Editor

With the growing awareness of the gravity and extent of the problem posed by environmental pollution it became apparent that effective action is required immediately on all levels, ranging from global legislation to the creation of the correct mentality in the individual citizen. Contrary to the views frequently expressed by consumer organisations and pressure groups, industrial enterprises are as aware of this as individuals, communities and nations – sometimes more so.
The Concern Committee for Pollution Control, with its Executive Bureau, bears witness to the fact that the management of Philips is not merely alive to ecological problems, but determined to tackle them in a rational, organized way.
The President of Philips, Mr. H. A. C. van Riemsdijk, expressed this concern in the memorandum following on page 2.

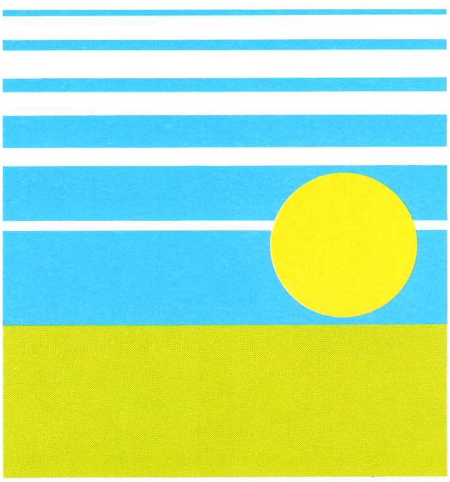
In this issue

Vol. 1 no. 1

Opinion

Our responsibility towards the environment

A Summary of Scope and Attitude



'In my view, our company is involved in the battle for a clean, healthy environment in two ways. On the one hand, we endeavour to organize our production in such a way that we pollute the environment as little as possible. On the other, we supply equipment with which the battle against pollution can be tackled on a nationwide scale.
We are thinking of, amongst other things, equipment for measuring air and water pollution - developed by the Scientific and Industrial Equipment Division in conjunction with the special research group in the Philips Research Laboratories - and the Stirling engine developed in our Physical Research Laboratories. As you probably know, this engine is exceptionally clean and therefore offers a solution to the problem of air pollution by car exhaust gases.

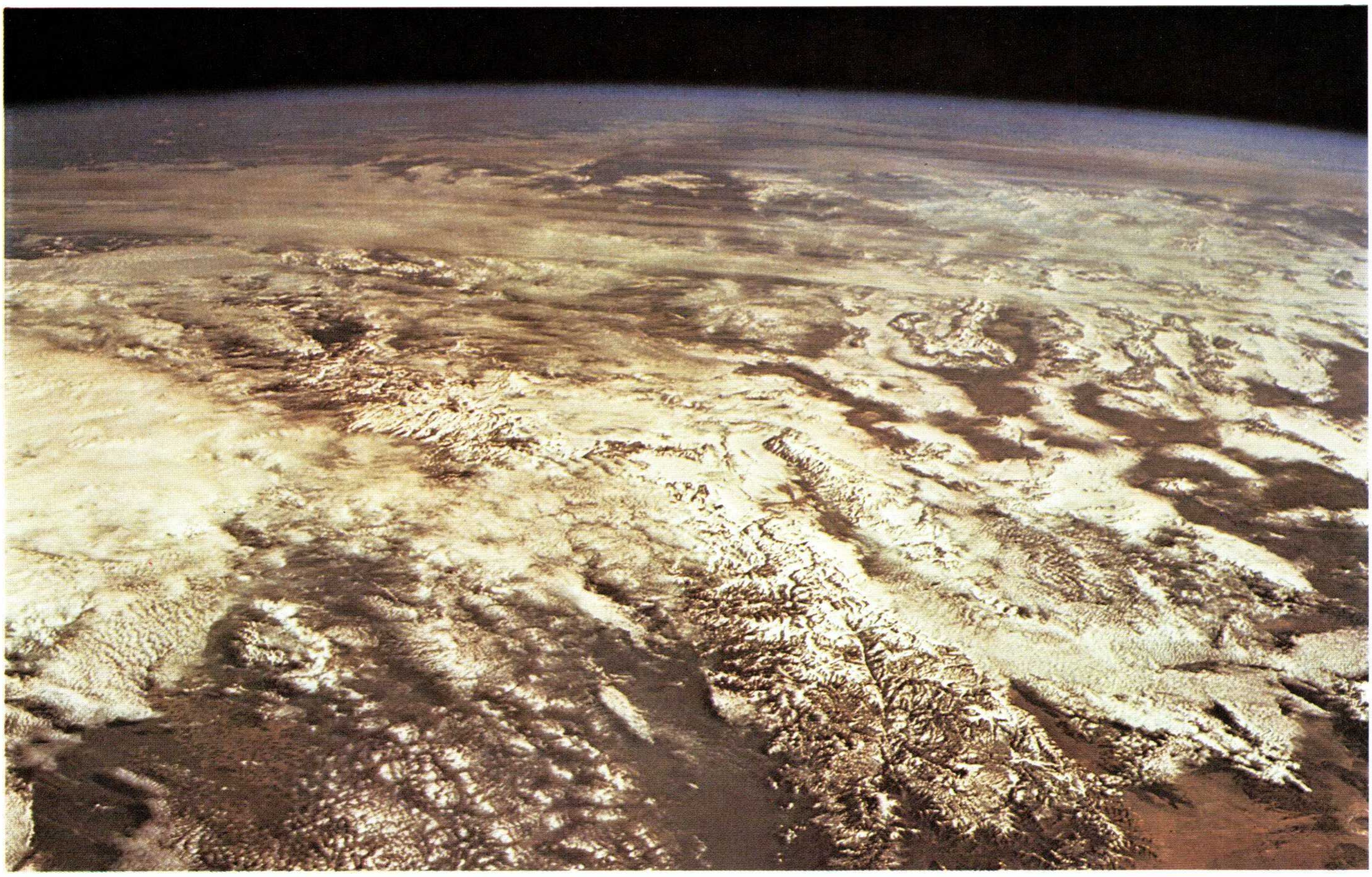
I should now like to consider in greater detail these two ways in which we are involved in environmental problems.
An example of our internal activities is provided by the situation which led to the incinerator in our factory in Maarheeze being shut down. We built it only two years ago in order to burn the large quantities of effluent, discharged by some of our factories. Previously, these effluents, particularly all kinds of solvents, were destroyed by a firm not belonging to Philips. When this firm went out of business, we decided to build our own incinerator. The investment was justified by the rapidly growing quantity of, often dangerous, wastes.
Meanwhile, the activities of the Pollution Control Office - the executive organ of the Concern Pollution Control Committee - had begun to bear fruit. By systematic investigation of the processes employed in our factories, and their alteration wherever necessary, it became possible to reduce the amount of effluent to such an extent that there was no longer any point in keeping the combustion furnace in operation. In many cases this reduction was achieved by the regeneration and re-use of chemicals. This approach therefore led not only to a reduction of effluent, but also to a saving in raw materials.
The Concern Pollution Control Committee is a coordinating policy body in which the Medical Service, Building Design and Plant Engineering, the Works' Safety Department and the Legal Department are represented. Knowledge and experience in the area of environmental control are exchanged at meetings of factory managers and through the publication of a quarterly magazine.
The Committee is mainly concerned with technical processes. Formerly, attempts at combatting the pollution of air, water and soil usually involved the building of large expensive purification installations. Today, as we have just shown, a completely different philosophy has been developed. Instead of trying to destroy the pollutant once it is made we go back to the process in which it originates and alter that - thereby effecting a double saving.
The application of this policy to new products and processes is largely determined at Divisional level. But it is the Committee's responsibility to ensure that new processes are not introduced until the environmental aspects have been thoroughly investigated.
In our research laboratories, too - an important source of industrial innovation - we take environmental aspects into account during the development of new materials and technologies, so that even in the very first stages of thinking

about new techniques and products, due attention is paid to care for the environment.

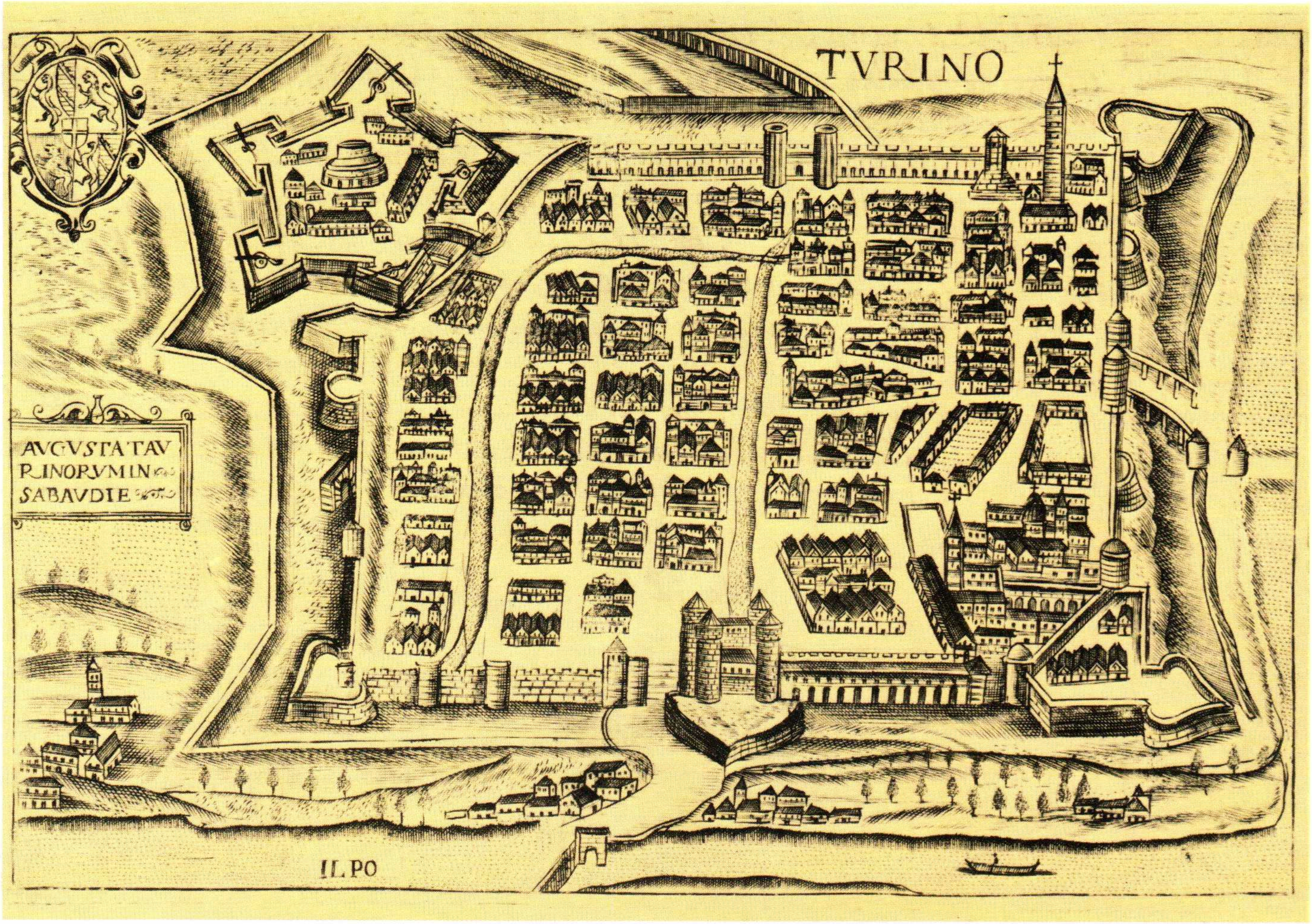
I would now like to turn your attention to the air and water pollution systems manufactured by our Scientific and Industrial Equipment Division.
First, let me answer the question: why measuring systems? Because constant, automatic analysis and measurement of air and water enable effective and economic steps to be taken to combat pollution on the correct scale. A good example of this is the air pollution measuring network operating in the Rhine estuary. This network, with its built-in alarm system, comprises thirty-one sulphur dioxide detectors or 'sniffers'. The data registered by these detectors is transmitted by a tele-metering system to a central control room for processing and interpretation. When the alarm system comes into action, local industries can immediately take the necessary steps to reduce pollution to an acceptable level.
The division has sold some 1400 of these sulphur dioxide sniffers during the last four years. Of these some 500 are in the USA, 170 in Canada, 200 in Italy. The remainder are elsewhere in Europe, South Africa, Japan, Hong Kong and Mexico. At present, a measuring network comprising some 220 sniffers distributed over eleven regional networks, is being built up for the whole of the Netherlands.
Measuring equipment is currently being developed for other airpolluting com-ponents. For example, work has started on the designing of equipment for the measurements of small concentrations of heavy metals in water which are harmful to health. Together with the State Institute for Public Health in the Netherlands, we are also working on measuring equipment for the detection of chlorinated hydrocarbons (including pesticides) in water.
Another item which merits attention is the development of the CO_2 meter which permits the rapid, automatic, reliable measurement of water pollution of organic origin. Other instruments in our programme permit the automatic measurement of oxygen dissolved in water and of the acidity, conductivity, temperature and turbidity of water. Many of these instruments can be combined to form unmanned measuring stations which, in turn, can be linked up in nation-wide networks. In this way, sources of pollution can be detected.
Meanwhile the Scientific and Industrial Equipment Division has also gained extensive experience in the domain of water treatment.'

