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INFORMATION PAPER ON THE APPROPRIATE TECHNOLOGY GROUP  
AT THE EINDHOVEN UNIVERSITY OF TECHNOLOGY <sup>1/</sup>

by

P.R. Attwood\*  
and  
B. van Bronckhorst\*

\* Department of Industrial Engineering, Eindhoven University of Technology, the Netherlands.

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A. INTRODUCTION TO THE AIMS AND ACTIVITIES

1. The aims of the A.T. group at T.H. Eindhoven.

- 1.1. To teach appropriate technology to undergraduate industrial engineers.
- 1.2. To train these undergraduates for appropriate technology practice.
- 1.3. To devise training projects in appropriate technology.
- 1.4. To construct and test prototype solutions for industrial problems.
- 1.5. To disseminate information abroad concerning appropriate technology.

2. The activities of the A.T. group at T.H. Eindhoven.

- 2.1. To teach appropriate technology involves using the experience of the staff from developing industries at home and overseas for imparting the appropriate technological way of thinking to undergraduate industrial engineers. The aim is to make them aware of the problems that can arise in developing industries and to suggest how they might find solutions. This is done through lectures, discussions and actual case studies leading to participation in the analysis of problem situations.
- 2.2. To train for appropriate engineering practice involves the introduction of problem-solving techniques in the workshops and laboratories, by organising students into small groups in order to investigate appropriate solutions for specific industrial problems. This work involves value analysis, design, construction and testing of prototypes; each year, the problems are related to a central theme and this year it is "helping handicapped people", but other themes have included "improving traditional water pumps" and "wind as a source of energy".
- 2.3. To devise training projects for final year students involves the knowledge of technical problems and work activities in order to produce terms of reference for research projects that will help them to develop a constructive approach to the development of industry. The subjects for these projects originate from contacts made with developing industries in the course of consultancy and advisory

work. Before the project can become a practical investigation, it is necessary to define the problem and decide upon the objective for its solution. The terms of reference for this objective are prepared according to the following five aspects for solving problems: -

- 1) A General Description of the requirements
- 2) Specification for the solution giving details of the costs, dimensions, time, materials and specific properties.
- 3) Functions to be achieved by the solution.
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- 5) Financial Aspects relate to the price to be paid for the solution and its economic implications.

Then, alternative ways of achieving these terms of reference for a project will be investigated as technical training for Appropriate Technology which provides experience with different materials, tools, machines, equipment and work processes. In this way, final-year students obtain a practical appreciation of the difficulties encountered when developing new products.

A good example of the way that training projects can be devised from industrial surveys in developing countries is the one carried out in Indonesia in order to determine how appropriate modern management procedures and production methods were for the Indonesian metal industry.

It was discovered that there was a great need for certain modern techniques of management and industrial engineering in the Indonesian metal industry in order to improve its development. Firstly, methods and systems analysis should be used to evaluate the production functions and streamline the organisation as a whole. Secondly, internal problems could be relieved with effective cost accounting and work measurement in order to reduce machine times, to control manufacturing costs, to improve quality of

production and to standardise work operations. Thirdly, external factors that influenced productivity would have less effect if there were better training procedures for the indigenous personnel, better facilities for financing industrial developments, better facilities for financing industrial developments, better maintenance of plant and equipment, closer liaison between markets and producers, less need for importation of replacements and more effective procurement procedures.

The specific investigations which resulted from that survey included the following:

1. A training programme for the metal industry in Indonesia.
2. A course on planning maintenance for machine tools.
3. An investigation of the metal industry in Peru.
4. Design of cast iron products for a group of small foundries.
5. A feasibility study for producing diesel engines in Indonesia.
6. The reorganisation of small scale industries in other developing countries.
7. Developing a Production Engineering School at Bandung, Institute of Technology.
8. Management training for the Indonesian textile industry.
9. An organisation structure for the Indonesian metal industry.
10. A procedure for standardising metal components.

