

The Noticeability of the Cosmetic Glove

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A HAND prosthesis can be useful in more than one way. It can be helpful in dealing with objects, and it can be helpful in interpersonal relations. The latter aspect is the one with which we are here concerned. The usefulness of a prosthesis in human relations is termed "social usefulness." To a wearer who considers his hand amputation a private matter, for example, and to one who does not wish to be recognized as an amputee, a prosthesis is socially useful if it cannot be recognized as an artificial device. Moreover, the amputee may be concerned that another person looking at the prosthesis should feel comfortable. In such a case, that prosthesis is most useful which does not repulse or embarrass another person but is "good to look at."⁴

In 1949 a cosmetic glove, produced at the Army Prosthetics Research Laboratory, was sent for testing to the Research Division of the College of Engineering, New York University. Investigation of the cosmetic glove led to formulation of the problem of the social usefulness of prosthetic devices in general. The methods developed during the study of the glove are, furthermore, generally applicable to

the investigation of the social usefulness of other prostheses. This article deals only with the problem of the noticeability of the cosmetic glove. The question of its appearance, *i.e.*, the desirable and undesirable characteristics of the sight of the cosmetic hand, is not discussed.

EXPERIMENTS AND RESULTS

On cursory examination, the experimental prosthesis looked like a normal hand, but on closer scrutiny it could easily be recognized as a cosmetic device. Further, it did not match the normal hand of the particular wearer, although it was, at that time, the best match among several available cosmetic gloves (Figs. 1, 2, 3, and 4). Moreover, the glove simply was filled with vinyl foam, and the hand was thus nonfunctional except insofar as the amputee might wedge light objects between the springy fingers.⁵

The problem was to determine whether such a glove is realistic enough not to be noticed as a prosthesis, or, rather, how frequently the wearer of such a glove goes unrecognized as an amputee. Four different experiments were conducted.

¹Based on Report 115.07, Research Division, College of Engineering, New York University, to the Advisory Committee on Artificial Limbs, National Research Council, prepared by Elizabeth Cattell, Tamara Dembo, Sylvia Koppel, Esther Tane-Baskin, and Solomon Weinstock. Some of the experiments were conducted at the New School for Social Research, New York City.

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⁴Independent of the appearance of a prosthesis to other persons is the importance of its appearance to the wearer himself. This subject involves such complex problems as the feelings a person has about his injured body, a matter much too detailed to be discussed here.

⁵In extensive work with arm amputees at the Army Prosthetics Research Laboratory, it has since been demonstrated that proper motion characteristics are as essential to hand realism as is the appearance of the glove itself. Among the most revealing features of the present APRL hand are its robotlike action in prehension and its obvious rigidity when not in use. A future goal in artificial-hand design is to build into the mechanism some reflex "cosmetic" movement in prehensile activities and some "natural" motion of the digits when the prosthesis is not in active use, such as when it is carried empty at the side during walking. See page 93. —ED.

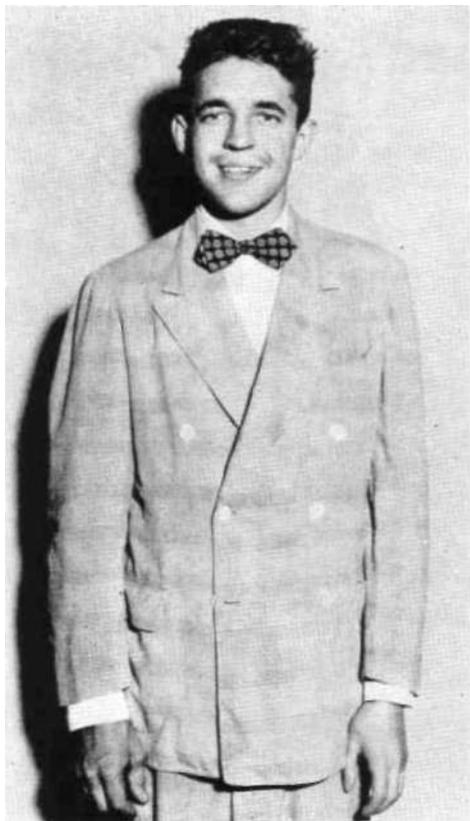


Fig. 1. Winthrop Sullivan wearing the cosmetic glove on his left (to the reader's right).