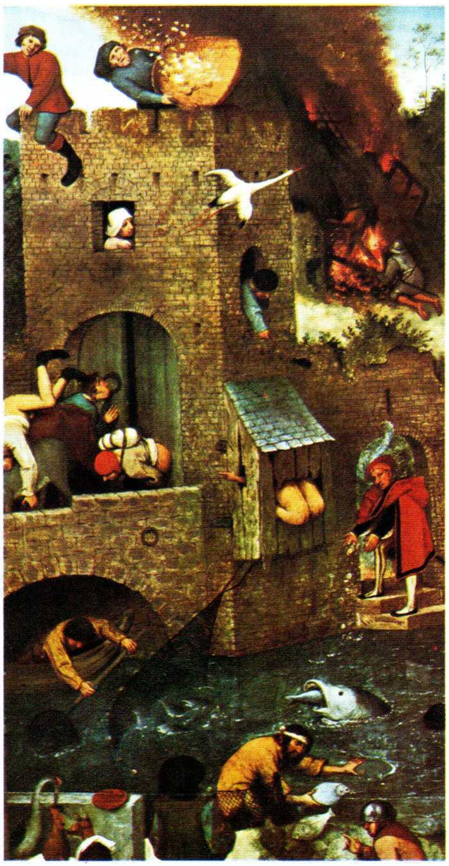
'In my view, our company is involved in the battle for a clean, healthy environ-ment in two ways. On the one hand, we endeavour to organize our production in such a way that we pollute the environment at little as possible. On the other, we supply equipment with which the battle against pollution can be tackled effectively on a nationwide scale.' These words are taken from a memorandum by the President of Philips, mr. H. A. C. van Riemsdijk, on the subject of the company's responsibility towards the environment.

Pollution of the atmosphere



Below that thin blue line is the air we live in. In relation to the earth, a film no thicker than the skin of an onion. Upon it all life depends; we pollute it at our peril. Yet for the last two thousand years men have been doing so. Fortunately their numbers were too small and their technology too primitive for the effects of their lack of concern and ignorance to do widespread harm. Pollution was local.





Rome with its population of around a million, its warrens of narrow streets obstructed by tradesmen's booths; its thousands of multi-storey tenements, not connected to sewers, in which ordure accumulated in heaps in the stairwells awaiting the arrival of the dung cart; its open pits full of the rotting carcases of animals and men and its hundreds of thousands of cooking fires must have been the centre of the most concentrated pollution in the ancient world. Yet, as Seneca records, you were in clear countryside almost as soon as you were through the gates. It is noteworthy that amongst all the stenches he seems to object only to smoke and soot. The towns of the middle ages and early renaissance were smaller though few had any sewage system at all. Turin, shown in this map as it was in 1656, was quite typical. You could walk out of it in a few minutes.

'As soon as I had left the oppressive air of the city behind me, and the stench of the smoking chimneys which, once the fires are kindled, belch forth all the pestilential fumes and soot they contain, I felt myself an entirely man'.

(Seneca - writing about Rome in 61 A.D.)

1273 Use of coal prohibited in London as being 'prejudicial to health'.

1306 Royal Proclamation prohibiting artificers from using sea-coal in their furnaces. Record of the execution of one offender.

1578 Queen Elisabeth I 'findeth herselfe greately greved and anoyed with the taste and smoke of the sea-cooles'.

1648 Petition of Londoners to Parliament to prohibit the importation of coal from Newcastle on account of the injury they experienced.

1819 Committee appointed by Parliament to inquire how far persons using steam engines and furnaces could erect them in a manner less prejudicial to public health and comfort.

1875 The Public Health Act containing a smoke abatement section on which legislation to the present day has been based.

1936 Public Health Act, in which were included the provisions of the Smoke Abatement Act of 1926.

1946 First smokeless zone and prior approval legislation (Manchester Corporation Act).

1952 London smog disaster, the most serious for many years, with a death roll of 4,000 *(q.v.)*.

1956 Clean Air Act.

1966 First Congress of the new International Union of Air Pollution Prevention Associations (in London).

It is difficult to find contemporary ilustrations that show the conditions in the streets but the rats in this woodcut from the Lübeck Bible, printed by Steffan Arndes in 1494, give an idea of the effect of open sewers. Rats were, of course, the carriers of plague which periodically swept across Europe from the Near East to the Atlantic. Conditions in all towns and cities must have been similar and remained so for another three centuries. Yet it was again the smoke, not stench, that Elizabeth I found distasteful in the City of London. Smoke from burning coal was the target of the earliest attempts to control pollution. An edict of 1273 forbids it. In 1306 a man was hanged for burning coal. Yet it went on. The whole history of the fight against pollution can be followed in the series of laws against coal burning, first in London and later in the rest of Britain that extends from 1273 to the first enforcement of Clean Air Acts in 1956.

Reproduction of a woodcut from the Lübeck Bible 1494

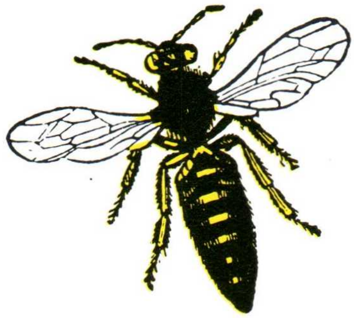
The first years of the nineteenth century saw the beginnings of a new source of pollution from railway locomotives and the threat of it in the proposals for mechanically-propelled road vehicles. Even a century after this cartoon was drawn the attitude had not changed; no-one thought of the motor car exhausts as being more than a local nuisance and it was neglected in framing legislation to control pollution, which concentrated on getting rid of smoke.Yet by the time they began to take effect, the motor car had created acrid smog over a large part of California and made the air of most large cities unpleasant if not dangerous to breathe.

A view in Whitechapel Road, London, 1830

Engraving by Gustave Doré (1833-1883)

The citizens of London seem to have been particularly sensitive to smoke – at least smoke from burning coal – from very early times. And, as the extracts from the history of pollution in Britain at the top of the opposite page show, they long ago determined to do something about it. Yet, right up to the middle of this century, London fog was an international joke against the city.

With the industrial revolution came air pollution on a wholly new scale. It was not merely smoke from factory chimneys. Much more important was the smoke from the thousands of densely packed houses that spread outwards from industrial towns. You could no longer walk into the country in a few minutes. As the streets spread open sewers became impractical; dung carts replaced them: it was not until the second half of the century that water-borne sewage began to be general. Over every town hung smoke so thick and persistent that, in these cloudy latitudes, whole populations were stunted and deformed by lack of sunlight. This was true not only of industrial towns but in the great mercantile cities. At the beginning of Bleak Horse, Dickens describes a November day in London – 'Smoke lowering down from chimney pots making a soft black drizzle, with flakes of soot in it as big as full-grown snowflakes – gone into mourning, one might imagine, for the death of the sun. Fog everywhere. Fog up the river, where it rolls among green aits and meadows: fog down the river, where it rolls defiled among the tiers of shipping and the waterside pollutions of a great (and dirty) city. ' For another century it was accepted that the natural colour of stone buildings was black. And Notre Dame was as black at St. Paul's. Pollution had become synonymous with smoke.

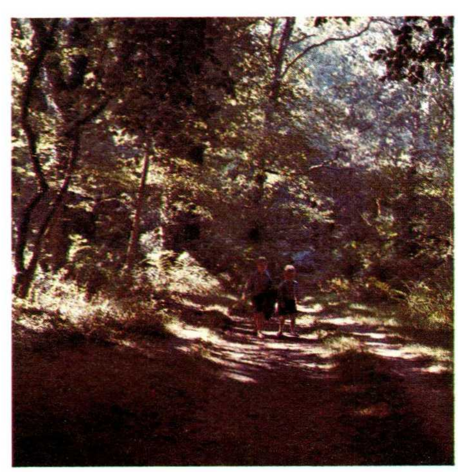


Since this photograph was taken in 1955 conditions in many industrial areas – and in most large cities – have improved. Clean-air legislation has got rid of the smoke and the sun gets through. It has become worthwhile to clean stone buildings so that the Madeleine, for example, now gleams with a whiteness that would astonish any Parisian who had not seen it since the fifties. But, paradoxically, the cleaning may shorten the life of the stone, for the soot protected it from other pollutants that are still there.

Clear skies do not mean the end of pollution. The stones of Venice are rotting under a clear blue sky, eaten away by acid pollutants faster than they can be protected or restored. And it is said that, with the spread of industry at Pireus, the Acropolis of Athens has lost more stone in the last forty years than in the previous two thousand.

Pollutants – even solid particles if they are small and reach the upper atmosphere – are carried over immense distances.

You can no longer escape industrial pollution by driving into the country.



Where the soil is deficient in nitrogen, as it is beneath some of the coniferous forests of Canada, the trees are dependent on nitrogen 'fixed' from the air (that is, taken up and converted into nitrogenous compounds) by lichens growing on their upper branches.

When in the course of normal growth parts of the lichens die off and fall to the ground and decompose, the nitrogen is transferred almost directly to the fine tree roots immediately beneath the surface. But the lichens are sensitive to SO_2 in the atmosphere. If they are killed off altogether by pollution the trees will be in danger. The lichens that will grow in an area are, in fact, an indication of the severity of pollution. The only survey of pollution so far that covers the whole of the British Isles was carried out by thousands of children examining the lichens that grew near their homes. On this basis they could classify six grades of air pollution, from not polluted to heavily polluted. Their findings correlated well with official figures, where these were available. What was disturbing was that many places popularly sought for their 'fresh air' were heavily polluted.

A hundred years elapsed between the first serious attack on the sewage of industrial towns and the first successful attack on their smoke. Today we haven't that kind of time. The speed of technological development and the difficulty of reversing trends once they have started means that we cannot wait upon outcomes; we must strive to predict them. And for that we need measurement. If our children or grandchildren are to know the pleasure of letting in the fresh morning air we must get to grips with pollution now.

The problem is a world-wide one, and in the long run will have to be dealt with internationally. Meanwhile, one - relatively small - country is treating it seriously on a nationwide scale. The Netherlands government set up a monitoring network covering the whole of the country. One hundred automatic stations measure the SO_2 concentration once a minute (SO_2 is a tracer roughly representative of the other pollutants). These form the baseline grid. In areas where pollution is high, or its pattern complex, there are additional stations. Any of these can be equipped to monitor CO, NO, wind-speed and direction, temperature, relative humidity and so on. All these data go first to regional stations, where they are recorded, hourly averages are extracted, and sent to the central measuring station at Bilthoven. The body of the following article describes the scheme and the steps that led to its implementation.

National Measuring Centre, Bilthoven

Regional measuring centres

Monitoring stations on baseline grid

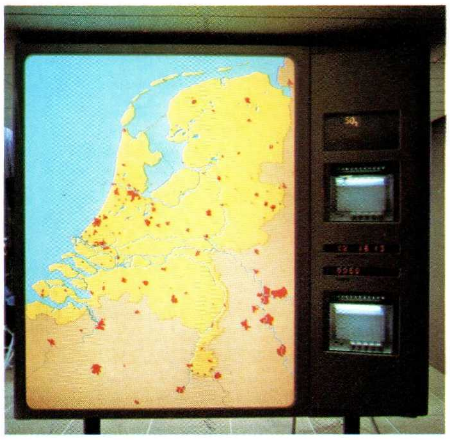
Additional monitoring stations

Link between regional and national measuring centres

Network comprising 100 monitoring stations on regular 20km baseline grid across The Netherlands, with approximately 120 other stations located in special positions. All monitors are linked to the National Measuring Centre, Bilthoven.

A nationwide pollution monitoring network

Example worth following?



The network

Early in 1973, a national air pollution monitoring network was put into operation in the Netherlands.
This network consists of some 220 monitoring stations, of which 100 form a regular baseline grid covering the entire country. The remaining stations cover special topographical features: densely inhabited areas, large industrial centres, and borders. Each station is equipped to measure regularly one or more of atmospheric pollutants, and to transmit the data to one of nine computerised Regional Measuring Centres. These centres perform the first stages of data reduction before transmission to the central computer in the National Measuring Centre in Bilthoven. This controls the total system and stores and processes all information of nationwide relevance.

The country

The Netherlands is a small country. It is also one of the most densely populated and highly industrialized in the world.
Annual energy consumption is in the order of 50,000,000 equivalent tons of fossil fuels. Chemical industries, blast furnaces, power plants, ships in rivers and canals, petroleum refineries, dense traffic and private homes all contribute to a high level of pollution. Meteorological and pollution conditions and wind direction are extremely variable. Complicating the matter is the fact that this country's neighbours are also heavily industrialized. So the country must often cope with pollution coming across international boundaries, from the industrial concentrations in the Ruhr area and northern Belgium. The Netherlands' governmental structure is hierarchical. Besides the national government and its many agencies there are provincial and municipal authorities, each with their own responsibilities and authority concerning the maintenance of clean air.
To force such a protean problem into a rigid framework is difficult, and since pollution will not contain itself within national, regional or municipal bounderies, any solution must take the entire hierarchy into account.

The System

The underlying principle was clear from the beginning. Before one can control, one must get the facts.
Many questions needed answers. What pollutants were present? In what quantities? With what variations over a day, week or longer periods? In what combinations? Where were their sources? How did factors, such as meteorological conditions, affect them? What was the overall drift pattern of each pollutant?
Conventional ways of gathering such information include collecting samples in little bottles, taking them to the laboratory, measuring concentrations by conventional and often slow laboratory methods and manually recording the results. Such methods were totally inappropriate to the job with which we were faced.

