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HUMAN RELATIONS IN INDUSTRY*

BY

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1. My approach will be that of a "universalist" rather than a specialist.† I shall try to present various relevant considerations in their right total setting.

2. The subject of human relations in industry is attracting increasing attention to-day. There are many reasons for this in the conditions of our time. In the desperate national need for improved production there is a growing appreciation that, since mechanical re-equipment will take a long time, immediate results must be sought mainly in better use of human effort, for which voluntary co-operation is an essential condition.

3. That there should be increased interest is to the good. But there are dangers in a special concentration of interest aroused in this way—first, the danger that the improvement of human relations may be sought merely as a means to an end, and, secondly, the danger that the human factor may be treated as a detached subject for the specialist, as something which can be studied in isolation instead of as part of a total situation for which all share responsibility.

The Ends of Industrial Activity

4. "What are the ends of industrial activity?" As I see it there should be a threefold purpose.

(1) To achieve "excellence"‡ in production, which in practical terms means to produce the "right" things with the minimum expenditure of human effort and material resources.

(2) To provide for the human beings engaged in it a satisfactory activity as the foundation of a good life.

(3) To fit in as an important part of a satisfactory pattern of society.

Of course in this imperfect world (certainly as we are likely to find it in our lifetime) there will be no ideal fulfilment of all these purposes. In practical circumstances they may at times be in conflict one with the other in the sense that more emphasis on one may mean less on the others. But no single one of them can be neglected, and the three must be reconciled as best possible.

Let me apply these ideas to the subject of my address in the actual conditions of to-day, and explain my apprehensions of the "dangers."

5. My chief point is that if managers start now to take a human interest in their workers *merely* as a means to an end—merely in order to improve production results—then they will be both wrong and unsuccessful. They will be

wrong because it is wrong to treat human beings merely as a means to an end. They will be unsuccessful because they will be found out. The whole industrial field is bedevilled with suspicions based on past memories. As a result, even the most honest attempts to improve human relations tend to be viewed with mistrust—either as mere dodges to get something extra out of the workers for the benefit of the profit-makers or as signs of a temporary mood "produced by force of circumstances rather than a change of heart" (to quote words recently used to me by a trade union leader).

Human Relations

6. Good human relations in industry can only be surely founded on the treatment of each individual as a human being of infinite value whose welfare in the highest sense must be regarded as an end in itself. Industrial employment can provide the foundation for this welfare to the extent that the worker can find interest, free self-expression, and happiness in his work, something more than a mere distasteful way of earning a living. To help workers to find this should, therefore, be seen as an essential part of the managers' task in handling human relations.

7. But before I turn to that I want to make two points to show how I see this central purpose in its relations with the other two purposes in my list and in the total picture.

If to-day there is a danger that the "central purpose" will be debased or distrusted by being seen merely as a means to getting increased production, there is a converse danger that concentration on creating good human relations may tend to make the importance of *efficiency* undervalued. It is not enough for managers to be human and kind-hearted. Their efficiency—technical, commercial, administrative—is also necessary. Without that, "excellence in production," the first in my list of three purposes, cannot be achieved. And that is vital. If British industry fails in the quantity and quality of its production our whole order of society may break down. But there is more in it than this. Efficiency in management (both technical and commercial) is an essential condition for good human relations. As Sir Stafford Cripps said the other day, "Co-operation rests on confidence, and confidence rests on competence."

Social Setting

8. The other point I want to make is concerned with the social setting—that is to say, with the third heading in my list of ends. It is impossible to have the right atmosphere of interest, happiness, and co-operation in industrial employment if the demands which it makes on the individual are in conflict with his social setting or his aspirations as affected by that setting. If his work makes demands on his time and energies which prevent his playing his due part as a member of his family or of other social groups, if,

*Read in opening a discussion in the Section of Occupational Health at the Annual Meeting of the British Medical Association, Cambridge, 1948.

