

density, photogrammetry, measurements of time and fluid flow and the investigation of lapping techniques illustrates the breadth of the need for precise measurement and development in basic techniques.

In the general field of engineering dimensional metrology, assistance is given to industry by testing measuring equipment of all types, machine tools and workpieces, by advice on the design of precision measuring apparatus, and by providing practical help in the alignment of large-scale engineering structures. The air gauging technique is being applied to the development of special measuring equipment.

Other needs of the engineer receive the attention of the Applied Mechanics Section, which is responsible for the measurement of force (load), pressure and hardness, and conducts research in vibration, engineering design, production processes and the mechanical aspects of machining. This Section is equipped for the measurement of load up to 500 tons-force in compression and 50 tons-force in tension, for the measurement of hardness in the usual scales, and has deadweight pressure gauge testers ranging up to 30,000 pounds-force per square inch.

Particular attention has been paid to the factors governing the functional requirements of an engineering product in relation to production and inspection, and the results of analytical study of these factors are being widely disseminated by publication and lecturing. In parallel, and in support, research is being conducted to determine the factors in machining which control dimensional frequency distribution, tool wear and tool life.

A small but active Electronics Section has been busy applying electronic techniques to a variety of problems such as a pressure controller for barometry

and the measurement of the periodic errors in machine tools and of cutting forces in research on machinability. It is to be expected that this Section will be expanded in due course in order to reap more fully the advantages in accuracy and flexibility which electronic techniques can bring to precise measurement.

Returning to the subject of vibration, it is recorded that the demand for vibration testing and consultative services have seriously reduced progress on main research projects and that certain of the Division's equipment has had to be moved to a site shown by a vibration survey to be less objectionable. The simultaneous growth of the need for more powerful machines and equipment and for greater refinement of measurement presents a growing problem of particular importance to all metrologists, a problem which will become increasingly difficult to solve without forethought on the part of all concerned.

The staff of about three dozen research officers and technical officers, helped by an equal number of technical assistants, during the year published nearly a dozen papers and had some half a dozen further papers ready for publication. Indicative of the high regard in which the work of the Division of Metrology is held is the recent appointment¹ of its chief, Mr. N. A. Esserman, as the first director of the National Standards Laboratory. This is stated to be one of the first consequences of the recommendations made by a committee of the Advisory Council which reported last year on the future development of the Laboratory. Mr. Esserman remains directly responsible for the work of the Division.

¹ *Nature*, 182, 291 (1958).

BRISTOL CITY MUSEUM

THE report of the City of Bristol Museum for 1957* continues the series of readable, well-produced and attractively illustrated publications issued annually by that Museum, in which it also continues to record a commendable extension of activities and responsibilities, evidenced by the introductory matter on the personnel and scope of committees and sub-committees on general museum work, on staffing and policy, on the preservation of ancient Bristol and on the Museum School Service. The latter, for years an informal advisory committee, has now become fully official, reflecting the increased volume of, and value placed upon, the work the Museum does for the schools of the area. It is presided over by the chairman of the City Museum and Art Gallery Committee, and its members include teachers serving in Bristol schools and representatives of departments of education.

Staff matters reflect the health of any museum. In this report, loyalty and long service to a respected institution are reflected in the retirement of the administrative assistant after forty-five years service—thirty-three years of which were with the Museum and Art Gallery—and of the museum foreman after twenty-two years. One member of the staff has obtained an M.A. degree and another the diploma of the Museums Association, while a third has left to

take up a curatorial post in another institution. The director and staff also figure as officers or members of a variety of learned societies and advisory bodies, both national and local, and the list of research work accomplished and papers published is clear evidence of a busy institution.

The acquisition of Chatterton House, the birthplace of the boy-poet Thomas Chatterton, thanks to the generous intervention of the Dulverton Trust, adds to the many attractions Bristol Museum can offer. Temporary exhibitions continue to be a major offering to townspeople and visitors—a post-war feature of museums' activities, which take much time and give much trouble, but which are greatly worthwhile. The lenders range from the city librarian and city archivist to the Victoria and Albert Museum in London. Publications produced include a "Guide to Roman Buildings in Kings Weston Park" and leaflets on the Folk Museum at Blaise Castle House, as well as programmes of a highly successful series of winter lectures and summer conducted walks to places of historical or scientific interest in the neighbourhood. The services rendered are varied—from providing an attractive venue for official receptions given by the Lord Mayor, the Sheriff and the Vice-chancellor of the University of Bristol to housing a training course for students for the diploma of the Museums Association.