EXPERIMENT I

In the first experiment, 30 separate tests were performed. Each required a wearer,⁶ an experimenter, an observer, and a stranger. The stranger was the "subject" because his reaction, *i.e.*, whether he did or did not recognize the cosmetic hand as a prosthesis, was of prime importance. The wearer went, as a customer, to various stores and shops in New York

⁶ No account of the study would be complete without mentioning the unstinting help of the wearers. Winthrop Sullivan and Brennan C. Wood. Whenever necessary, they volunteered to participate at odd hours and on weekends in addition to their regular time. More important, they made many observations which contributed to a clearer understanding of the experimental situation. Mr. Wood incurred a right above-elbow amputation in 1943. Mr. Sullivan underwent a left below-elbow amputation in 1937. Both wearers have been connected with the NYU Research Division since 1948. They started to wear the cosmetic hand at the beginning of these experiments. Considering themselves hook wearers, they were at first somewhat critical of the hand. During the investigation, however, they became aware of some advantages of a cosmetic hand prosthesis.

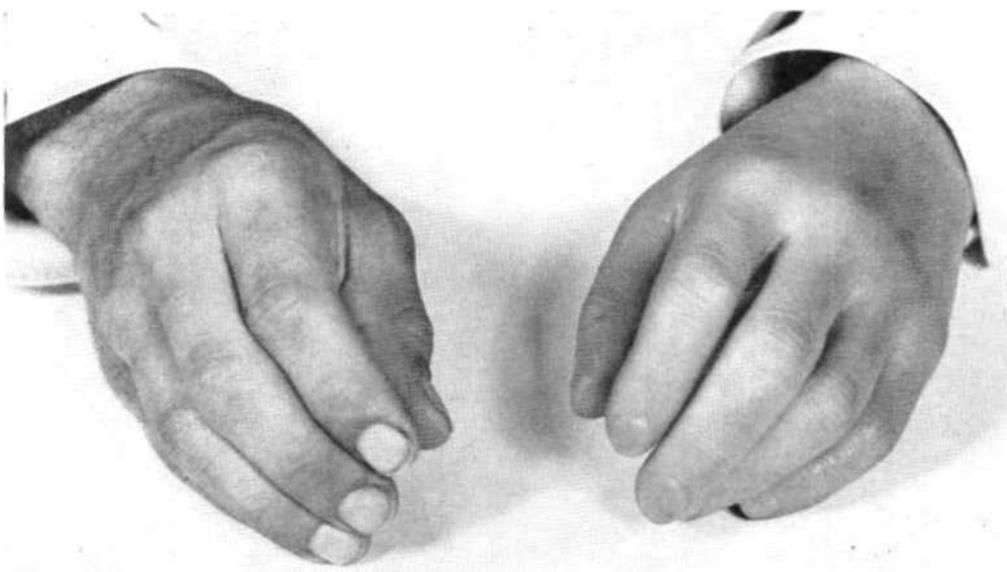


Fig. 2. Mr. Sullivan's hands.

NOTICEABILITY OF COSMETIC GLOVES

City and engaged salemen (subjects) in conversation. In each instance, he put his arms on the counter and, to make sure that the cosmetic glove was in sight of the salesman, gestured, pointed, scratched his hand or face, indicated size or shape of objects, held a newspaper, smoked, soiled the cosmetic hand and wiped it off, or supported objects (*e.g.*, held a wallet against his body with the artificial hand), all the while acting in a leisurely manner in order to prolong the contact, usually for from five to twenty minutes. Experimenter and observer entered the store with the wearer but as a separate party. While the wearer talked to the subject, experimenter and observer stood aside as if engaged in conversation, the observer pretending to listen to the experimenter but actually taking notes on the behavior of the wearer and the salesman. The latter, of course, did not know that he was the "subject" of a psychological experiment.