†"Universality does not consist in knowing as much as possible, but in seeing the relation between things. The universalist man does not wish to know everything but to grasp what is essential. Suddenly in a moment of blessed rapture he is vouchsafed a glimpse of the whole." (Walter Schubart.)

‡I use "excellence" in the sense of the Greek word "arete."

in his outside society, his interest in his work brings him not honour but low regard or even ridicule, that will set up internal conflicts militating against good work or happiness in it.

9. Let me sum up what I have been trying to say. First, the greatest need of our modern industrial society is to make industrial employment something which is, and is seen as, an essential part of a satisfactory human life (individual and social), *not* a cause of conflict or an evil burden to be escaped from or reduced as far as possible. Secondly, this purpose will not be attained unless managers are both single-hearted in their pursuit of it and also efficient at their production job. Thirdly, industrial employment must fit in harmoniously with the workers' social setting.

10. These conceptions are absolutely fundamental. They are fundamental for the individual because without satisfying work—free expression in work—there can be no sure foundation for his physical, mental, or spiritual health. They are fundamental for society because somehow or other industrial employment must be fitted into the total pattern of society as part of a balanced and harmonious whole. (We have hitherto failed to evolve a satisfactory pattern of an industrial society.) They are fundamental for economic achievement because, unless industrial employment can fit in with a satisfactory individual life and a satisfactory form of society, there must always be friction and loss of effort in industrial employment.

Practical Arrangements or Methods

11. What then are the practical arrangements or methods which will help to make industrial employment a satisfying creative activity which fits in with a satisfactory pattern of society? This is what I see as the main question. But there is perhaps a prior question which must be answered. Is the end stated in my question attainable at all? Is my whole approach unrealistic? Doubtless many people will think it is. Certainly it is a commonplace to say that conditions of modern industry—with its mechanization, mass production, breakdown of skilled jobs into repetitive unskilled or semi-skilled operations, and so on—have made it impossible for the bulk of manual workers to find in their daily work a soul-satisfying activity. I do not deny the difficulties; but I think they are exaggerated. I believe that modern industry offers opportunities for new kinds of interest to offset the loss of craft interest. Nevertheless there is of course here a crucial question, and we need to know much more on many aspects of it—how jobs affect different people; what proportion of drudgery is tolerable or, indeed, may even be desirable as a sort of "roughage" in our mental and spiritual diet; how jobs and machines can be designed with better regard for the human beings who have to do or operate them; how far, even from a production point of view, it is right to break down jobs into separate operations; at what point there begins to be a loss of effort from boredom or monotony which counterbalances any benefit from simplification, etc., etc.

12. Taking account of all these considerations I find myself brought to certain practical conclusions.

First, the less the creative satisfaction in the work itself the greater is the need for supplementing it with satisfactions in comradeship, in understanding the common purpose of the working team, and in the use of leisure.

Secondly, at the very lowest, industrial work should be seen as a dignified activity, a necessity of nature, a condition of self-respect—not a definite evil imposed unnecessarily by the selfishness or incompetence of others. At the very lowest, even though it may not be itself a strong positive element of satisfaction in a good life, it must at least afford a foundation for that and not be an obstacle to it.

13. With these reflections I turn back to my main question—"What are the practical methods and arrangements which will help to make industrial employment a satisfying creative activity in a satisfactory pattern of society?"

The first thing to make clear is that there is no single universal prescription, no code or set of rules which an industrial leader can adopt with the comfortable feeling that he has got the solution for all the problems for the rest of his life. Indeed it is an essential point in my answer to say: "Beware of cut-and-dried systems; the problem is one which needs never-ending attention, fresh effort every day, courage to face disappointments, flexibility to adapt methods to the varying conditions and different classes of work or worker, patience and sympathy to understand each single individual with his infinite variability. (For it all comes down to the individual in the end.)"

14. There is another reason why no single answer can be found to my question. One cannot generalize about British industry. There are such great variations between one unit and another, one industry and another, one district and another.