2.4. To develop advanced projects to be undertaken by postgraduate students and staff in order to investigate the special conditions that exist in developing small industries. Initially, local small scale industry is examined because much of the experience available in the developed countries can be adapted appropriately to developing countries. The finance and organisation of these projects are after arranged by a central body at Eindhoven University called the Committee for International Cooperative Activities (CICA) which is responsible for promoting assistance to developing countries. The Chairman is ir. B. van Bronckhorst. These projects are also concerned with designing and constructing prototypes for the manufacture of appropriate products for either

private or public industries. Sometimes the projects are independent, but many are joint cooperations with institutions in the developing countries. Roughly speaking, 80% of the projects are concerned with the traditional manufacturing sector which is related to the needs of the rural and urban poor, whilst the other 20% is concerned with the transfer of modern technology. The following institutions have collaborated in developing prototypes for industries in developing countries:

- Development Technology Centre, Institut Teknologi, Bandung/Indonesia;
- Small Industry Development Organisation, Dar es Salaam/Tanzania;
- Sarvodaya Shramadana Movement, Colombo/Sri-Lanka;
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- Centro de Estudios Económicos y Sociales del Tercer Mundo;
- University of Zambia, Lusaka/Zambia;
- University of Suriname, Paramaribo/Suriname;
- Polytechnic University, Hanoi/Vietnam;
- Tanzania Metalwork Cooperative Society (TAMECO)
- Institut Teknologi, Surabaya/Indonesia.
- Solidariteitsinstituut, Santiago/Cabo Verde.

2.5. To disseminate information abroad is the aim of all staff members of the group when they present lectures, prepare papers, hold seminars, or perform consultancy work. Appropriate technology can be taken for granted when it is most effective because the results are so appropriate; however, appropriate solutions are only obvious to people who have the experience to look for them. It is this experience that provides valuable information for disseminating to the less developed industries. Courses on development problems are financed each year by the Netherlands Universities Foundation for International Cooperation (NUFFIC) and are presented by the national universities in rotation. A policy of NUFFIC stresses the importance of education, and technology in particular, being transferred to the developing countries themselves as much as possible; consequently, staff

members are encouraged to act as visiting lectures to developing institutions. Furthermore, it is the task of NUFFIC to supervise and guide the execution of projects on development cooperation which form part of the PUO programme related to overseas developments that benefit large sections of the population. These activities are directed towards the strengthening of scientific institutions in developing countries by disseminating to them the knowledge and skills that are available in Netherlands universities.

The particular expertise is available in the AT Group at Eindhoven University is the ability to transfer technology that is appropriate to developing small industries. A strategy for the transfer of technology has been developed as an exchange model for use in Indonesia, but it can apply to other developing countries too.

3. Existing and Proposal Experimental Development work in the vakgroep Appropriate Technology.

3.1. Existing projects

- Cooperation with the Sarvodaya Schramadana Movement in Sri-Lanka. Financed by NOVIB, this project aims at introducing Socially Appropriate Technologies through the training centers of the Movement. These training centers are part of the community development plan which is operational in about 700 Sri-Lankan villages. The project is executed together with the TOOL Foundation.
- Cooperation with the Development Technology Center, at the Institute of Technology, Bandung, Indonesia. Financed by DTH. This project aims at establishing an information center for appropriate technologies, and a need-response unit in which appropriate hardware is developed in direct cooperation with requesting groups. Furthermore, the project provides a base for training Indonesian volunteers, as well as giving an opportunity for the KKN program of the Universities ( a study-service scheme for students ). This project started early 1976 and is also executed together with the TOOL Foundation.
- Assistance to the Tanzanian Metalwork Cooperative Society, in collaboration with the Small Industry Development Organisation. This project aims at improving of productivity and quality within the cooperative.

The foregoing projects are aimed at rural areas of developing countries. The vakgroep is acquiring experience in developing and assisting such projects, as well as contributing in actual organising and hardware development. Students take part in these projects that are mainly carried out by the overseas partner. The vakgroep provides support to the counterpart.

Another type of projects is carried out in the field of small industries, more particularly in socio-economically weak regions.

Main issues under study are:





- Small scale production and its socio-economic role,
- Managing small production organisations,
- Developing small industry,
- Training needs for small industry.

Studies undertaken are:

- Patterns of small industry and socio-economic effects in the Roermond region, Netherlands.
- Technology and Organisation of small public transportation systems, in and around Bandung, Indonesia.
- Problems of Small Industry, a cooperation between the situation in Suriname and Zuid-Limburg, Netherlands.
- Small industries in West Lake Region, Tanzania.
- Manufacturing of small diesel engines, using small mechanical workshops in Western Java, Indonesia..

Activities in both fields of study ( technology for rural areas, and small industry ) are to be supported by theoretical studies, and hardware development. The vakgroep will not undertake basic research, but aims at a selective application of existing knowledge. Requests for doing specific development work arises from the projects and studies carried out so far, as well as from outside sources.