When the wearer left the store, the experimenter approached the salesman and asked some questions about the man who had just left. The observer continued to stand aside and recorded the discussion (interview) between the experimenter and the subject. An example of an interview follows:

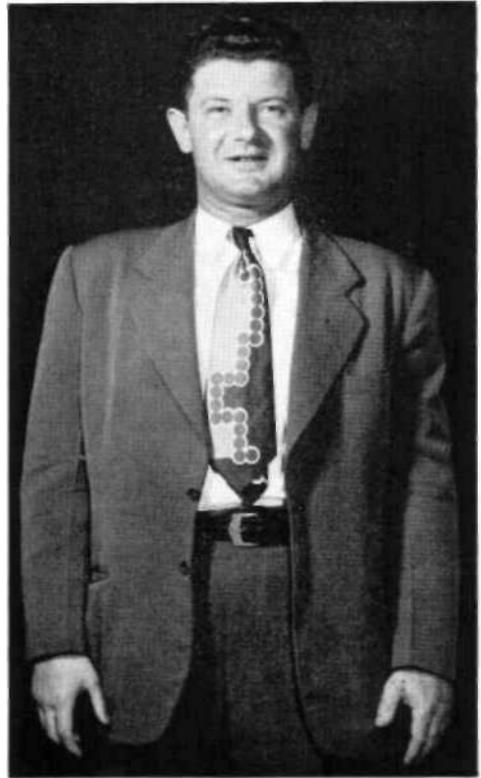


Fig. 3. Brennan C. Wood wearing the cosmetic glove on his right (to the reader's left).

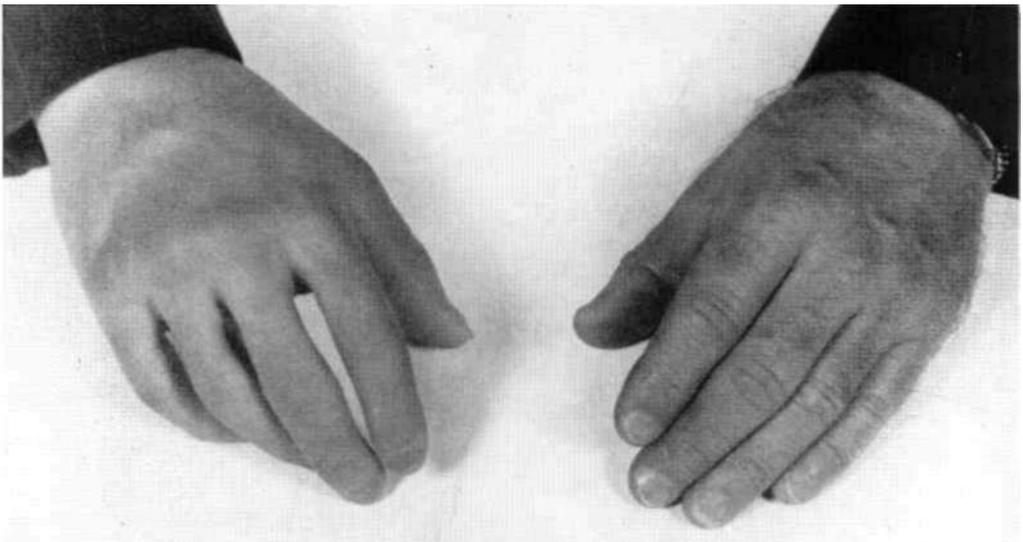


Fig. 4. Mr. Wood's hands.

Experimenter: Did you notice anything **about the man** who was just in here?

Salesman: In what respect?

Experimenter: Well, did you notice anything unusual about him?

Salesman: About his hand.

Experimenter: What was there about it you noticed?

Salesman: There was no action in it.

Experimenter: When did you notice it?

Salesman: When he had his hand at his side. When he lighted a cigarette. He held his hand like this [shows stiff position].