15. Yet this recognition that there can be no finality and that there must be constant variety and flexibility of method should not blur the conception of the guiding purpose nor discourage efforts to keep day-to-day practice under continuous scientific observation. On the contrary, the very nature of the case increases the need for clarity of purpose and patient interpretation of experience.

Negative Obstructions

16. When one turns to consider practical measures, I believe that the chief emphasis for immediate attention should be placed on removing obstructive influences.

I say this for two reasons. First, I believe in individual liberty as a fundamental principle, and I regard freedom of expression in work as the most essential element in this. Therefore I favour the sort of method which as far as possible leaves the individual to work out his own salvation. Secondly, I believe that the ordinary people of this country are fundamentally decent and ready to make the best of things.

Without arguing these points fully I will state my own belief that the problem of creating adequate satisfaction in work would not be too difficult if certain negative and obstructive influences could be removed. Our chief trouble to-day is that there are so many of these which prevent the individual giving his normal instinctive response. There are the suspicions which I have already mentioned based on memories of the past. There is the fact that the individual worker approaches many questions as a trade unionist, and that the whole trade union organization grew up as a war organization to fight for one side against another. There is the fact that, in spite of recent improvements, material conditions—housing conditions, factory conditions, methods and tools of work—are in many cases such as to make it very hard for the individual to see his work as a satisfying activity consistent with a good social life. There is the fact that for many the margin for security, leisure, and good times is still inadequate.

These are all general considerations. But in every particular situation there will be found particular obstacles. I could give many illustrations where the influence of individuals—individual tactlessness, or jealousy, or suspicion—is holding up progress and co-operation.

There is need to deal resolutely and patiently with all these negative obstructions, general and particular. That requires tactful handling of individuals, but in the long run success will depend on getting the right guiding purpose clearly conceived and widely accepted.

17. If, then, my remarks are to have any practical value I must give more concrete content to my definition of the guiding purpose. In the simplest terms I have stated this as the purpose of making the individual happy in his work. But of course one cannot consider the individual in isolation. His work must fit in with that of his fellow workers and his relations with them form an essential part of the conditions affecting the result.

Essential Points

18. The best way to bring out the kinds of action which are necessary is to make a list of the main points which are essential for a satisfactory total situation. Approaching the matter in this elementary way I would say that the guiding purpose should be to create in each industrial undertaking a satisfied healthy community of individuals

each interested in his own job,

feeling that he has an individual responsibility for it and some freedom for expressing himself in it ;

all working together as a team,

with a sense of joint responsibility, understanding the place of their own work in the total purpose. Satisfied that this total purpose has a recognizable social value.

Working in healthy conditions

at tasks which give the satisfactions of skill in performance and of physical effort accomplished without overtaxing strain,

and finally satisfied that the proceeds of the whole joint effort are fairly divided.

This is a very elementary statement. It includes eleven conditions, all of which are familiar.

The much more difficult question, however, is by what means these conditions can be established.

19. I will start with two general or overriding conditions.

(1) *Organization*.—There must be a good organizational structure capable of supporting the ideas embodied in my list of eleven conditions. Otherwise anything done about them will be mere camouflage with no genuine validity. In particular there must be a clear conception of the function of every individual working in the organization, and a clear chain of authority. Each must know *for what* and *to whom* he is responsible. Otherwise the idea of joint responsibility will not work ; and there will be a constant risk of confusion and frustration. This of course has a bearing on the position of industrial medical officers.

(2) *Enlightened Opinion from the Floor Upwards*.—It is in the creation of this that I see the essential purpose of joint consultative methods. I cannot, as I should like to do, deal fully with all that is involved in the successful application of these methods. But there is one point which I must make. Joint consultation is normally, and quite correctly, seen as a method for bringing about a sharing of responsibility. But there are some current fears (and aspirations) about this idea of "sharing responsibility" which I think are based on a misconception. As I see it, sharing responsibility ought not to mean getting responsibilities either confused or divided. It ought not to mean that the workers claim a share in "management" in the sense of usurping responsibilities which properly belong to management. Nor, conversely, should it mean "management" trying to put on to the backs of the workers responsibilities which it should carry itself. (I mention this latter possible interpretation because I have found that in certain cases, where "management" has carried ideas of joint consultation very far, apprehensions of this kind are actually voiced by the "workers.") What it should mean is, on the one hand, that every worker should have the chance to put forward ideas on the arrangements affecting his own job and feel that he has some freedom in the actual handling of that job, and,

on the other hand, that in doing this he should have an understanding of the central purpose of the whole organization.