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- Technique and organisation for small industry;
- Systemic management for small industry,
- 'Scaling down' existing processes,
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## B. Integrative approach

### 1. Considerations.

Over the 5 years of its existence, the vakgroep has acquired experience in a wide variety of activities. A number of average sized projects were carried out in developing countries, and an extensive documentation is now being worked at. Furthermore, 7 students did their graduate (Ir., equal to M.I.E.) work under supervision of the vakgroep. Their studies ranged from appropriate technology in sheltered workshops for the mentally retarded to a checklist for technology assessment studies. Their work took them to South America, Africa, India, and South East Asia. At present - as was mentioned in the introduction part of this paper - the vakgroep devotes a large part of its time to education, especially introducing freshmen to the problems and promises of learning "industrial engineering design under odd conditions". For it is believed that training engineers to arrive at solutions especially when standard procedures do not wholly apply, is a must for the next decades, both in developing countries and in western countries. The vakgroep believes that appropriate technology should begin at home!

### 2. Areas to be distinguished.

Three main areas where appropriate technologies will be requested are:

- production systems of the western hemisphere; to bring those in tune with the limitations imposed gradually, more particularly with respect to materials and energy.
- systems connecting the economics of western countries to those of developing countries. Transfer of Technology and Selection and application of technologies are main issues here.
- original production systems of the developing countries; primitive as they might seem but proven to be able to absorb population increase.

The objective here is to strengthen those systems, as well as widening their scope and capacities.

3. Topics under consideration.

The main focus of attention of the vakgroep has been on the third area mentioned. This will remain so, but also structural studies in the second area/<sup>have</sup>to be carried out.

A preliminary study on technology transfer in Indonesia showed the dependence of that country on transferred<sup>r</sup> skills from abroad and special equipment, materials, energy and information of all types compared to the 'normal' western conditions, no effective functioning of medium and small industry in such a country can be expected, unless measures are taken to alleviate these problems.

The way the growth of industrial sectors is planned is aggravating the difficulties that are encountered in industrial development. For instance when a country aims at increasing its textile production, two things will happen. Firstly, a shift from manual weaving to mechanical, large size operations, and secondly the simultaneous occurrence of unemployed in the manual sector and manpower shortage in the new mechanical sector. Existing educational facilities cannot cope with the problem, so training facilities are looked for and found abroad. Returning local citizens tend to become 'pseudo expatriates' with preferences towards modern capital intensive solutions, and without any knowledge of alternatives for more appropriate, e.g. labour intensive, solutions.

Technology transfer therefore has to be carried out taking into consideration the effects on employment, skill development, dependence on foreign supplies of materials and equipment, manpower requirements and information demands. It is suggested that technology assessment units are established in developing countries, in order to regulate incoming technology in accord with the development patterns prevailing. Furthermore it seems

reasonable to establish legal control over technology development, eg - the Mexican Acts concerning the Registration of Transfer of Technology and the Use and Exploitation of Patents and Trademarks.

Within these encompassing controls, attention should be devoted to establishing training schemes matched to the manpower needs of the growing industrial sectors; peak demands of manpower are to be expected about halfway the period during which the targets are reached. Such training schemes should be supplementary to the existing institutionalised education. Therefore supplementary training facilities should be established in time along with industrial development.

Finally as the local (small scale) entrepreneur stands at the heart of development, studies on the subject of innate entrepreneurship will be conducive to arrive at more appropriate methods of management, as well as better instruments for judging small scale industries performance. It is suggested that small industry extension units are to be encouraged, and where existing, further upgraded to fulfil their task better.