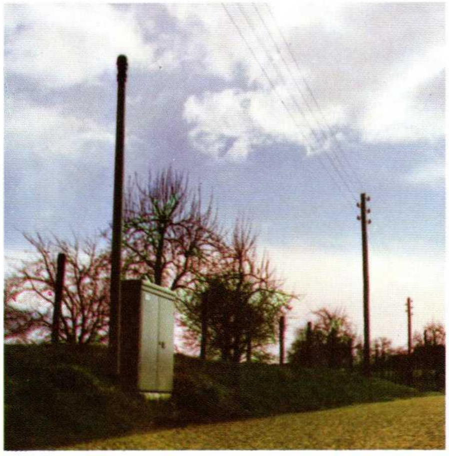
The beginning

It was clear that some form of legislation would some day have to be enacted. This legislation would have to be effective, yet fair. It would have to be seen as fair by the people and institutions it affected.
Once again, gathering facts seemed to be the most sensible starting point.

Control room of pollution monitoring network

Measurements of air pollution from the 220 monitors of the network reach this control room in the central measuring station at Bilthoven after being recorded and processed by the regional stations. Each monitor in the network is represented by a lamp on the large map beyond the control desk. If the level of pollution at any monitor passes a given threshold value the lamp representing that monitor lights. Thus, for example, a parcel of highly polluted air moving across the country would be represented by a group of lighted lamps moving across the map. The whole network can be controlled from this centre and it is here that the long-term averages, trends and predictions are worked out by a computer.

A problem lay in establishing the proper sequence of events. Which should come first: facts, techniques or criteria? Who should take the first step, government or industry? How big could that step be? Premature legislation might be too weak. And turning the initial steps over to scientists and industrialists was equally risky. Without clear political direction technical solutions would have little meaning. Two principles emerged from this seeming impasse. First, the solution had to be 'grown', not 'built'. And second, it had to be the result of a dynamic, symbiotic partnership between government and an industrial partner with the technological and production resources needed to determine the requirements of a system, provide the hardware for it and put it into operation.



The System grows

Once the dimensions of the problem were clarified, it was not too difficult to establish a set of realistic objectives for the early phase of the project.

A national network would have to be created, to provide comprehensive surveillance of air pollution over the whole country. It would be designed ultimately to provide the following information:

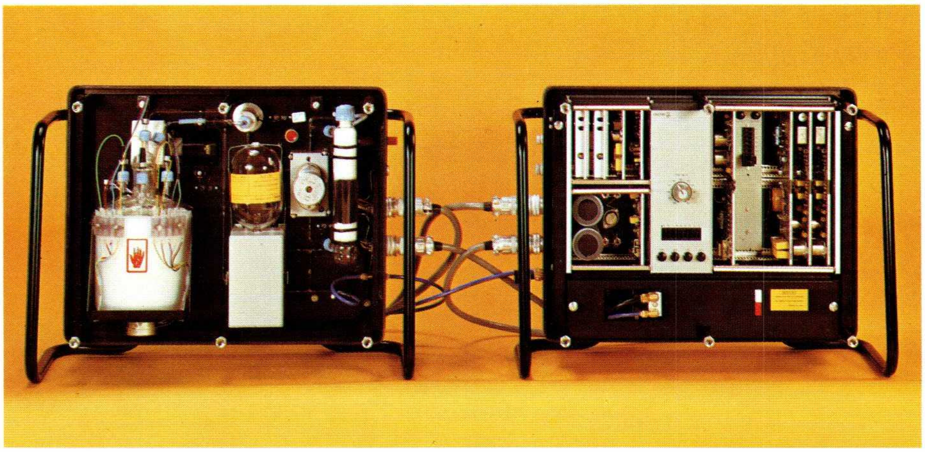
1. A reliable estimate of the quantity, composition and origin - international as well as national - of the pollution.
2. Data for establishing trends in the degree of pollution from year to year and the influence of zoning decisions, growth of industry, traffic and population on these trends.
3. Determinations, by deduction, of the effects of countermeasures on these trends.
4. Information for short-term warning purposes, to allow forecasting of unacceptably high levels of pollution under unfavourable metorological circumstances, and for predicting their spread over the country so that preventive measures could be initiated before danger became acute.

The Netherlands Government decided to involve an industrial partner in the project from its inception, in order to inject a strong commercial incentive. (From a research institute one receives a method. From a business one gets a working system.) The company selected would have to provide an expertise in everything from sensing devices to systems management. It had to be experienced in automatic monitoring instrumentation, computers, and telecommunications. It had to be able to design for manufacture in quantity. Ideally, it should also be able to provide installation and servicing.

One firm able to meet all of these requirements is Philips. Preliminary contacts were made in 1966, during which time research was begun, in cooperation with the Technical University of Eindhoven, into the development of a monitor able to measure SO_2 in air. At the same time the cooperating partners carried out a feasibility study. In February 1968, the government-industry cooperation was made official.

The Rijnmond project

Also in this period, a separate plan was conceived, between The Rijnmond Authority and Philips, for the creation of a system for monitoring air pollution in the heavily industrialized Rijnmond area near Rotterdam. This system, completed in October 1969, consisted of 31 remote SO_2 monitors, a transmission system and a computer. The monitors provide data continuously and automatically on SO_2 content in the atmosphere, which is used as a



SO_2 Monitor, comprising separate chemical and electronic modules.

Part of the Rijnmond area seen from the air.

'tracer' to detect general pollution levels. Wind direction is also measured. Data from each station are transmitted to a computer in a Central Control Station. Each hour a mean pollution level is calculated for each monitor. If the level of several monitors reaches a pre-determined figure, the computer gives a warning, enabling The Rijnmond Authority to act.

The steps towards implementation

Meanwhile, a number of government task groups were working on various aspects of the Dutch National Network in concert with each other.
A working group for Analytical Chemistry was given the job of determining all the pollutants that should be measured.
A Systems Evaluation Group was set up to recommend whether the system should be centralised, decentralised, or have elements of both.
Other governmental groups were given the task of recommending where to site monitors, and how many would be needed.
Health inspectorates in the various provinces were consulted, as were research institutes and the Royal Dutch Meteorological Institute.
All submitted their observations and recommendations to the Director General of the RIV (The National Institute of Public Health).

In 1970, a new contract with Philips covering the three years was entered into. It covered the general national network plus the development of a multi-component air monitoring system for the measurement of NO, NO_2, O_3 and SO_2 in a single unit. A later contract covered the development of a CO monitor.
Only when the system was close to become a reality, was a clean air act passed. This spelt out the specific powers and responsibilities of provincial authorities.
In this way, the time between decision and implementation was kept to a minimum. In May 1973, the Dutch National Network became operational. The first major growth phase was completed. Total cost of this system was in the order of Hfl. 1.50 per inhabitant.

The future

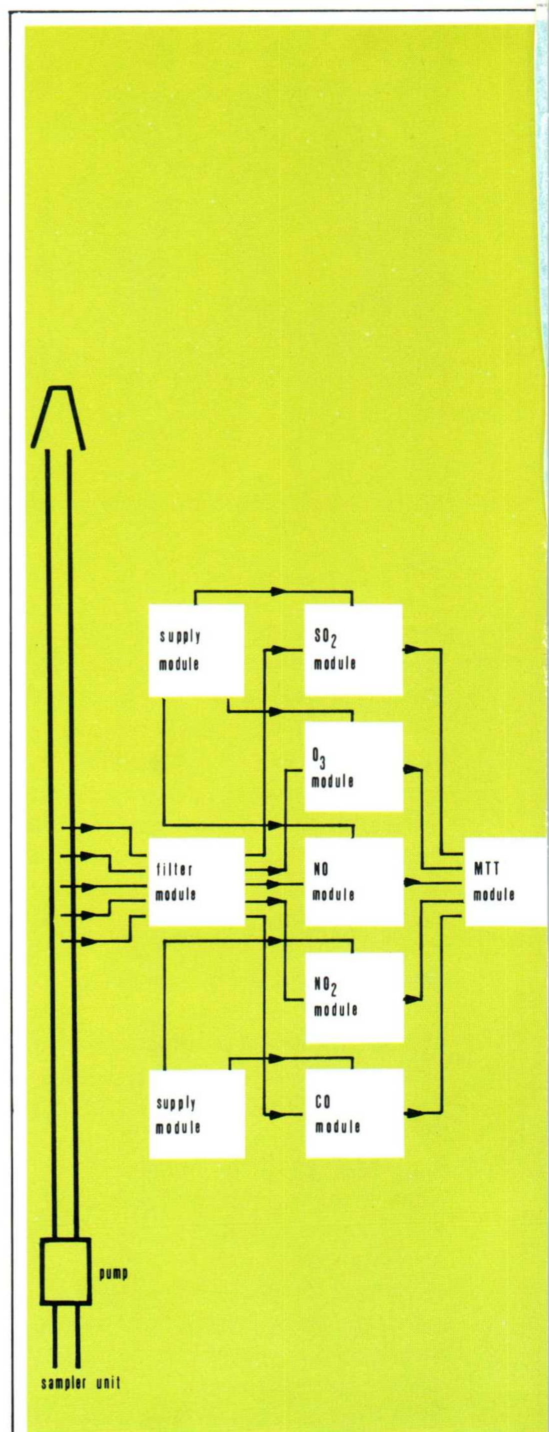
The experience of the Dutch government to date has confirmed the wisdom of the flexible approach to the design of systems for air pollution measurement.
First of all, the system may be extended in terms of its measuring capability. As automatic measuring instruments are perfected for an ever increasing number of polluting substances and environmental parameters, they may be added to the existing monitoring stations whenever and wherever they are needed.
Second, the system may be expanded geographically, even internationally. New stations and sub-networks can be added without difficulty. Monitors can be installed on towers and high buildings, to allow the authorities to begin gathering air pollution information in three dimensions, and thus to produce increasingly accurate diffusion models.

Perhaps the greatest future potential of this approach lies in its ability to bridge the technical and political gaps between neighbouring countries, and thus make practical, for the first time, a truly international system of air pollution control. Already, direct data links are planned between the Dutch National Measuring Centre and its counterparts in West Germany and Belgium.
Third, information generated by the system can be used with ever increasing effectiveness locally. In principle, the data produced are available to any group or governmental body needing this information. Provincial authorities using mobile units to measure pollution from traffic or local industry may use the network stations as reference and calibration points. Municipal governments may use the fixed stations in the same way, even to the point of producing a detailed analysis of what happens to the air pollution condition on a street when a traffic light is installed.
And finally, the principle of the system can be adapted easily to solving other problems, such as water pollution and noise. In its essentials, the system is simply a tool for continuously and simultaneously collecting data from many widely separated locations, and then processing the data centrally to aid in decision making and eventual enforcement.

Knowledge of the pollution of water and the soil is as important as that concerning the air we breathe - and as urgent. For example, in Britain it has just been discovered that the aquifers (the underground rivers beneath chalk and limestone strata), that have hitherto been the country's sources of purest water, are contaminated - it is said irreversibly - by chemical fertilizers that began to be used in large amounts some thirty years ago. The ground water has taken that time to percolate through the overlying strata. This is an extreme example of the long delay that may occur between an action and its ecological consequences, but it does illustrate very clearly the need for vigilance. We shall be dealing with the monitoring of water pollution and with water purification in future issues of this journal.
The equipment, however, is already in the field. This automatic station is part of a network monitoring the river Mambro in Italy.

Monitoring station

Uses modular system enabling SO_2 and/or any other combination of pollutant gases to be monitored as required.