The chief executive officer, just like a military commander, has certain responsibilities for leadership and decision which he cannot devolve. There should be no weakening in his leadership and authority. But that does not mean that he should not help his subordinates to understand the reasons for his decisions, or that when it comes to settling how operations (whether in military action or industrial production) should be carried out he cannot get valuable ideas by consultation with his subordinates right down to the rank and file. The essence of good organization is (as Elton Mayo has well put it) to ensure that every decision is taken at the level where it can be most rapidly and effectively taken. And the essential point is that decentralized decisions cannot be well taken unless they are based on sufficient understanding of the central purpose. It is in these conceptions that I see the essential value of joint consultative methods, and I want to see medical officers brought into the whole process of joint consultation.

Role of Medical Officers

20. I pass from these two overriding conditions to consider a few particular points in regard to which, as I see it, medical officers have a most important part to play.

(a) First, there is all that is involved in *fitting the man to the job and the job to the man*. This of course has two aspects: on the one hand, selection and training of the man ; on the other hand, design of the job and the tools for doing it. The two aspects are interdependent. I have already in my introductory remarks stated my view that much more study is needed of the psychological reactions of different kinds of manual work (taking into account the different aptitudes and characters of individuals). Based on such studies, much more thought should be given to the arrangement of production processes and the design of machines so that they may be best adapted to the human beings who have to work them.

We can all think of types of machines which must tend to "dehumanize" those who work them. There are many other aspects of this question. One of particular interest is the effect of ageing on industrial capacity. Increasing age may increase the value of certain capacities and diminish the value of others. Jobs should be designed to take account of this. This is important not only for the sake of the individuals concerned but also for general morale and production results. For example, new methods of work measurement and control introduced by some progressive firms are undoubtedly "hotting up the pace" of work, so that the older men feel at a disadvantage. Yet some of the older employees, say in the 50's, may in many ways be the most valuable elements in a works community.

Another aspect is when a man suffers from some special disability which disqualifies him for certain jobs—for example, colour blindness. Careful human consideration of the individual is necessary in such cases, consideration which will discover what he is best suited for and what openings can be found. In all this of course the medical officer can play a great part. His knowledge can help in the designing of machines as well as in finding out for what a man is best fitted. The positive helpful approach is needed here.

(b) A second point that I specially select for mention is *human understanding of each individual*. As I have already said, it all comes down to the individual in the end, and I regard it as a vital feature of a good organization that every worker should have, in the chain of authority above him, someone who can give appreciation of good work and who also understands him as an individual—not only in his work but in his interests and all the outside influences which affect him.

This point is of great importance in itself ; but also for another reason. I see it as closely connected with discipline. There must be discipline ; but firm discipline cannot be fairly exercised without an understanding of the individual and all that affects his conduct.

(c) Thirdly, I come to an obvious point—health. This—and I mean positive health in the widest sense—is clearly a vital factor affecting the will to work and happiness in work. It is so essentially the subject of your conference that I will not enlarge upon it in this introductory talk.

21. I have, as already explained, selected these three points because I see them as matters which closely affect the position of medical officers and in regard to which they have a special part to play.

Outside Influences which may Help or Obstruct

22. To complete my sketch of the general framework I must make a short reference to the outside influences which may help or obstruct the fulfilment of the purposes of which I am speaking.