Departmental reports record valuable work on the coin collections, greatly used for reference purposes,

* The City Museum, Bristol. Report of Committee for the year ended 31 December, 1957. Pp. 23. (Bristol: The City Museum, 1958.)

new exhibits on African ethnology, primitive ship-
ping, berries and twigs, British Lepidoptera for begin-
ners and metalliferous mining in the Mendip Hills,
and a new room devoted to Georgian costume as a
contrast to the already popular Victorian room. The
new Department of Conservation is proving its great
worth and has a lengthy and interesting list of repairs
completed, treatments accomplished, models made
and exhibits prepared to its credit. Its organization
has been greatly helped by the Works Laboratory
of the Bristol Aeroplane Company—an interesting
example of co-operation. Special reference is due to
the work for schools, for which an additional assistant
organizer has been appointed. Lessons in history,

biology, geology and geography are given to an ever-
increasing number of classes, and it is gratifying to note
that children from nearly one-third of all the junior
and secondary schools in Bristol attend, while the
School Loan Services, with a better collection than
ever before of specimens, models and photographs,
are used by more than 70 per cent of the schools in
the Bristol area. Teachers in training in seven
institutions visit the Museum to learn how best to
use museum facilities in their future professional
practice. At the other end of the scale, the Saturday
Club continues to enjoy an enthusiastic membership
of young naturalists aged 9–11 years.

D. A. ALLAN

SOME PROBLEMS OF SMALL FIRMS

A SHORT report published by the Department
of Scientific and Industrial Research gives
details of one of the most encouraging services to
industry carried out under its auspices*. It is a
commonplace that the economic prosperity of Great
Britain would be secure if a fair proportion of the
many small firms and medium-sized firms could be
brought up to a standard of efficiency equal to that
of some of the bigger firms. One of the difficulties
is that, hitherto, there has been an unbridged gap
between research institutions with their store of
valuable knowledge and the small and medium-sized
firms who might well use this knowledge but lack
trained scientists and technologists to guide them to
it. This report describes the work of a technical
liaison service which was organized in 1955–56 by
the Scottish Council (Development and Industry),
the broad purpose of which is to promote the economic
development and well-being of Scotland. A team of
three investigators, all men who had retired from
responsible managerial or technical posts in industry,
visited small and medium-sized engineering firms in
the industrial belt of Central Scotland to find out
what problems confront the smaller firms in the drive
for greater efficiency and expansion; what equip-
ment they possess for solving these problems for
themselves; where to get help; and in what ways
external sources could help.

During the survey the technical liaison service
helped 109 firms, each with fewer than five hundred
employees and with no elaborate management organiza-
tion, to find solutions to 223 problems which they
could not overcome with their own resources. Every
interested firm was visited by a member of the team
who helped to define each problem precisely and then
to find a solution. Some questions could be answered
on the spot from the member's own experience; the
rest were referred to the Scottish Council's office in
Edinburgh, where the technical co-ordinator of the
project got in touch with the most likely sources of
information.

The work of the experimental technical liaison
service disclosed that:

(1) Firms in the survey were relying predominantly
on trade contracts and other firms for information on
new developments and techniques, and were accord-
ingly in danger of operating within a closed circle.

* Small Firms with Big Problems: a Short Account of an Experi-
mental Technical Liaison Service run by the Scottish Council (Develop-
ment and Industry). Pp. iii + 24. (London: Department of Scientific
and Industrial Research, 1958.)

(2) A few firms had ample technical resources, but
most had few or none.

(3) Although many of the firms seemed to be
attempting creative adjustments to new circum-
stances, only ten of them were managing to do so
without introducing violent and disruptive changes.
There were many reasons for this, but a predominant
one was lack of technical information on which
long-term plans could be based.

(4) Most firms were having difficulty in answering,
from their own resources, some of the problems
which affected their future plans; they discussed
these with the technical liaison service.

(5) Half the problems had been previously aban-
doned, or were defined for the first time during
discussions with the team, or with the staff of research
and other organizations introduced by them.

(6) Answers to more than 70 per cent of the problems
were found by the technical liaison service during
the survey. The information required was in existence,
but its sources unknown to, or unused by, the firms.

The outstanding success of the technical liaison
service led the steering committee of the Scottish
Council to recommend that a permanent technical
liaison service should be provided; at first it would
help small and medium-sized engineering firms, as
the experimental service had done, but later it should
be extended to other industries. The Committee
indicated that the operation of regional schemes on
these lines should be in the charge of the Department
of Scientific and Industrial Research and suggested
that the Secretary of State for Scotland should be
asked if an official service could be provided. Mean-
while, the Committee felt that the service was so
urgently needed that it should be run by a private
Scottish institution until an official scheme could be
established—preferably by an independent organiza-
tion, like the Royal College of Science and Tech-
nology at Glasgow, since the experimental service
gained much from the support of technical colleges
and from easy access to technically qualified staff
with industrial training.

The Scottish Education Department has recently
authorized the expenditure required to set up a
technical information service, on the lines proposed by
the Scottish Council's steering committee, under the
Department of Industrial Administration at the Royal
College of Science and Technology, Glasgow. This ex-
tension of the Department's work is largely experi-
mental and will be revised in not more than three years.