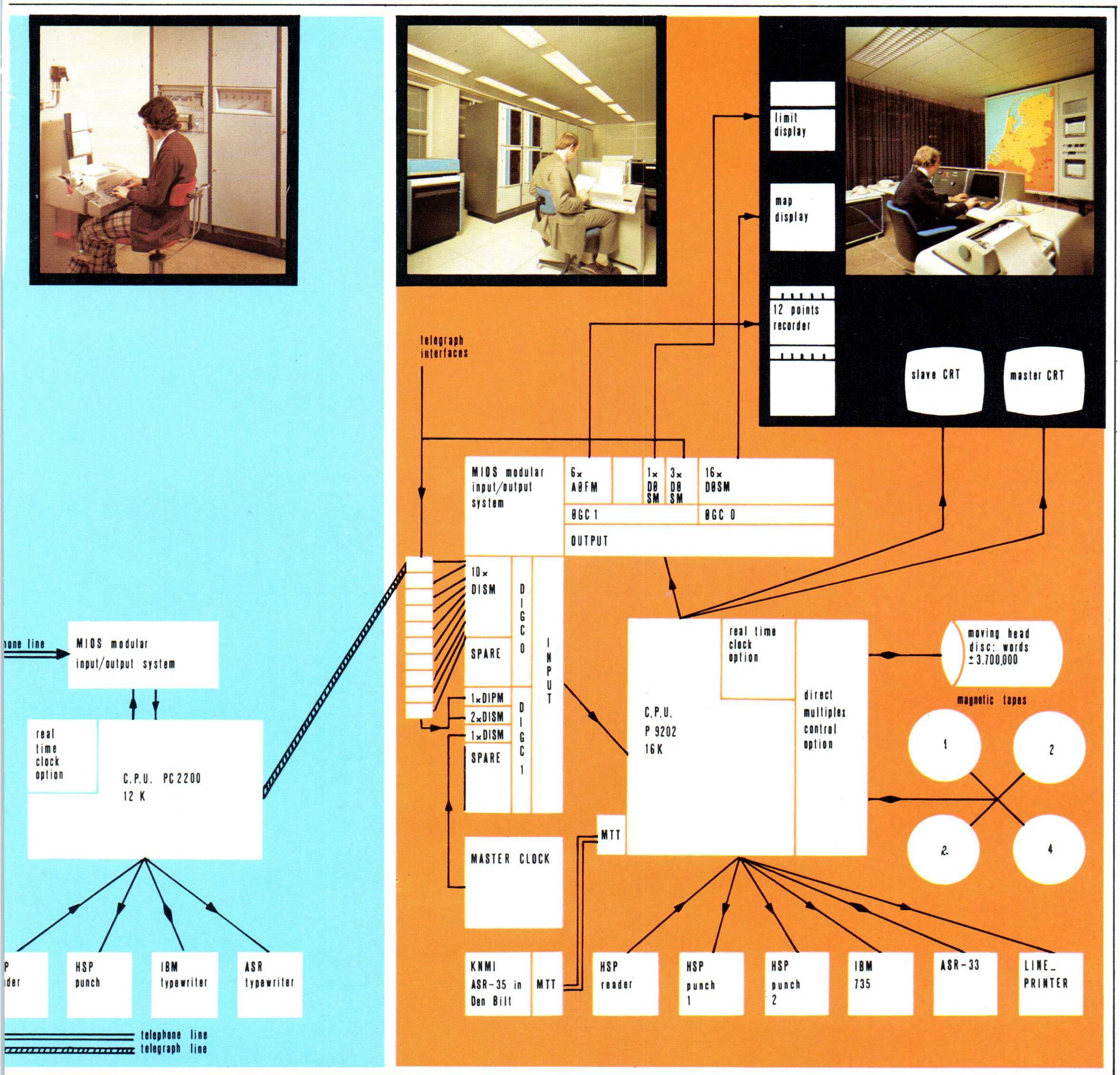
Regional Measuring Centres

A computer in each centre runs regional monitors, processes readings and transmits data to the National Measuring Centre, also providing local readout.

National Measuring Centre

Computer room, from where the entire network is run, and data from Regional Measuring Centres are received, processed and stored.

Network control room from which all operations can be supervised and run, with various methods for presenting information.



Pollutionless, ecologically harmless energy

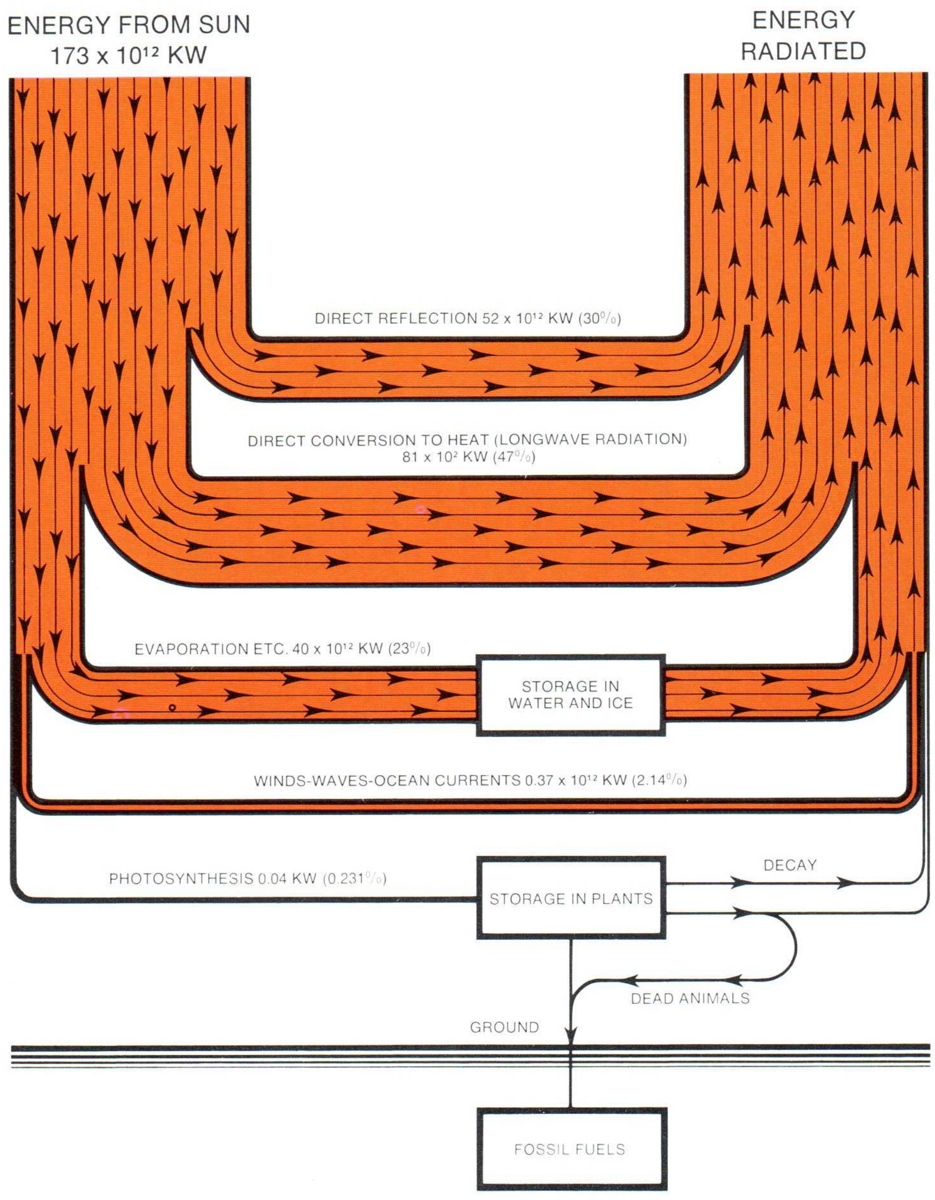
The earth receives a continuous stream of energy from the sun; almost all of it streams out again as heat – longwave radiation of one kind or another. A small amount is fixed by photosynthesis, that is the synthesis of the carbohydrates that are the substance of vegetable matter. A tiny fraction of this stream becomes fossil fuel. It is the accumulation of this trickle of solar energy over millions of years that we are now consuming as coal, oil and natural gas.

But what about the huge present income. We use a little of it as hydraulic power but the broad band across the middle of the diagram carrying 47 % of the input is untouched. It is this energy, simply reradiated, that could be tapped without untoward ecological consequences.

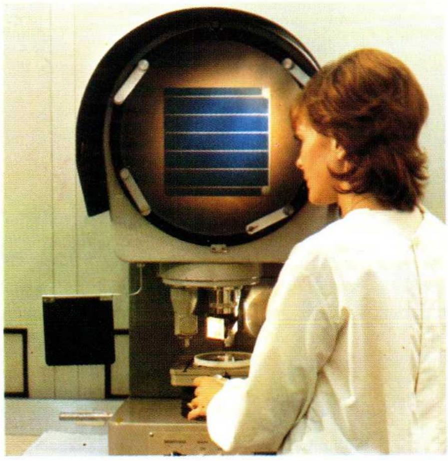
Proposals for using this solar energy go back a long way. The objections to them have always been that solar energy is too variable, most abundant where needed least and not available at night. However, more efficient means of converting solar radiation to electrical power have now reached the stage at which practical test installations on a large scale could be made and small-scale installations are running. New means of storing large amounts of electrical energy may make its fluctuations and discontinuity less serious.

Interest in solar energy is certainly reviving. It was the subject of a conference of 300 scientists sponsored by the U.S. Energy Commission earlier this year. In Australia development has been proceeding steadily for the last twenty years and a new study unit has recently been set up

Since the Earth is not getting hotter it must re-radiate all the solar energy it receives as well as the small amount of internal heat generated by radio-active decay of materials in the crust. This is the condition of natural balance. But both the burning of fossil fuels (solar energy stored over millions of years) and the



exploitation of nuclear power, increase the heat that must be re-radiated and alter the balance. If these man-made sources of additional heat ever became comparable to the solar energy flux, the average temperature and climate of the Earth could be drastically changed. On the other hand, if the solar energy were trapped and used - for example to generate electricity - before being reradiated, there would be no change in the natural heat balance. The energy available for such use is the 47% in the broad band across the centre of the diagram.

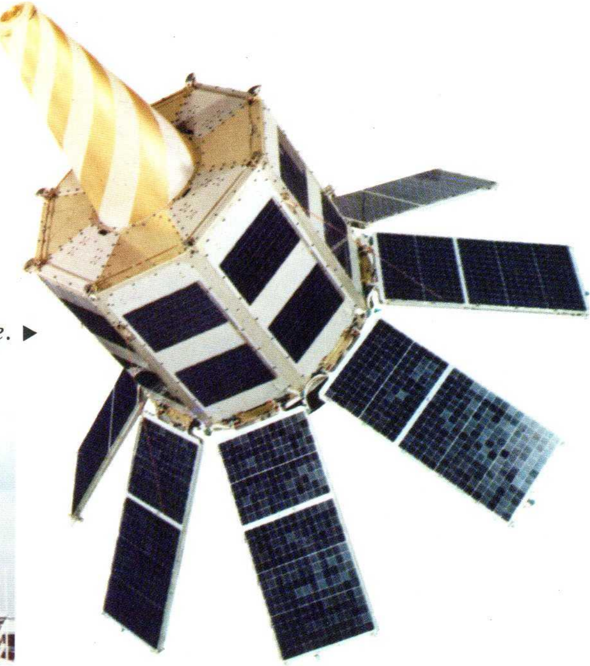


there by the CSIRO (Commonwealth Scientific and Industrial Research Organisation).

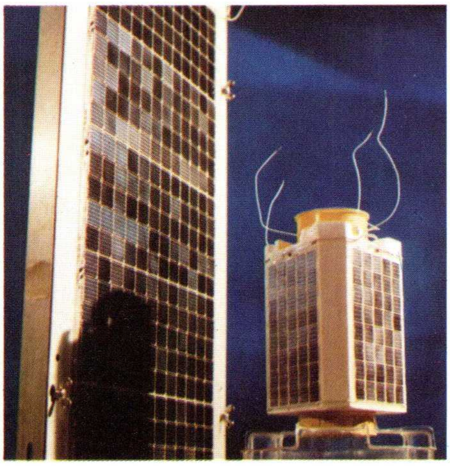
By far the simplest means of converting solar to electrical energy is the semi-conductor (at present, silica) solar cell.

Unlike installations that depend on conventional steam turbines, or un-conventional magnetohydrodynamic generators, they produce no waste heat. Their efficiency is lower (around 10 %) than that predicted for some of these alternatives so that - if the differences are real - a larger area would be needed to collect the same amount of power. But solar cells have a unique advantage over other contenders. Their efficiency does not depend on size: a 1kW plant is as efficient as a 1000MW one.

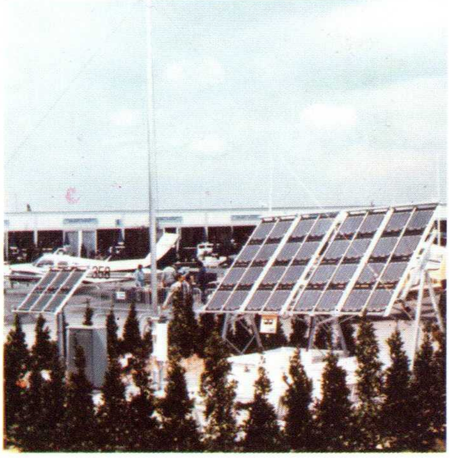
Consequently they lend themselves to the local generation of small powers. The recent development of energy storage in fibre-reinforced flywheels has the same advantage: small flywheels for storing relatively small amounts of energy are about as



The EOLE satellite. ▶



Arrays of solar cells for generating power in space satellites.



RTC solar cells at Le Bourget.

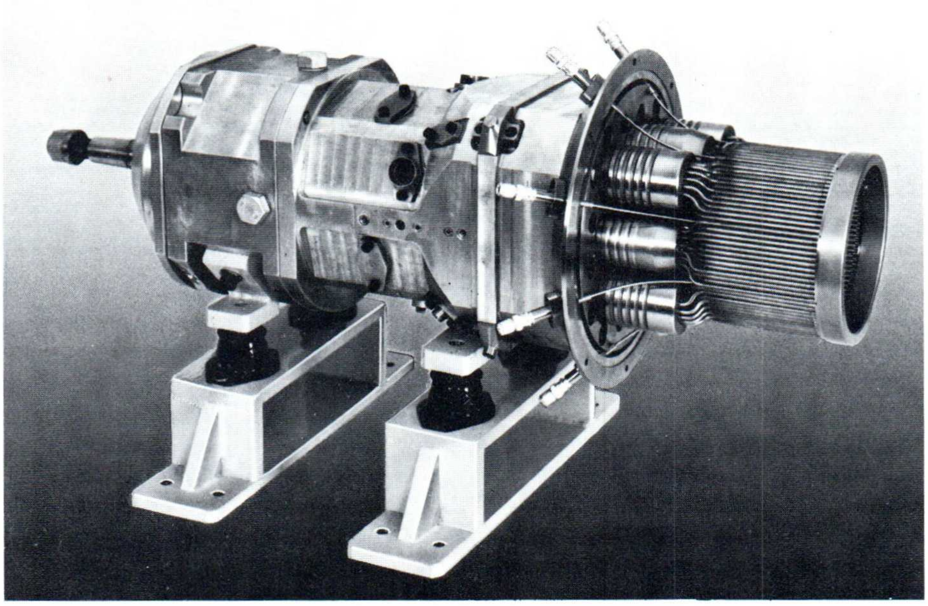
Permanent 50W power generator station for radio beacon near Saint-Girons in the south of France, some 30km from the Spanish border. ▶

efficient as large ones. And they share with solar cells the advantage of simplicity. Thus it is now possible to envisage solar plants of reasonable size from which continuous power could be drawn.