Of all the outside influences that of the trade unions is the most obviously important. Here there are crucial questions to-day. What is going to be the trade union attitude to firms which are genuinely trying to create a sense of joint responsibility, community, and loyalty? Will trade union officials fear conflict of loyalties and obstruct? Or will they use their powers to encourage such firms? I believe the national trade union leaders are likely to take a broad and sound view on this question; but the attitude of subordinate officials in the districts may be different.

Apart from the trade union there are of course many other outside influences to take into account; political influences (under which heading one must put the Communist influence, which may be based on a desire to see the whole existing system break down); social setting and home conditions, the locality and its traditions; education (with particular reference to the effect on the general attitude to manual work of extending the statutory school-leaving age to 16); memories—good memories for bad things—an obstructive influence chiefly in the old industries like coal-mining or cotton textiles which got their form in the early days of the Industrial Revolution and have been through bad times; and, finally, habits and the effect of world wars on breaking habits.

The Parts to be Played

23. What I have said hitherto about ends, methods, and outside influences has all been intended to lead up to the practical question, How should the various people concerned—executive officers, functional officers, rank and file—play their parts in the field of human relations?

In turning to this question of the parts to be played I come to the second of the two current dangers to which I referred at the beginning—the danger of regarding the human factor or human relations in industry as subjects which can be considered in isolation or left to specialists.

Everything to do with human relations and attitudes must be seen as an integral part of a total situation. Everyone engaged in industry in any capacity should be concerned with these questions all the time. When a production programme is being planned, when plant layout is being discussed, when new machinery is to be installed, or new designs of products are to be introduced—in every decision affecting every aspect of work—the reactions on the human being concerned should be taken into account.

24. For this reason I want specially to stress the importance in regard to this matter of human relations of having the right conceptions of the position of specialists or functional officers,* and of the role of detached scientists and scientific research. Scientific research into human factor problems cannot be carried out in laboratories; and the chief value of the “scientific approach” in this field lies in the application of scientific method to the continuous daily study of the life processes of industry—industry being seen as a body of human beings working together for a

specific purpose. Special pieces of research work may be of value but they must be carried out on the spot in industry and must be applied to total situations, treating the unit investigated as a functional whole. Even these *ad hoc* investigations alone can make only a minor contribution. The major need is for continuous observation in the course of normal work.

Industrial Medical Officers

25. This brings me to the position of industrial medical officers considered as a class of specialists who have a most important part to play in the matter of human relations. I will venture some ideas I would like to see accepted.

(i) The aim should be essentially constructive—the creation of positive health rather than merely the cure, or even the prevention, of disease.

(ii) A full-time medical officer should be employed and should be treated as a member of the management team. He has just as much right to this as the chief engineer.

(iii) As members of the team, works' medical officers should take part in all joint management discussions and should know broadly what is happening in the firm as a whole. The medical view should be heard on every point in the total planning of premises, plant, production, etc.

(iv) The fact that a medical officer is a specialist should not exclude him—or indeed any other specialist—from eligibility for appointment to the highest administrative posts, if he desires that, and if he has the necessary abilities and qualities.

(v) If, on the strength of this broad conception of the human responsibilities of management, the medical officer is included in the management team he must himself have similar broad human conceptions of his own work. He must see the men and women with whom he comes in contact not as “cases” but as human beings. He must be interested in all that affects them. He should have “psychological insight into the material with which he is dealing.” I take these last words from a paper read recently by Dr. Donald Stewart.

26. In what I have said I have been putting forward the broad conception of the works medical officer as a member of the management team. This I see as necessary for the achievement of the main purpose in human relations. But it is also necessary if the medical officer is to be able to do his own daily tasks properly.

“For instance”—to quote from a managing director's letter—“I well remember our own medical officer having a check done on the carbon-dioxide content of one of our shops and finding it somewhat too high for his liking. He examined the shop and found that by extension of the flue pipes on certain die-casting machines it seemed probable that this inert gas could be more efficiently exhausted. This was done, and overcame the problem quite simply. I am sure that the less-trained man would have demanded ‘a much more efficient ventilation system,’ which would have involved enormous expenditure and which would then, by its nature, have increased the heating problem in the shop, giving rise in turn to the need for better heating arrangements, but leaving the problem of draught behind it still.”