Experimenter: Do you think it could have been an artificial hand?

Salesman: No, it was not an artificial hand. It was his hand. He held it close to his side. Maybe he had no action in the shoulder. He did not use that hand. Used one hand at mirror. Held it. Just turned it.

After being informed that the hand was a prosthesis, the salesman said he had not recognized it as such.

EXPERIMENT II

In the second experiment, three or four people (college students and their friends) were asked to take part as subjects of a psychological group experiment on "impressions of personality." On their arrival, the subjects found the wearer, who was introduced as one of the group members. Everyone was asked to sit around a table and to wait for another group member supposedly delayed and, in the meantime, to get acquainted with each other. The wearer, holding his hands in plain view on the table, conversed with the group members. After about 10 minutes he left the room, ostensibly to make a phone call. Then each member of the group was asked to accompany an experimenter to another room, where the participant was asked to give his impression about the person who went to make the phone call. If, during the interview, it became clear to the experimenter that the subject had not noticed the hand, the subject was given another opportunity to observe the wearer, and then a second interview took place. Sometimes the procedure was repeated a third time. In all, 29 subjects were used.

An example of an interview performed in Experiment II follows:

Experimenter: As you know, we are studying quick impressions of personality. Mr. X is part of the experiment. Could you give your first impressions of him? What struck you about him, mainly?

Subject: He seemed intelligent, friendly, sociable. It seemed as though he could talk on other than his major field of interest.

Experimenter: How would you describe him physically?

Subject: Physical impressions are a pretty personal matter, I think. Would say he was more positive than negative, from the point of view of attractiveness. Genial.

Experimenter: Could you give the outstanding characteristics of his face?

Subject: He had a fairly easy smile, seemingly accompanying a sense of humor and a desire to please.

Experimenter: Could you describe his hands?

Subject: Yes, I noticed his hands. I usually do notice hands.

Experimenter: Could I interrupt to ask why you always notice hands?

Subject: I just always have. It dates from the fact that when I was young I thought I couldn't be beautiful, but I could have nice hands and fingernails, so I always notice other people's. I guess I can visualize the hands of every friend I have ever had. I think his were in-between, no particular character.

Experimenter: Anything else?

Subject: He had nice hair, a little wavy. A kind of flushed face, more healthy than not.

Experimenter: Were there any gestures on Mr. X's part that you remember?

Subject: No. He had his hands out on the table most of the time, but I don't remember his gestures particularly.

The subject who stated that she usually notices hands did not notice the cosmetic hand or any signs of difference about the hand.

The experimenter and the subject returned to the group. After about ten minutes more the wearer left, and the second interview took place:

Experimenter: Now can you give some further impressions of Mr. X?

Subject: I noticed his eyes more this time, a little different than most people's but difficult to describe, noticeable. I noticed his nose tips up a little, like Sonja Henie's. I noticed his hands more because you called them to my attention, but I don't think these physical impressions mean too much.

Experimenter: Was there anything outstanding about his hands?

Subject: His nails were not particularly graceful, they were a little short, but clean looking. I confirmed the fact that his hair was curly and his face ruddy. He seemed very well balanced, not neurotic, in that he seemed willing to go along on other people's fun. He certainly didn't show any compulsion to take the spotlight or to resent it when somebody else took it.

Experimenter: We'll all go back together again, and then

there will be a third interview. I want you to notice his hands again particularly, and in detail. Notice the movement or lack of it.

The subject was interviewed again after she saw the wearer for the third time:

Subject: I did notice his hands, the shape, and the rather short fingernails. They looked clean and healthy, but I like tapering fingernails.

Even during the third period of contact with the wearer, the subject did not notice any difference between the wearer's two hands, although she was able to describe them.

The results of Experiments I and II are given in Table 1.