Philips research laboratories have been looking into solar energy since the thirties. However, it was not until the fifties, when silicon conductor devices replaced selenium as a means of converting solar into electrical energy, that any very hopeful development was possible. The Laboratoires d'Electronique et de Physique appliquée (LEP) at Limeil-Brévannes near Paris, part of the Philips international research organization, did much of the fundamental research at this time, especially on silicon. By 1965, silicon solar cells were being manufactured by RTC, La Radiotechnique-Compelec, a French company within Philips. These were primarily developed for the Dutch space satellite ANS (Astronomische Nederlandse Satelliet) and the French satellite EOLE. Since 1967 RTC have supplied a number of solar energy panels as terrestial power sources – for example, supplying electricity for telecommunication equipment.

Recent Philips research has raised the conversion efficiency of silicon cells to 12 % and the current aim is an efficiency of 15 % coupled with a reduced cost of manufacture. One interesting installation is that supplied last year to the Meteorological Station at Dungeness on the Kent coast run by Trinity House (which is responsible for navigational aids – lighthouses, buoys, beacons, etc. – in the seas and estuaries of the British Isles). These panels, which charge the nickel-cadmium batteries used by the station, are experimental, the object being to test the suitability of solar cells for powering the many buoys and beacons in the Thames. Trinity House has been very well satisfied with the results so far; there was no difficulty in maintaining the charge during last winter.

An automobile engine that is clean but not fussy about fuel



Prototype of a swash-plate Stirling engine.

If a hydrocarbon – petrol or paraffin for example – burns completely, the products of combustion are water and carbon dioxide. This is what happens when for instance you burn paraffin in an ordinary room heater. Why does an automobile engine, burning petrol which is equally carefully refined, produce so much pollution – carbon monoxide which is poisonous, oxides of nitrogen and, of course, lead compounds?

The reason is the high speed at which combustion must occur within the cylinders. It is really an explosion and the conditions do not allow all the carbon in the fuel to combine with two atoms of oxygen to make carbon dioxide; a considerable proportion of it combines with only one, forming carbon monoxide (CO) which is poisonous. The high temperatures resulting from combustion in a confined space cause some of the nitrogen in the air to combine with the oxygen, forming nitrogen oxides. The burning of the fuel is so rapid as to be referred to as an explosion and, unless something is done to stop it, a high-velocity shock wave spreads through the mixture of petroleum vapour and air ahead of the combustion and hits the cylinder walls. This is known as 'pinking' or 'knocking' and for a long time limited the power that could be obtained from an engine. Then it was discovered that by adding a lead-hydrocarbon compound (tetra ethyl lead) to the petrol the shock wave could be slowed down or suppressed. So automobile fuels are doped with lead and engines are designed to run on doped fuels and have to be altered (and their horsepower had to be reduced) if they are to be capable of running on unleaded fuels. This is where the lead comes from. Finally some of the fuel – and in some high-performance engines quite a lot of it – is not burnt at all.

Notice, in passing, that you pay for the unburned fuel though you get no horsepower from it and you get less horsepower from fuel that burns to poisonous carbon monoxide than you would if it burned completely to carbon dioxide (CO_2).

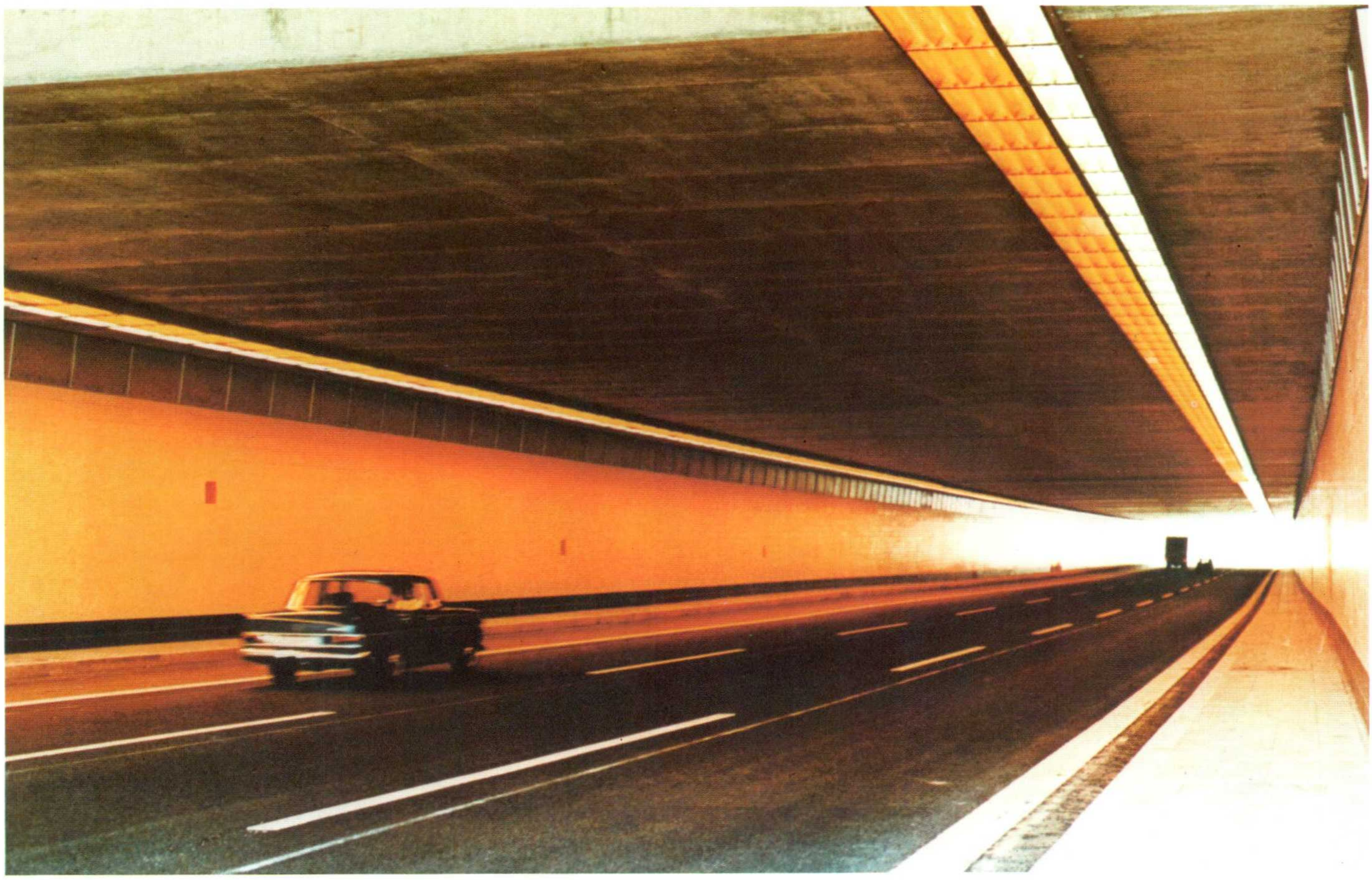
The engine shown here gets over this fundamental difficulty by burning the fuel outside the cylinder. It is an experimental Philips Stirling cycle engine developing about 60 horsepower and its exhaust consists entirely – like the hot gas rising from a paraffin room heater – of carbon dioxide and water.

This is because the fuel is burned *outside* the cylinders. In fact, if you heat the coils on the right hand end with an ordinary paraffin heater, or a propane burner or even a lighted roll of newspaper, the engine wil begin to run. It will run on almost any fuel. There is certainly no need for leaded fuels.

If all automobiles had this type of engine there would be no more pollution from motor traffic than there is from a room heater. In fact you could run this engine in the living room.
It is so quiet that you would hardly be aware of its presence. One technically interesting thing about it is that it has an excellent power-to-weight ratio, that is to say it is light for the power it develops. This is the more surprising because, at the time Philips research laboratories began work on it, the accepted engineering dogma was that the Stirling cycle (the alternate heating and cooling of the air or other gas within the cylinder by an outside source) would never be practical for high outputs because the size and weight of the engine would always be completely disproportionate to the horsepower it produced.

Tunnels are not just black holes

Expertise in light and vision



'Gräfelfing' Tunnel, near Munich, West Germany.

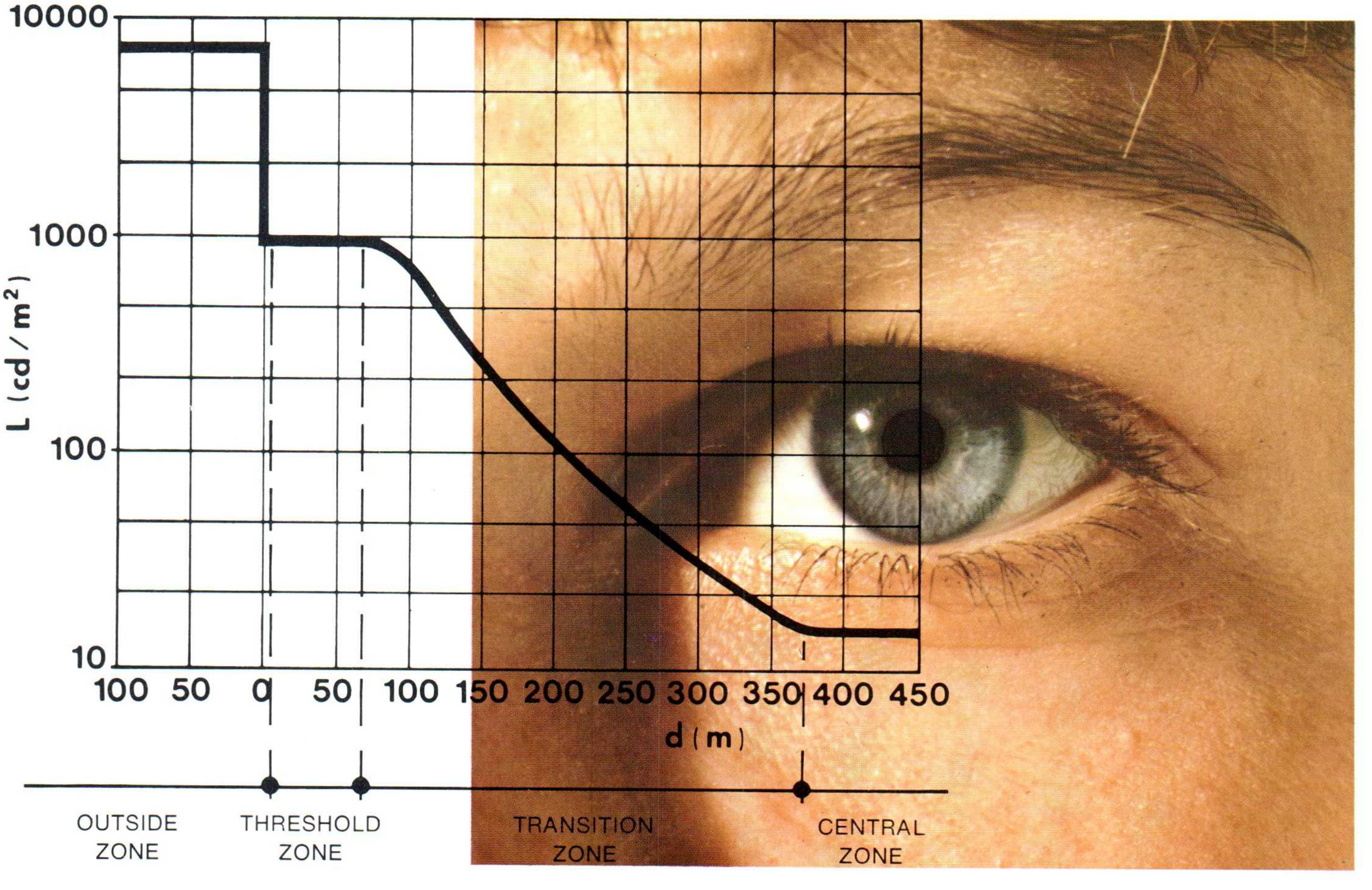
Two tunnel tubes, each containing three traffic lanes, an emergency lane and a pedestrian pavement on either side.
Total length: 273 m
Max. speed allowed: 100 km/h
Total number of fittings:
840 TL fittings (2 lamps 40W)
300 SOX fittings (3 lamps)
540 SOX fittings (2 lamps).

When you drive towards a tunnel, your eyes are adjusted to the level of the outside day-time luminance. Around noon on a cloudless day in midsummer, this may be of the order of 100,000 lux, a level which is almost unbearable without sunglasses. Under an overcast sky, the luminance would be about 60,000 to 80,000 lux. Even in direct shadow it wil still be around 10,000 lux, a level that is very pleasant to the eye. During such days, the luminance inside a tunnel is often no higher than 1/1000th of the light outside. When we drive into a tunnel, adequate observation of those details which we must be able to see for our own safety and that of others is restricted by two factors.