27. Points like these are of considerable practical importance, but I am more concerned with the contribution which the medical officer can make towards achieving what I have described as the essential task of management in the field of human relations—to create conditions in which people can find interest and happiness in their work. The matching of the worker and the job is part of the task on which the good medical officer can make the decisive contribution.

Human Contacts

28. Beyond this I am impressed with the special opportunity which the good medical officer can have in the whole field of human contacts—especially under the heading of

*It has been well said that the general manager should himself be a specialist on human relations. But this does not mean that a personnel officer should not be included among the functional officers.

appreciation of the individual. He has the chance to make close contacts with workers without arousing any suspicions of ulterior motives. He has an opportunity to gain their confidence and to get to know their personal problems and all the outside influences which affect them. And at this point I want to express the view that, when the general relations between management and workers are good, there is no ground for the fear that the medical officer will become suspect because of his association with management if he is treated as a member of the management team. On the contrary, I believe it is true to say that, because he is a doctor who has access to and can influence management, the workers will go to him with problems which would otherwise never come to light.

In that connexion I am specially impressed with the opportunities of the medical approach in industries where the psychological atmosphere is abnormally difficult—coal-mining for instance. I have in mind, for example, the investigation which is now being made into nystagmus by Professor Brown, working from Durham University. All his arrangements have been made with and are supported by the local trade union organization.

In all this field one has to remember that psychological investigations—any research projects which can be regarded as a sort of “psycho-analysis” of the workers—are apt to arouse acute suspicions. On the other hand, investigations made for a clear purpose which the workers can readily understand are welcomed and can evoke co-operation.

Full-time Medical Officer

29. I have advocated a service for purposes which could not be met by occasional visits from an outside practitioner but which depend on a full-time medical officer treated as an integral part of the management team. I have advocated such a service for the whole of industry. But what is the present position? I believe that, when Sir Thomas Legge arranged the first conference of industrial medical officers in 1921, only 20 could be found. Now I am told that there are ten times that number—about 200, supplemented by about 700 part-time officers. This obviously therefore covers only a tiny patch of industry. There are about 150,000 factories in this country. The vast majority of these of course are very small, but 15,000 are advanced enough to have canteens.

Obviously, therefore, my ideal is a very long way off. But is it really practicable? Would it cost too much? How could it be provided by small concerns which could not afford the service of a full-time medical officer of their own?

30. I do not know whether there has been any comprehensive investigation on these questions. I can do no more than raise them as questions for discussion. As to cost, I have been interested in some articles by Dr. Gange, the chief medical officer of the Glacier Metal Company, which showed that the annual cost in an engineering firm employing about 3,000 worked out at 22s. per head. Dr. Gange compared the total annual cost in this case—£3,300—with the normal rate of expenditure on the maintenance department of an industrial undertaking of that kind and size, which he put at £20,000 to £50,000. Certainly if these figures are a true guide there ought to be no obstacle on financial grounds.

As to the provision of services for the smaller firms the solution would clearly have to be found in some kind of grouping arrangements.

31. I pass now to another question which has been in my mind throughout, and which has very wide implications—namely, “How do my conceptions of a medical service provided by individual firms fit in with Government policy,

Factory Acts, the factory inspectorate, national health policy, and the new State medical service scheme?”

I will only venture on a few observations on what might be the effects if, over the whole industrial front, there could be developed the kind of works medical service which I have advocated.

(i) It could be fitted in with, and be a most valuable supplement to, anything that can be done by the Government by way either of factory legislation or of a State medical service.

(ii) The kind of research work into industrial health, fatigue, etc., which has for many years been sponsored by the Medical Research Council would have a much greater chance of getting effective application.

(iii) There might be considerable economies and a much better adjustment between what is attempted or prescribed and the resources that are available. The example that I quoted from a works medical officer in a particular factory seems to show that, if such advice were always available, good practical results might be achieved at much less expense than if the same results were aimed at by rigid regulations.