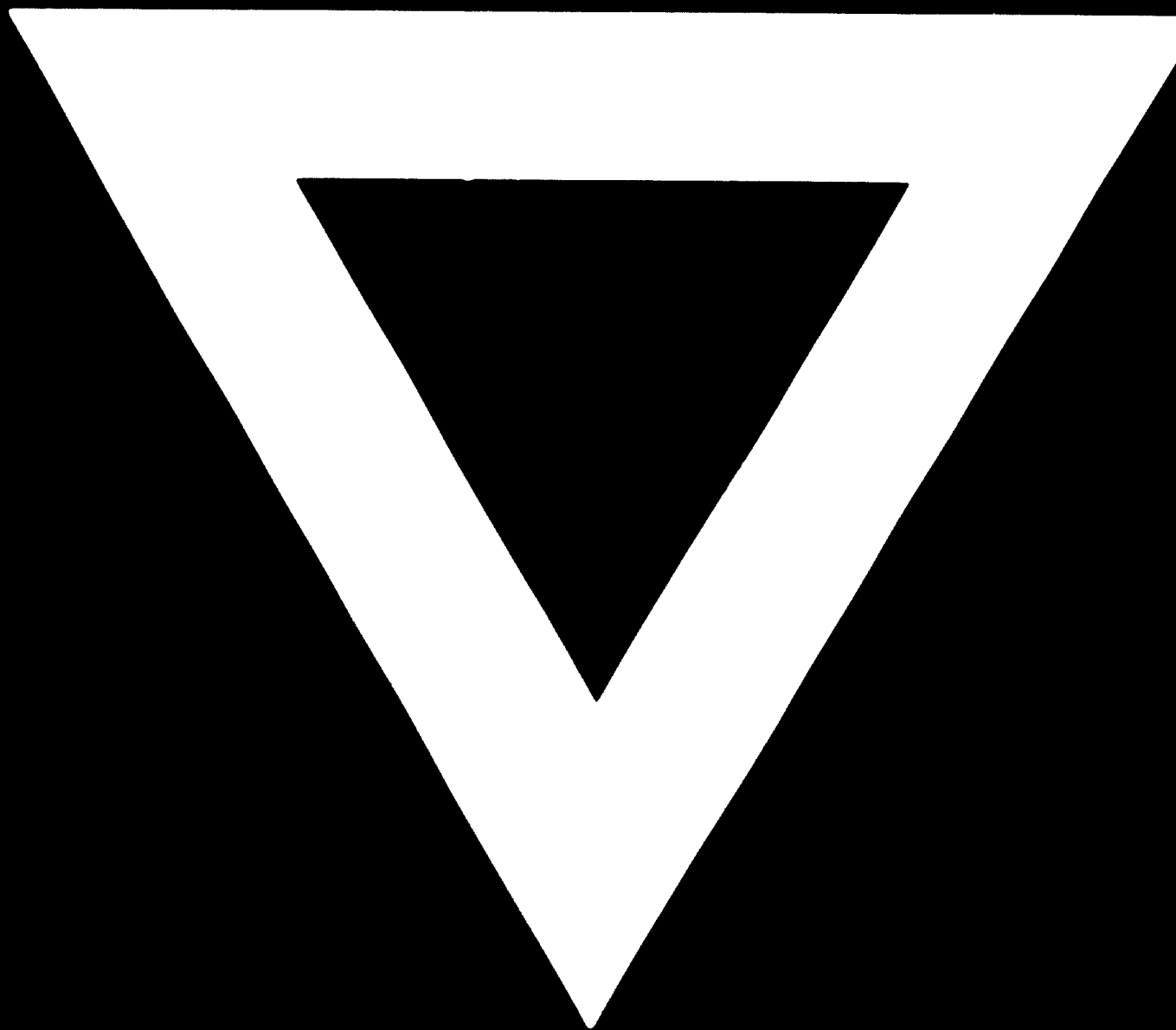
4. To summarise.

The vakgroep Appropriate Technology is a small unit in the growing department for Industrial Engineering of Eindhoven University, Holland. Its contributions are in the fields of education and experimental development. Students are trained for "industrial engineering design under old conditions". The vakgroep engages in studies and experimental development in small scale industries and rural technology. Both micro and macro studies are undertaken.