Of 30 subjects in Experiment I, 24 (80%) did not recognize the cosmetic hand as a prosthesis. In fact, they did not even notice any difference between the two hands of the wearer.⁷ The remaining 6 subjects (20%) commented that the arm or hand was in some way injured, but they too did not notice that the hand was artificial.⁸ Thus, in an everyday situation of a salesman dealing with a customer, *not one* salesman in Experiment I noticed the cosmetic glove *as a prosthesis*.

The question arises as to why the prosthesis was not noticed by the salesmen. One could ask whether the unnoticeability may not be accounted for by the "fact" that the busy New York salesman does not have enough time to pay attention to the appearance of his customers. This, however, was not borne out by

⁷ A person examining a cosmetic hand may be surprised that it is so frequently unnoticed. The incidence of unnoticeability came as a surprise to the wearers themselves. After the first few contacts, the wearer encouraged the experimenters to make doubly sure that the cosmetic hand *really* had not been noticed. The experimenters did this by explaining to the salesmen the purpose of the experiment and asking this time directly whether the subjects had noticed the cosmetic hand.

⁸ It might be noted that in 5 out of 6 cases the hand was noticed as injured when attempts to do something with it failed. For example, the wearer took ice cream, started to put it in the cosmetic hand, then put it down and picked it up again with the other hand. Another time a wearer held his wallet against his body with the cosmetic hand. As the salesman brought the change near the wearer's wallet, the wearer rapidly put out the normal hand to take the change.

Table 1
NOTICEABILITY OF THE COSMETIC GLOVE

| Experiment | Seen as Prosthesis | | Seen as Own Hand of the Wearer | | | | | |
|---------------------|--------------------|----|--------------------------------|----|----------------|----|--------------------|----|
| | | | Injured hand | | Different hand | | No difference seen | |
| | No. of Ss | % | No. of Ss | % | No. of Ss | % | No. of Ss | % |
| I 30 Subjects (Ss) | 0 | 0 | 6 | 20 | 0 | 0 | 24 | 80 |
| II 29 Subjects (Ss) | 3 | 10 | 0 | 0 | 3 | 10 | 23 | 80 |

the data. When asked to describe the customer (the wearer), the salesman was well able to describe how the wearer looked, what he did, and what he said. Yet the salesman had not noticed the cosmetic glove.

In Experiment II, 29 subjects took part.⁹ Within the framework of "description of personality," 23 (80%) did not notice any difference between the two hands, 3 (10%) noticed that one hand looked different from the other but did not recognize it to be an artificial hand, and 3 (10%) noticed that it was a prosthesis.

That the cosmetic hand was not recognized by any of the salesmen as a prosthesis and rarely as such by the students and their friends, one may argue, is due to the "fact" that people do not pay attention to the properties of another person's hands. To test this "hypothesis," Experiment III was carried out.

EXPERIMENT III

In Experiment III, with a setup essentially the same as in Experiment II, the wearer used a hook instead of the cosmetic hand. Here, 11 out of 12 people (92%) noticed that the amputee was wearing a prosthesis. It appears, then, that the cosmetic hand goes unnoticed not because people are negligent in their observations but rather because it does not deviate sufficiently from the appearance of the natural hand. The hook, however, which de-

⁹ Although 32 subjects engaged in Experiment II, three of them had to be excluded. One was married to an arm amputee. The two others tried to shake hands with the amputees. These three subjects recognized the hand as a prosthesis. But our experiments were confined to visual contacts only.

viates radically in appearance from the normal, is noticed readily (Table 2).

Table 2
NOTICEABILITY OF THE HOOK AS COMPARED WITH
THAT OF THE COSMETIC GLOVE

| Experiment | Seen as Prosthesis | | Seen as Own Hand of the Wearer | | | | | |
|----------------------------------------|--------------------|----|--------------------------------|---|----------------|----|--------------------|----|
| | | | Injured hand | | Different hand | | No difference seen | |
| | No. of Ss | % | No. of Ss | % | No. of Ss | % | No. of Ss | % |
| II (Hand) 29 Subjects (Ss)..... | 3 | 10 | 0 | 0 | 3 | 10 | 23 | 80 |
| III (Hook) 12 Subjects (Ss)..... | 11 | 92 | 0 | 0 | 0 | 0 | 1 | 8 |

EXPERIMENT IV

In the first three experiments, untrained observers were used. The question arose as to whether different results would be obtained in experiments with people especially trained to notice bodily characteristics. One could expect that art students, for example, would be especially apt to notice the cosmetic hand. Accordingly, in Experiment IV, six art students participated as subjects, all members of a drawing class for which the wearer served as a model. Six to eight feet separated the wearer from the students. They were told that, after having made the drawing, they would be asked how the model impressed them as a person.