32. Lastly, it is important to observe—and this is in harmony with all that I have been saying to-day—that a works medical officer could not possibly fill the place I envisage in a management team and in the confidence of the workers unless the whole attitude of management is such as to have already won their complete confidence. Unless there is confidence based on genuine consideration for the individual worker medical advice and medical inspection, if seen as part of the “management” set-up, are apt to be distrusted and feared.

A Request

33. At the end of this unduly long paper I want to put forward a practical request. I imagine that I have been asked to address you because I am a member of the Government's new Committee on Industrial Productivity and chairman of its Panel on the Human Factors affecting productivity. From a panel of a committee which is only advisory and which is dealing with such an all-embracing and elusive subject as the human factor it is not easy to produce effective action. In the first place we have inaugurated a series of research projects covering such matters as joint consultation methods; the training and selection of foremen; work design and measurement of human performance; effects of ageing on industrial productivity and allocation of work; the effect on production of simplifying operations by job breakdown; methods for dissemination and assimilation of existing knowledge, etc. We are also planning some investigations into particular industries. Apart from these research projects we hope to be able to stimulate action of a more practical nature designed in various industries or areas to encourage the exchange of knowledge and the raising of average standards of productive efficiency nearer to the level which progressive firms have shown to be possible.

If any effective action is to result, that will depend largely on the measure of active co-operation which can be got from industry—both management and trade unions—as well as on the closeness of contact which can be established so as to reveal opportunities. I have from the beginning felt that most valuable aid could be got from industrial medical officers, and, without taking further time in explaining the position, I want to ask this conference whether it would be possible to form a group of industrial medical officers with whom my panel could discuss possibilities.

Conclusion

34. I will add one final word. All that I have said has been framed to lead up to certain considerations about the position of industrial medical officers as part of the manage-

ment team. I have naturally therefore tended to speak of human relations in industry in terms of the attitude of "management" to workers. But I do want to emphasize that to think in these terms alone is quite inadequate. Human relations in any case are a two-way business, and the success of anything that can be done depends not merely on how management behaves to workers but on how the individual workers respond. But there are some things which seem to me to be clear beyond all doubt.

The first is that management if it wants to retain leadership should not argue about who is to blame, but should itself accept responsibility for giving a constructive lead.

The second is this. To-day we must all make a choice between two alternative ways. Are we to go forward or back? Are we to play down to the worst motives—fear and greed—or play up to the best—pride in the job, a sense of responsibility, a desire to act a worthy part in life? I have no doubt about what is the right answer, whether viewed as a matter of practical expediency or moral rightness. The only hope is to go forward, and the chief task is to clear away the obstacles which hinder the better motives having free play.

RAT-BITE FEVER DUE TO STREPTOBACILLUS MONILIFORMIS

BY

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After many years of difficulty and confusion it is now clearly established that rat-bite fever may arise from two distinct infecting agents. Not all cases are due to actual rat bites, and in the absence of a clear history clinical differentiation of the two types is generally impossible and bacteriological evidence alone conclusive. Infection with *Spirillum minus* (originally named *Spirochaeta morsus muris* by its Japanese discoverers in 1916–17) is the commoner variety, and very many cases are on record. Infection with *Streptobacillus moniliformis* is much rarer, and Altmeier, Snyder, and Howe (1945) could trace only 17 examples published in the United States. This micro-organism was first discovered by Schottmüller in 1914, and classified by him as a streptothrix. The present name was first applied by Levaditi, Nicolau, and Poincloux in 1925, who isolated it from a laboratory worker, who, incidentally, had not been bitten by a rat.

The whole story of the elucidation of rat-bite fever of both varieties, including the relations of the streptobacillus to Haverhill fever and to the organismal cause of pleuropneumonia in cattle, is very fully reviewed by Brown and Nune-maker (1942). The incubation period of the spirillar infection is usually longer (seven days or much more) than in the streptobacillary disease (three days or more), but the period is so variable that only a clear history of a bite followed by a long interval before illness develops might clinically suggest the spirillar variety.