The first is that our eyes cannot observe details in a small, dark portion of the field of view, because they are adapted to the luminance of the surrounding area.

This can give rise to the 'black hole' effect if no provision for the avoidance of this potentially dangerous transition from light to dark has been made in the form of a threshold zone of adequate luminance.

The second restriction is the fact that visual adaptation to drastically changed luminance is a comparatively slow process. For example, if you come out of the full daylight into a completely darkened room, it will take your eyes approximately 20 minutes before they are fully adapted to the darkness.
In tunnels such extreme adaptation is unnecessary, but it does mean that the threshold zone must be followed by a transition zone in which the luminance diminishes at a specific rate to the level in the main section of the tunnel. When leaving the tunnel, the opposite process takes place: First there is a transition zone and then the threshold before entering daylight again, in order to avoid a 'black hole' effect in reverse - a 'bright hole'. At night there is no black hole and the level of lighting in the tunnel should be lower than it is by day. The ratio of the luminance level inside to that outside the tunnel should be less than 3 : 1.



Recommended values of luminance, L, for various distances, d, inside a tunnel (for a speed of 75 km/h).

When a driver enters a tunnel, his eyes need some time to adapt to the lower luminance level inside the tunnel. Thus it is necessary to make the luminance change gradually, to allow his eyes to adapt to this lower level. Tests have shown that 5% of drivers consider a period of approximately 15 seconds acceptable for a transition from 8000 cd/m² down to 15 cd/m². At 50 km/h a driving time of 15 seconds represents a distance travelled of 210 m. At 70 km/h this becomes 300 m and at 100 km/h approximately 400 m. Experience gained with existing tunnels and from tests on models shows that a minimum of 15 cd/m² should be recommended for the average luminance of the carriageway in the central part of a tunnel. For extremely long tunnels, or for tunnels with a considerably reduced maximum speed, however, 5 to 10 cd/m² are acceptable.

Less obvious factors

There is more to tunnels than meets the eye. Apart from the lighting, the complete electrical and mechanical installation comprises ventilation and pumping facilities, equipment for traffic surveillance and control - including traffic lights, fire detection, fire alarm and fire fighting equipment - closed television circuits, radio and emergency telephones.
Sometimes there are systems for toll collection and traffic registration too.

- Denmark: the Limfjord Tunnel and the 'Englandsvej', Copenhagen
- Germany: various tunnels, including those at Munich and Heilbron
- France: the Sisteron Tunnel
- Hong Kong: the Cross Harbour Tunnel
- The Netherlands: the Schiphol, IJ, Coen and Heinenoord Tunnels
- Italy: a series of tunnels on the Brenner motorway between Verona and Innsbruck (Austria) including the Piedicastello Tunnel

Limfjord Tunnel, Aalborg, Denmark.

Two tunnel tubes, each carrying three traffic lanes (E3 motorway).
Total length: 1000 m
Max. speed allowed: 100 km/h
Total number of fittings:
1382 TL fittings (1 lamp 65W)
736 TL fittings (1 x 65W, 1 x 120W)
1050 TL fittings (2 x 120W).

In this sense, big tunnels are much more than black holes. They are well-designed projects with safety as their main criterion.

Past performance

Philips has been responsible for installing the lighting and other systems in a great many tunnels. A few of them are listed below:

- Chile: Lo Prado Tunnel, 2.7 kilometres long
- Brazil: the Nove de Julho and Via Anchieta Tunnels at Sao Paolo
- Switzerland: the 3.2 kilometre-long Belchen Tunnel in the N2 route, and the Glion Tunnel on the Autoroute du Leman.

Facts for life

A biometrical centre supplies doctors and hospitals with quantitative information about people under their care. Doctors or hospitals can, and in most cases still do, make such measurements themselves but, since the instruments can be operated by lay people, this is a waste of a physician's or nurse's time. It may waste some of the patient's time as well. Since a biometrical centre is designed expressly for administering a whole battery of tests quickly, the flow of patients through it can be so arranged that little or no time is spent waiting for results.

In the audiometry station. The room itself has no sound-insulation; a free-standing soundproof cabin is used. This system has the advantage of flexibility - the cabin can be placed anywhere in the clinic or hospital. The same type of cabin can be used to house equipment such as a teletypewriter, protecting the surroundings from unwanted noise.

The function of a biometric centre is the collection of data relating to health from large numbers of people more quickly and at a considerably lower cost than is possible by other means. The data must be quantitative; capable of being expressed as simple numerical measurements. Height, weight, heart-rate, respiratory rate, the number of white cells, red cells, or the concentration of proteins, amino acids, glucose in blood or the salts in urine are all measurements of this kind.

Qualitative assessments of a patient's condition that depend on interpretation, such as those a physician makes when he taps a patient's chest, are no concern of a biometric centre. It follows that a centre has no need of doctors on its staff. Most of the work is the administering of simple routine tests, and can be done by unqualified assistants (the more intimate examinations are usually done by nurses). There is no need for the assistants to understand the significance of the measurements they make – or help the patient to make for himself.

The information collected is *used* by doctors. But since it is in numerical form it can be keyed into a computer, and processed in various ways.
For example, the computer can look up the records of people examined regularly, print out the figures for the current examination and any changes that have taken place since the last one.
It can calculate trends in some parameters not merely for individuals but for the population using the centre. This is particularly important in preventive medicine.
In short, a biometric centre is a most efficient means of screening large numbers of people.
It may be used, as the Philips centre is, for keeping tabs on employees' health particularly where they are working with hazardous materials; it can do a lot of the preliminary work for doctors taking on new patients on checking up on the health of existing ones. Above all, it can provide a continuing quantitative index of the general health of large populations.

The Philips Biometrical Centre at Eindhoven

This centre opened in May 1971; between the opening and the end of the year 1,000 persons were examined. The total for 1972 was 2,500; in 1973 some 3,500 general health examinations, 1,500 cervix tests and 200 diagnostic examinations were carried out.
Since the building itself is large enough to handle many more, personnel and organisation can be expanded as the demand for examinations increases.

It is used for the periodical examination of specific groups of Philips employees and those of a number of other industrial firms. But any doctor can call on it for routine examinations of his patients.

It is staffed by one nurse, three biometrical assistants, one laboratory assistant and one administrative assistant who does the clerical work with the aid of a computer. Electrocardiograms, chest X-rays and respiratory curves are interpreted by specialists from the Philips Medical Centre. An outside consultant examines the smears used in the detection of cervical cancer.

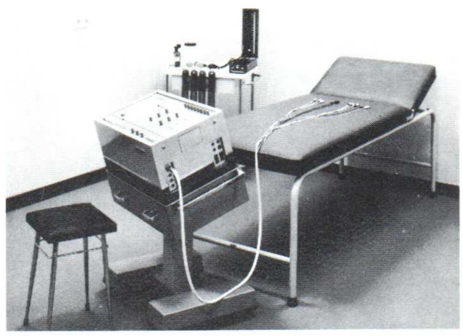
People make an appointment for examination (or have one made for them by their firm). Two or three weeks before the day, they are sent an explanatory leaflet and a questionnaire to fill in and bring with them.
They are asked not to eat before the examination.

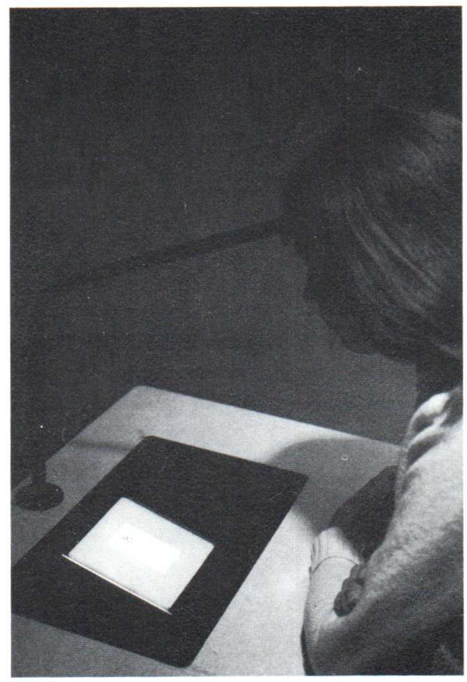
The nurse at the reception desk checks the questionnaire with the examinee and points out that the results will be in his doctor's hands in about a week's time.

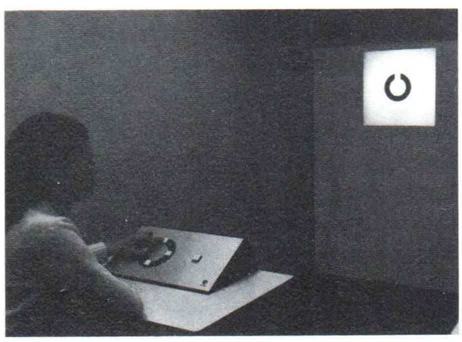
questions whilst an electrocardiogram is made and blood pressure and pulse rate are measured. Lung function is measured as vital capacity and one second value. The examinee's height, weight and wrist circumference are measured and from these the corpulence index is calculated. It is at this point that the cervical smear may be taken.
The examinee gets dressed and waits in the waiting room until exactly an hour has elapsed since he or she drank the sugar solution. Another drop of blood is

electrocardiogram, respiratory curve and the cervical smear are recorded. The card then goes to the Philips computer centre and the data is keyed into a computer for processing.

Office building at Medellín, Colombia - completely lighted by Philips. ▶







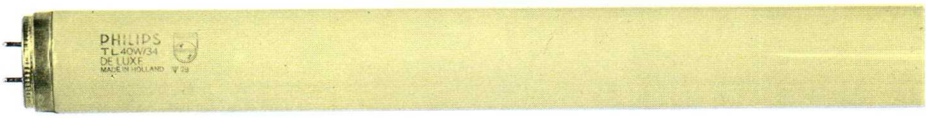
At the reception desk, the questionnaire filled in by the patient is checked by an optical reader to ensure that the answer-boxes have been properly filled in. The examinee carries this coding sheet with him as he passes through the centre, undergoing the various tests.

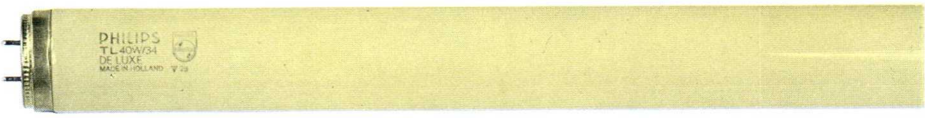
He or she then goes into the first examination room where samples of urine and blood are taken. He or she is given a sugar drink and goes straight on to a visual and audiometric test. Finally tremor of the right index finger is measured. The examinee then strips to the waist, puts on a paper jacket and is given a spoonful of barium paste. Four radiographs are made showing the lungs (and the oesophagus outlined by the barium paste). He, or she, then lies down and answers a few additional

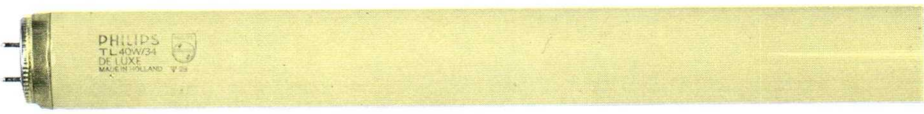
taken for the determination of glucose level, and the examination is over.

The data immediately available - visual acuity, hearing, weight etc. - are entered on a coding sheet that the examinee carries with him as he passes through the centre, and gives up as he leaves. When, a little later, the results of the urine and blood tests become available they are entered on the sheet and finally the specialists' interpretations of the radiographs,

The light you see by







If you want an artificial light source to match the colour rendering of sunlight it seems obvious that it should reproduce the solar spectrum, as closely as possible. That is to say, if you plotted the energy at each wavelength you would get a smooth and fairly level line on a graph.
But that is not how the eye sees.

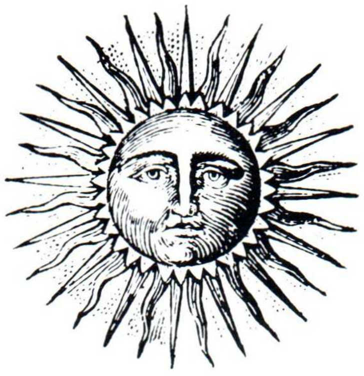
The light receptors (cones) in the retinas of our eyes, by which we perceive colour, seem to respond to only three parts of the spectrum centered in the red, the green and the blue.
If you plot these responses you get curves something like those in the top diagram. There is in fact one kind of cone cell for each of these curves.
In fact at their bases these curves spread out and overlap so that yellow light – Y – stimulates both the red-sensitive and the green-sensitive cells.