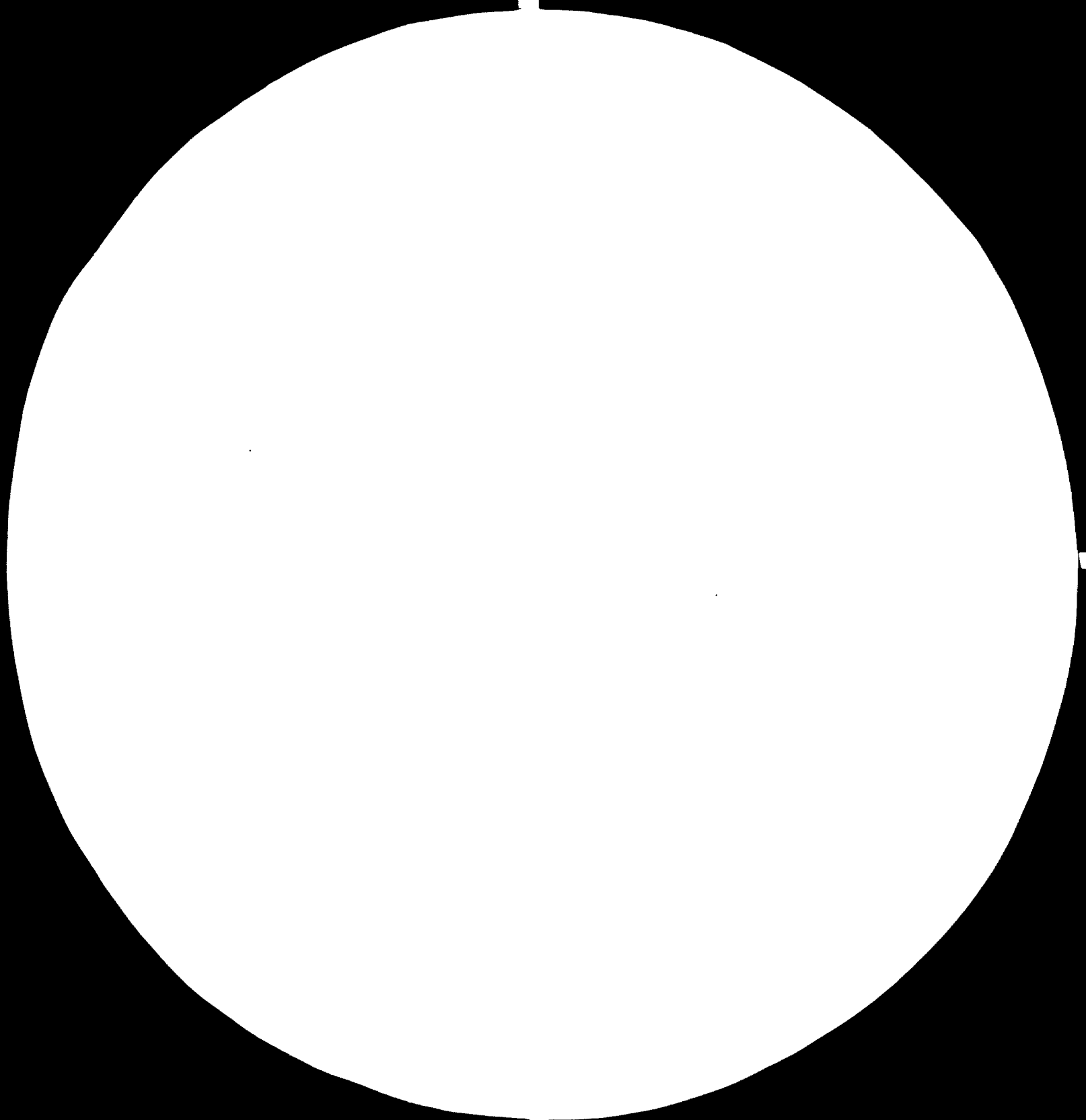
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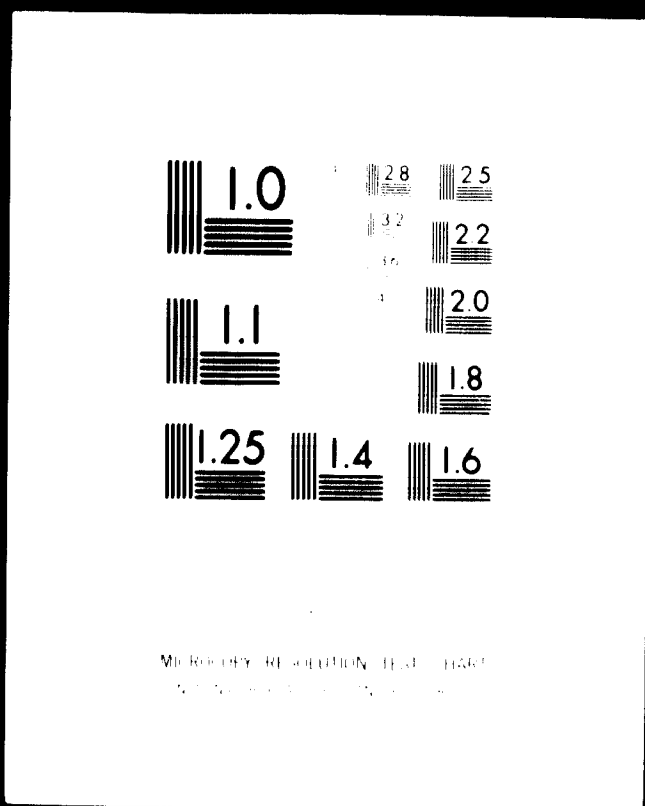