The newer arsenical drugs were quickly recognized to be very effective against the *Spirillum minus*, but the streptobacillary disease ran a protracted and serious course until the advent of penicillin.

This short account of a single case is intended to draw renewed attention to the *Streptobacillus moniliformis* as a

cause of rat-bite fever in Britain, to illustrate the methods of rapid bacteriological diagnosis and the chief cultural characteristics of the organism, and to emphasize the dramatic effect of adequate penicillin treatment.

Case History

The patient was bitten on the right thumb while handling a hooded rat prior to an experimental operation. His hands were "scrubbed up" at the time, and the wound was at once thoroughly washed and a sterile dressing applied. The wound appeared to be healing normally, but on the morning of the third day (i.e., within 48 hours of the bite) he felt very ill on waking. A severe rigor followed almost immediately, lasting half an hour, with fever beginning at 101° F. (38.3° C.) and reaching 103° F. (39.4° C.) by evening, and associated with severe pains in the limbs and back. Fever continued throughout the following day, with, in addition to generalized muscular pains, severe pain and redness over the right elbow at the olecranon. This first attack of fever lasted for about 48 hours, and on the morning of the third day after the fever started the patient felt much better, except for the painful right elbow. On this day a scanty rash appeared on the dorsal aspects of the feet. He continued to be fairly comfortable for 48 hours, when the first bout was completely repeated, with high fever (103° F.) and severe shooting pains particularly in the region of the right scapula. The rash also spread to involve the back, forearms, and feet. He was admitted to hospital on the seventh day of illness, about 12 hours before the end of the second attack.

On admission the patient looked very ill, with a temperature of 103° F. A fairly extensive maculo-papular rash (no petechiae) was present, most abundant on the forearms, hands, legs, and feet, and less extensive on the forehead and body. The spleen and lymph glands were not enlarged. The leucocyte count was 10,400 (85% neutrophil polymorphs, 14.5% mononuclear cells).

The laboratory investigations are given separately for clearness, but as soon as blood films proved negative for *Spirillum minus* and blood cultures had been taken penicillin therapy was started, with the idea, quickly proved correct, that the infection might be due to *Streptobacillus moniliformis*. There was no scarcity of penicillin, and 500,000 units were given intramuscularly at once. By next morning the temperature was normal, but penicillin was continued intramuscularly in heavy dosage for seven days, a total of over 12,000,000 units being administered. The patient quickly recovered without fever or relapse, and has remained completely well.

Laboratory Investigations

The clinical history suggested rat-bite fever, and the following investigations were rapidly carried out after the patient was admitted to hospital. Six fairly thick blood films were stained and examined for the *Spirillum minus*, with negative results. Two guinea-pigs and two mice were inoculated intraperitoneally with 1 ml. of heparinized blood from the patient; the results are referred to later. Blood cultures were made by dividing 20 ml. of the patient's blood among three flasks containing heparinized horse-heart digest broth, and were incubated at 37° C. After 18 hours a few fluffy granules were seen floating on the top of the layer of sedimented red blood cells, and these were found to consist of tangled chains of pleomorphic coccobacilli. They stained feebly by Gram's method, but strongly with Leishman, Giemsa, polychrome methylene blue, and carbol-fuchsin stains. Subcultures were readily obtained in glucose horse-serum digest broth and on Loeffler's serum medium, while after incubation for a further 48 hours the original cultures showed a mass of "cotton-ball" colonies covering the layer of red cells in the flasks.

The diagnosis was now made, but further bacteriological observations may be briefly but accurately summarized.

The Micro-organism.—This was pleomorphic, slender, motile, and non-sporing; occasionally occurring as short rods but mostly arranged in chains of coccal or coccobacterial bodies or in long continuous filaments spreading across several microscopical fields. All of these forms were present simultaneously, and the long filaments were so interwoven that the question of