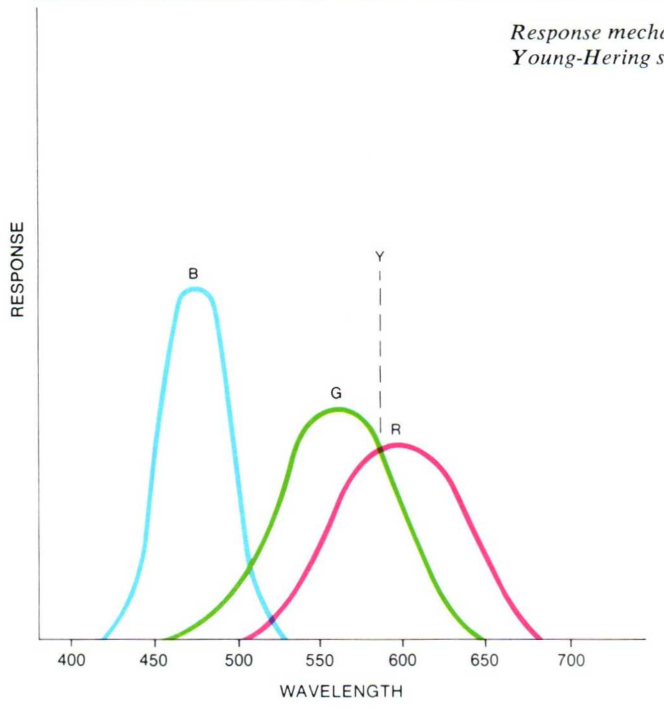
The brain interprets simultaneous signals from red and green receptors as yellow. It follows then that, if the cells actually receive simultaneously a single wavelength in the red (line R) and a single wavelength in the green (line G), the brain will interpret this as a yellow since the signals from the cells are the same as for a yellow. This is how colour printing works, though because the inks *substract* colours from the white paper, their colours are minus red (blue green) minus blue (yellow) and minus green (magenta). Take a magnifying glass and look.

Notice, however, that the response of the eye to a given amount of light at wavelength R or wavelength G is much greater than at the wavelength, Y.

The light of a fluorescent tube comes from phosphors, which, when excited by the ultraviolet and shortwave radiation of the mercury vapour discharge in the tube, emit colours that depend on the phosphors. Some phosphors emit light over a broad spectral band. By mixing such phosphors we can obtain a more or less smooth luminous output over the whole visible spectrum. But, as we have pointed out, the cones respond most strongly only to the parts of this spectrum around their peaks. Suppose therefore we chose phosphors that emitted light over a narrow band of wavelengths centred on the peaks of these three curves. Then the eye would have a much greater response to a given amount of light energy, because all of it was at wavelengths to which its cones responded most strongly. Yet it would still see white light because that is how the brain interprets simultaneous signals from all three kinds of cone.

For a given expenditure of electrical energy we should have, so far as our eyes are concerned, a brighter light. That is what has been done in the new Philips TL 80 series of fluorescent tubes. New phosphors have been developed which emit light of





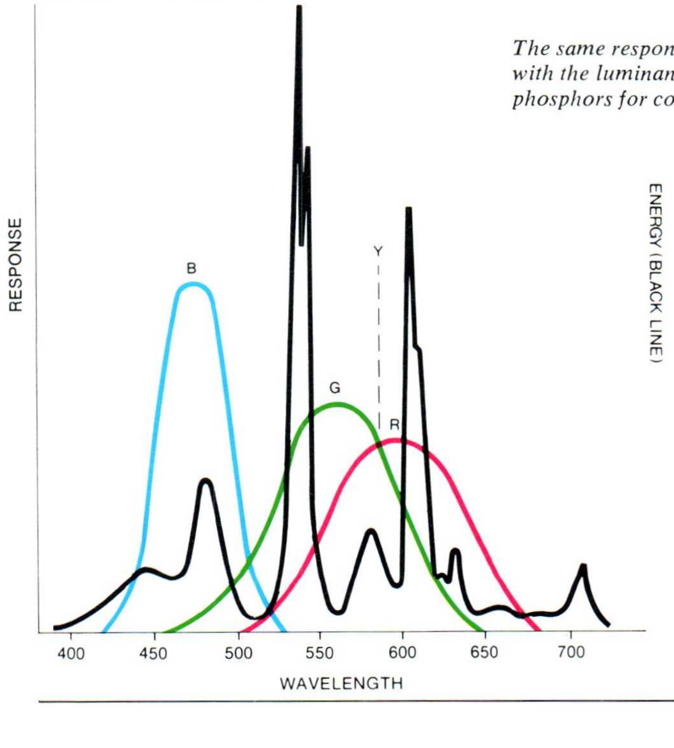
Response mechanisms of retinal cones on the Young-Hering system. Judd; 1947.

wavelengths exactly at, or very close to, the peaks in the responses of the retinal cones.

The result is that the luminous output of the lamp is 50 % higher than that of previous lamps which had a good colour rendering (known as de luxe).

The luminous efficiency is, in fact, as high at that of standard lamps in which the phosphors were chosen for light output at the expense of good colour rendering. That means that you can use two lamps where you have previously used three and you can save a third of the energy costs.

There appear to be only three kinds of colour receptors (cones) in the retina of the eye, each sensitive to a different part of the spectrum. These sensitivities - broadly to red (R), green (G) and blue (B) - are shown in the above diagram. The eye can see pure yellow, say that of the sodium lighting used in streets, because this stimulates both the red and the green receptors. It would, however, see the same colour if the cones received, instead of pure yellow, an appropriate mixture of red and green light. Moreover, if the red and green were of the wavelengths to which the cones are most sensitive the same amount of light energy would produce a brighter sensation of colour. This is the principle of the TL80 fluorescent lamp (lower diagram). The light radiated by the phosphors coating the tube is concentrated (as shown by the spiky black curve) in the three areas of greatest retinal sensitivity, instead of being spread fairly uniformly over the whole spectrum as in previous lamps.



The same response curves as those above with the luminance of the new Philips phosphors for comparison.

The evolution of telephony

PRX

The new insight into switching

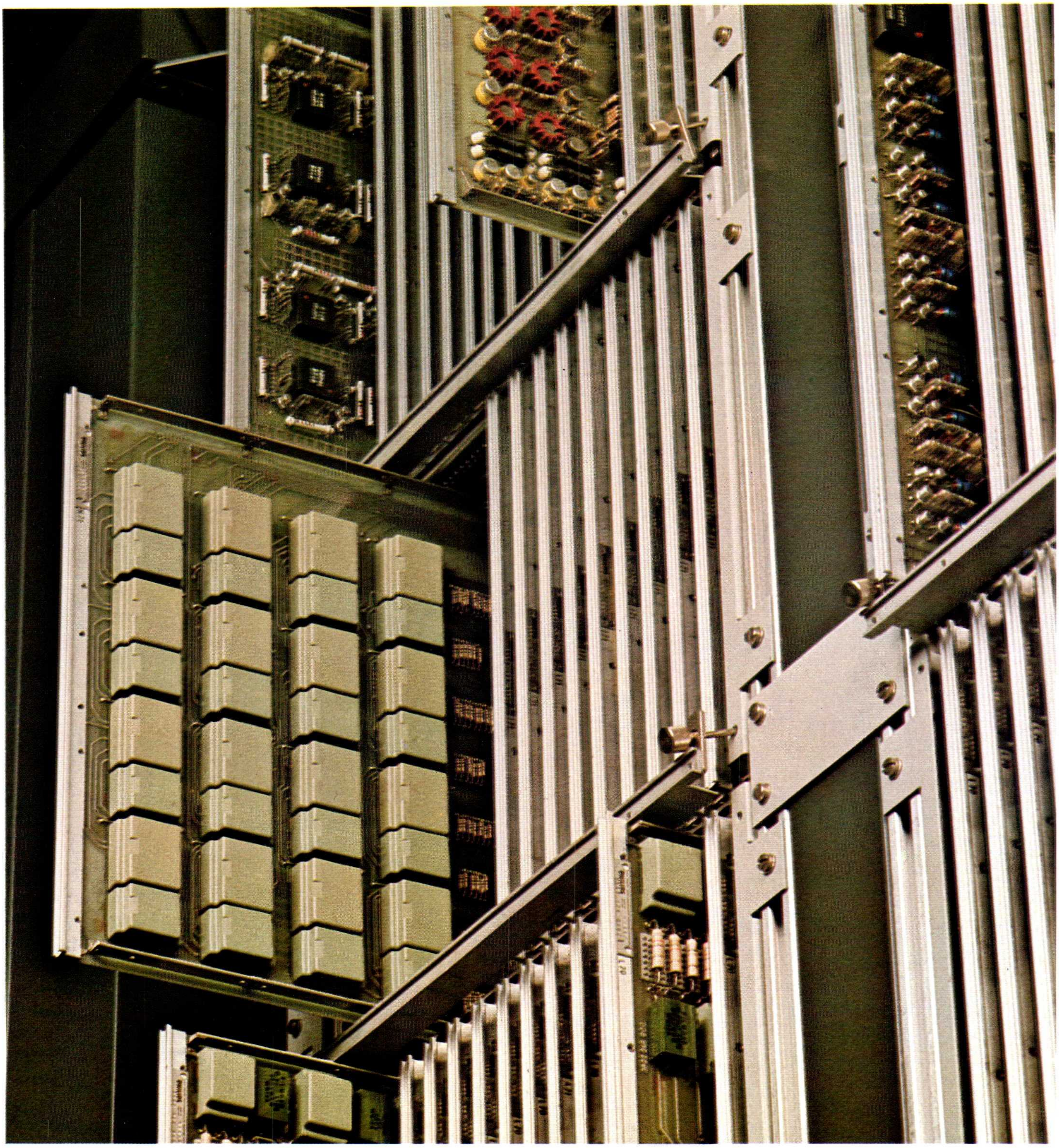
For a long time switching systems were conceived around a few electro-mechanical devices such as relays, selectors and crossbar switches. Studies of switching systems were based on the evaluation of block diagrams and on the operation of individual units. It was not until after the end of the second world war that the problems and possibilities of the various systems were studied in their own right.

At present we use such concepts as switching networks, directly and in-directly controlled systems systems having common network control and storage requirements of systems, with-out bothering whether certain functions are realized by hardware and wiring or by software and the electrically-changeable contents of a memory. Hardware need no longer be designed for carrying out specific functions per call but can be general-ized to the point at which it can be used, in combination with the coded information stored in the memories, in the decision making process of each call.

Today there is a better understanding of the interplay between series and parallel operations, the interaction between memory and logic, the meaning of general-purpose and special-purpose devices and the advantages and drawbacks of coded instructions and wired logic. As we see it, the conception of switching systems for the performance of new functions no longer depends to any great extent on innovations in the component field.
Today switching systems can be designed by combining familiar items in such a way that the services and features wanted can be realized in an economic and reliable way. Owing to the flexible nature of the system, new features, some of them as yet unforsee-able, can be implemented; most func-tions being realized as software modules.

The ever increasing traffic volume of the telephone network has led to new traffic measurement and network management techniques which allow better use and control of the network as a whole and, in this way, guarantee an overall high grade of service. The requirements mentioned will become increasingly urgent in the future. In our view an exchange can no longer be considered as an isolated part of the total telephone network as in older systems. It has to be approached as integral with the network. Remote control and integration of all opera-tional and administrative network functions are dominating factors in the architecture of the new generation of telephone exchanges, such as the PRX family.

PRX, the new Philips semi-electronic stored-program controlled telephone system (the characters stand for Processor-controlled Reed eXchange) is the result of long experience gained in telephone switching and in the application of electronics and com-puters in communication technology.



The PRX computer-controlled telephone switching system is designed for widely varying applications in public telephone network -·ranging from simple local terminal exchanges to main transit centers.
The system can be economically applied to initial traffic volumes as low as 100 erlangs, and extended to capacities of up to several thousand erlangs without major interference in the functioning of equipment already in service.

▲
Compared with conventional telephone exchanges, the space required by a PRX exchange is one half to one third. Yet, because of the way in which the circuits are mounted, every component can be easily reached.

The influence of stored-program control on the telecommunication network

The introduction of the 'stored-program control' principle is certainly one of the most important milestones in telephone switching development.

According to this principle all logical control functions and data are concentrated in the central processor, allowing a flexibility and variety in the switching facilities which could be achieved in electromechanical systems only at great expense – if at all. Having the logic in the software permits easy accessibility and changing of functions and data via both internal and external data channels.

As a result, centralized supervision and maintenance can be realized in an economic way. Functions such as blocking and unblocking subscribers, changing routing patterns, reading out metering data and other even more complicated functions can be initiated simply by commands transmitted over data links.

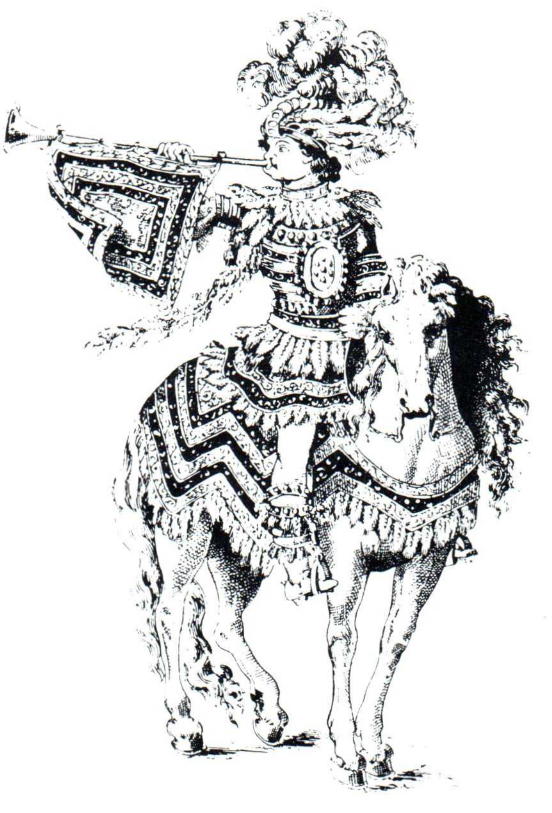
A national and even international telephone network could be divided into a number of maintenance areas, each equipped with a processor controlling, through data links, the several stored-program exchanges in these areas. In this way it would also be practicable to supervise traffic volume and the grade of service from a central point. This could provide the Administration with valuable data enabling future maintenance and expansion strategies to be planned and scheduled.