During the first part of the experiment, the wearer posed with his cosmetic left hand supporting his chin (Fig. 5). Ten minutes were allotted for the drawing. Then the wearer left, and the art students were questioned individually, the interviews being conducted in terms of what impression the art student had of the model's personality. Results showed that not one of the six art students was aware that he had been drawing an artificial hand, although some reference was made to the difference between the two hands, or it was felt that the hand somehow did not fit the person.

The second part of the experiment offered even greater opportunity for direct comparison



Fig. 5. Mr. Sullivan as sketched by an art student. The hand held to the face is the cosmetic one. While drawing this picture, the art student did not notice a difference between the two hands (Experiment IV, Part 1).

of the two hands. Here, the subjects were told that the model (wearer) would return for a second pose and that later the subjects would be asked "how his *hands* expressed personality." During the second drawing period, the wearer sat with his two hands covering his face (Fig. 6). But even under these conditions,



on my.
 4
 1. (man) browner
 2. hairy
 3. not so fat
 4. mass.

Pt.
 green (cool)
 smooth
 less
 fat

Fig. 6. Second drawing of Mr. Sullivan by the same art student who drew the picture shown in Figure 5. The notation listing the differences between the two hands is that made by the student at the time of the drawing (Experiment IV, Part 2).

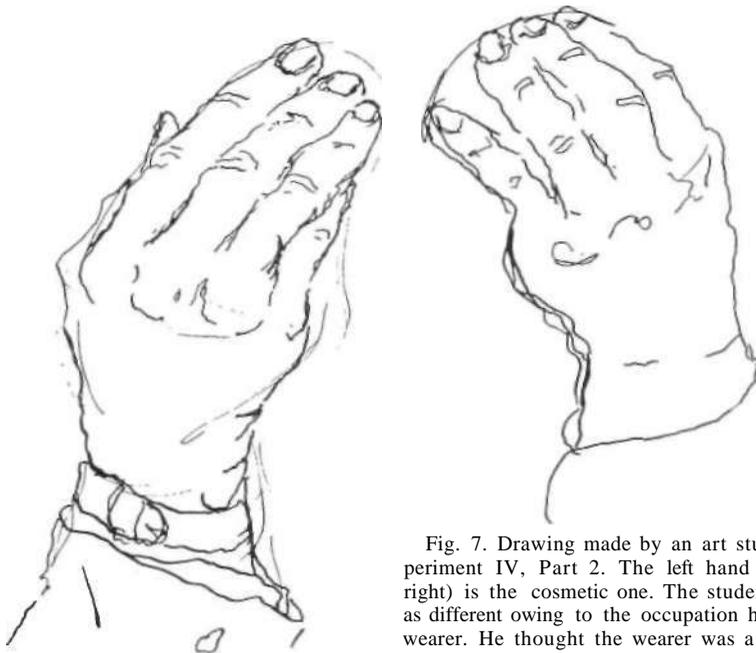


Fig. 7. Drawing made by an art student during Experiment IV, Part 2. The left hand (on the reader's right) is the cosmetic one. The student saw the hands as different owing to the occupation he ascribed to the wearer. He thought the wearer was a violinist.

only two of the six subjects noticed that one of the hands was artificial. The remaining four did not realize that they were drawing a cosmetic hand.

To illustrate how, in spite of differences noticed between the two hands in Experiment IV, it did not occur to the subjects that one hand was artificial, excerpts from two interviews conducted after the second drawing (Fig. 7) follow:

Experimenter: What gives now?