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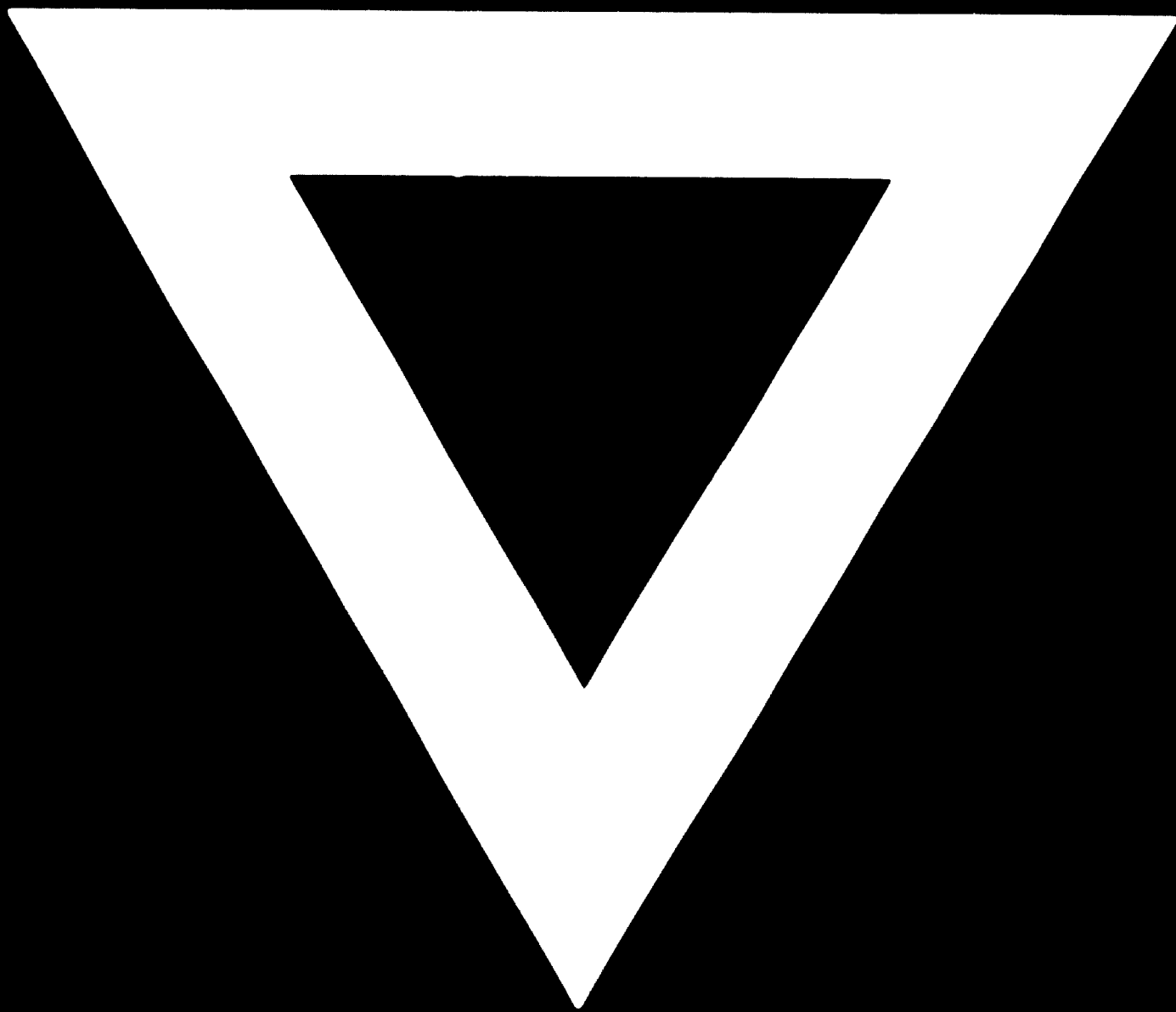
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