Network management, centralized intercept, centrally placed operators for traffic handling and centralized call-charge recording are other possibilities for these maintenance centres.

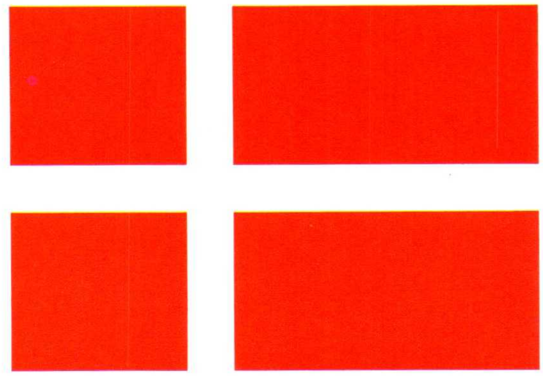
The introduction of a well-organized, high-capacity control system such as a computer provides a number of new facilities which enable trunk net-works to be used more efficiently. Because of their cost,conventional systems can incorporate only a limited number of these facilities.

The multi-purpose network

The introduction of computer techniques and common-channel type signalling in the PRX system philosophy could give rise to a data communication facility which is not only of interest for data transport associated with the basic telephone function or the allied supervision and maintenance functions, but also offers a number of data services of a quite different nature, such as inquiry from central data banks and other man-machine or even machine-to-machine communication.
Such a speculative future system structure is readily conceivable with a system of the PRX class, and harbours interesting prospects.



Public address system for Copenhagen's town-hall



The town-hall of Copenhagen is a fine example of late 19th-century Scandinavian architecture and a monument to Martin Byrop, who won the competition for it in 1892. His design, whilst including reminiscences of earlier styles, incorporates a strong an independent Scandinavian flavor.
The City Council's Meeting Chamber has great dignity but it presents many acoustical problems; these are accentuated by the lobbying, with its attendant rustling of papers and scraping of chairs, which goes on during debates.
For the past ten years, the town-hall has been using a standard public address system in an attempt to improve the audibility. The defects of this first system led to the Council's consulting engineers asking Philips to tackle the problem.
After extensive tests the major problems were sorted out.
The frequency spectrum differed greatly in various parts of the Chamber because of architectural features such as marble columns, wooden ceiling, wide bay windows and the eight large chandeliers. The galleries for public and press were acting as echo boxes. Since the architecture of the Chamber could not be altered, any new public address system would need to be made to suit it. Moreover, the tests revealed that there was a difference of 20 decibels between the highest-speaking female councillors and the lowest-speaking male ones. The new system would have to compensate that as well.
The resulting installation is unique. It allows a much higher level of sound pressure throughout the Chamber without feedback to the microphones from the loudspeakers. An audio filter deals with resonance and echoes and the compressor-limiter – in effect an automatic level control – with the great differences in loudness of the speakers' voices and the effect of the varying distances from which the microphones are addressed. The combination allows 15 decibels more sound pressure than the original system did.
In the Chamber itself four sound columns – two at different angles in each corner – enable the debating area to be covered with the correct level of sound pressure.
The town-hall's Mr. Jens Jorgen Lindsteen has this to say of the results: 'Not only do members hear better but also the stenographers, who make a permanent record of the proceedings, find their task easier. Additionally, we get much sharper broadcasts when the system is connected to the local radio station and, should the Council decide to go into private session, we can now be assured of absolute secrecy by turning off all loudspeakers except those directed at the Chamber floor itself'.

Driving a tunnel, keeping track of stocks - an office computer can do both and more

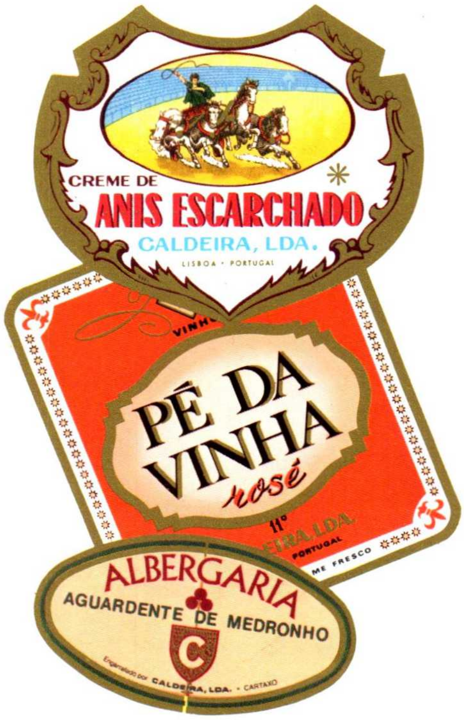
Through the earth beneath the city of Munich in Bavaria a steel mole – as blind as any living one – is digging the tunnel for a new underground railway. It is guided on its travels by the P352/1000 computer of the Austrian Philips Company many kilometres away, in Vienna.

The line of the tunnel in both the vertical and horizontal directions has been fed into the memory of the computer (in the form of numerical co-ordinates). Consequently the computer can calculate, for any point along the length of the tunnel, the angle that the section immediately ahead of that point makes with the section immediately behind.
The mole is driven forward by hydraulic rams bearing against the lining of the tunnel so far completed. It can be steered in relation to the completed tunnel by extending one group of rams more than the others – those on the right to turn to the left, for example.
Suppose that the mole has reached a point at which the tunnel must begin to bend. The location is transmitted over ordinary telephone circuit to the computer in Vienna which immediately calculates the angle at which the mole must be driven for the next metre or so and transmits this back to the surveyors. A laser-theodolite, mounted on the tunnel roof, is set to these instructions. Its beam falls on a target on the mole which is then driven so as to keep the beam on the target point. On a bend the computer may be required to calculate a new angle every five minutes.
Very few office computers find themselves doing anything quite so unexpected – but most of them deliver quite unforeseen benefits of one kind or another to their users.

Office computer finds reserve capacity at Bahco

The Primus paraffin pressure stove is almost certainly the best known product of the Swedish engineering company, AB Bahco of Stockholm. However as far as the company is concerned this is past history. Today the name Bahco is more readily associated with high quality industrial and domestic ventilation system, car heaters and tools.
The company's progressive policies led to bulging order books — and a new problem; how to reduce the steadily lengthening throughput from order to delivery. Bahco's existing data processing equipment was inadequate for the task.
The company needed a system that could handle orders and invoicing for Sweden and abroad and give a condensed daily report to the relevant departments on incoming orders and delivery conditions. It would have to cope with 40,000 invoices annually from some 3,000 clients, and a range of 750,000 products.

Following a detailed study, Bahco installed a Philips P 352 computer with a core memory of 1,000 words. Personnel became familiar with the system quickly, switched rapidly to its higher tempo, and felt confident that they could handle bigger volume and peak traffic.
Acceptance of the P 352 from the sales and economics departments has been wholly positive.
'We achieved our aims with a good margin', says Bahco.
'We have a reserve capacity we did not expect to have, a reserve that we can use in the future, either for extra volume or new procedures'.



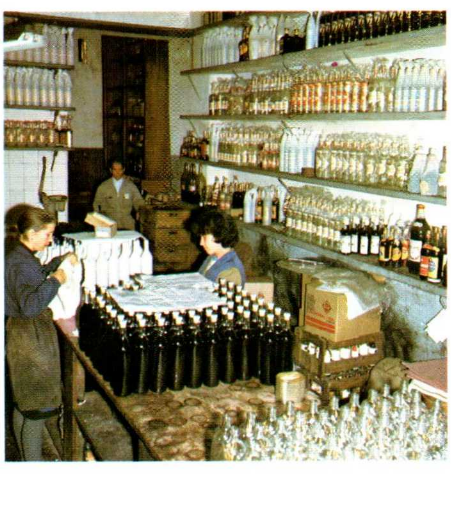
And this one finds new markets

Pé da Vinha, Boa-Cepo and Valbelo are the most widely known wines from Caldeira Lda., Lisbon.

The staff of this medium-sized company are engaged in buying, bottling and distributing young and mature wines from all over Portugal, and in processing brandies, liqueurs and syrups.

In recent years, the success of the operation resulted in additional administrative problems, particularly those of keeping invoices, customers current account, stock situation and sales statistics up-to-date.

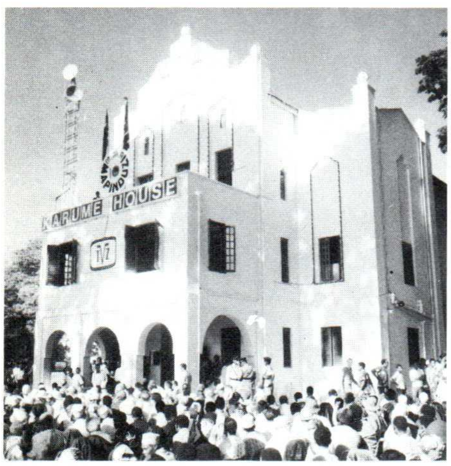
Consequently the introduction of some form of office computer became imperative. In October, 1970 Caldeira installed a Philips P 353/600 Office Computer to process all this information simultaneously.
The success of this venture is shown by the fact that Caldeira is now stepping up its exporting activities.



Philips news

Africa's first colour TV

Africa's first colour television service was officially inaugurated at a ceremony in Zanzibar on the 10th anniversary of the 1964 revolution.



The ceremony was performed by President Aboud Jumbe of Zanzibar and was attended by President Nyrere of Tanzania, Dr. S. Pathal, India's vice-president, Maj. Gen. Hussein Kulmie, Somalia's vice-president, and representatives of about 50 other countries.

Studio equipment, transmitters and an outside broadcast unit were supplied by Pye TVT Ltd. in co-operation with Philips East Africa. Inter Engineering, the Eindhoven-based company, acting as subcontractors, designed all the buildings, supervised the project, and took care of the electrical and mechanical installations.
The project includes a main studio and a smaller studio on the neighbouring island of Pemba, which has a 4kW VHF transmitter, and relay stations.
The studio centre in Zanzibar, from which two to three hours of programmes will be broadcast daily initially, consists of a main studio with three Philips LDK3 cameras and an Announce/Talks studio with a single LDK3 camera. The other programme sources include two TK60 video tape recorders and an LDK63 telecine with 16mm, 35mm and slide facilities. The associated control equipment incorporates a 12-channel Audio Mixer and a Vision Mixer with 15 inputs. In the Master Control Room there is a tied Audio/Video Switcher enabling the main studio to be freed for rehearsals and recording.
The City of Zanzibar was chosen as the studio site in view of the early 'on air' requirement. Among premises found to be unsuitable were a local cinema and the Sultan's Palace, but, eventually, it was agreed to convert the Municipal Hall which was not being used.
During January 1973 the Zanzibar Government decided that it should augment its programming facilities by buying an Outside Broadcast Unit. This comprises two LDK3 cameras with associated control and monitoring facilities, together with a TR60 Video Tape Recorder and portable microwave link. The vehicle is based on a Bedford chassis and weights about eight tons, and has been designed for the type of Outside Broadcast envisaged for Zanzibar. An associated generator van has also been supplied so that the vehicle can work either from the mains supply or from its own generator.
The staff of ZTV was built up considerably during 1973, and some of them received special training in the United Kingdom and the Netherlands.

Update plan for Hamburg harbour radar system

The German Philips organisation, is to update the radar systems in Hamburg's western harbour area with state-of-the-art equipment. Five existing radar stations are to be renovated and a ninth station added. The picture information of these nine stations will be concentrated in a new radar centre.
Third generation solid-state equipment will be used throughout. These changes will expand the Elbe radar chain into a huge system comprising three operational centres and sixteen radar sites, larger than those along the Weser and Ems, which were also set up by the German Philips organisation.

Trial videophone network links 65 subscribers in the Netherlands

A trial videophone network, linking 65 subscribers, has been set up in the Netherlands by the Dutch Post Office and Philips.
The subscribers are in Hilversum, The Hague and Leidschendam. The network will be used to study technical aspects of the system, methods of transmission, exchanges, the need for, and possibilities of, the videophone in general, future developments in this field and the relationship between people and such a communication system.
The development of the videophone in the Netherlands started in the Philips Research Laboratories in 1968. In 1972 a 20-connection network was set up in the Laboratories. After studying the preliminary results, the Post Office decided to set up a trial network so that two years of experiments could be carried out in co-operation with Philips into technical, ergonomic and operational aspects of the system. The results could make a valuable contribution to international discussions on conditions which systems like this would have to satisfy.
The videophone system now on trial operates on the 325 line, approximately 1MHz, system instead of the 625 line, approximately 5MHz, system used for Dutch television, because this number of lines is more suitable for carrying the videophone pictures.

New CCTV system designed for air research centre

Mullard Research Laboratories and The MEL Equipment Co. Ltd. have co-operated in the building and design of a pseudo random-dot scan CCTV system for the Royal Aircraft Establishment, Farnborough, England, which will be used to simulate and test subjectively various imaging systems.

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