Subject: Interesting things, real interesting. Makes a difference when you know you're supposed to look at hands. About his hands, there is a basic difference in his two hands. The right hand is more used, I would say [left hand is the cosmetic one]. There are several interesting things about them. First of all, the fingernails were fairly short. Gives me an idea that he may play a stringed instrument. The button of his cuff was open, couldn't tell if broken off. I thought of a violinist who would open his cuff so he could handle it. I think he is right-handed because that would be the bow hand, and all the movement would have opened the cuff. I don't think this particularly jibes with the feeling that the hand that would do the fingering would be the most wrinkled, worn hand. For this was not the case. Yet had the feeling that he

does do something special that involves the specialized use of one of his hands.

Experimenter: Why do you think this?

Subject: Well, there is a basic difference in structure. I couldn't see the right hand before when he was posing [subject refers to Figure 5], I drew the right hand first. It was thinner. I felt there was more structure visible, it was more wrinkled, I could think of some special occupation. Another interesting thing, the watch was worn inside the wrist on the right hand, which made me think it indicates a little about the personality.

Another interview in Experiment IV went as follows:

Experimenter: And what did the hands express?

Subject: Well, it looked to me as if [the hands express] the character of a person in very serious thought. Some trouble, wrestling with some problem, rather unhappy.

Experimenter: Was this because of the hands, or the pose, or both?

Subject: Both together. The hands were very tense and tight, not relaxed. Indicated that there was a conflict.

Experimenter: This was the physical appearance?

Subject: Yes, the tense position of the hand and fingers, the fingers close together and tight, not relaxed and easy. They show what's inside the person. He unconsciously clenched his fist and you noticed something,

DISCUSSION

In the first experiment in which the cosmetic glove was worn, not once was the cosmetic hand recognized as a prosthesis. In Experiment II, the glove was seen as a prosthesis by only three (10%) of the subjects. In both experiments, a difference between the two hands was noticed only rarely. In Experiment III, the hook was recognized as a prosthesis in all cases save one. If one wishes to "explain" the unnoticeability of the cosmetic hand during relatively short contacts, one may say that the appearance of the cosmetic hand is similar enough to that of the normal to remain unnoticed. We know, however, that the differences between the glove and the normal hand are pronounced enough to be seen by almost anyone. What, then, are the conditions under which the *similarity*, rather than the *dissimilarity*, is decisive? To understand what is involved requires a brief discussion of a few general problems of visual perception.

It is a well-known fact that objects on which we focus are seen much more clearly than are those seen within the area of our peripheral vision. Distinguished from these two areas in the visual field should be two others, namely, "area of concern" and "area of mere presence." An object is in the "area of concern" if we inspect it, that is, if we concern ourselves with it. If, however, we perceive an object "as just being there," if it is not being examined by us and we do not concern ourselves with it, it is in the "area of mere presence."

The area of presence and the area of concern of a visual field do not necessarily coincide with the central (focal) and peripheral parts of the field of vision. Each of the areas, that of concern or that of mere presence, can be either central or peripheral. We can, for example, stare at an object, focus on it, and yet not be concerned with it but with something going on elsewhere in our field of vision. Such is the case, for example, when one is looking at an object but wishes to watch another person unobtrusively. Here, the object focused upon is central and at the same time is in the area of mere presence. The person being watched is in the peripheral field of vision but at the same time is in the area of concern. Centrality and peripherality thus are distinguished by

whether we do or do not look at an object directly, areas of presence or concern by whether or not we attend to (examine) the object.¹⁰

Often there is a tendency on the part of an observer to make the area of concern coincide with the center of his field of vision, while objects that do not concern him are shifted to the periphery. The separation of the field of vision into central and peripheral areas is, however, essentially different from the separation into areas of concern and of mere presence. With regard to the noticeability of the cosmetic hand, the most important fact is that objects in the area of concern differ in appearance from those in the area of presence. Some differences in details perceived when two objects are in the area of concern are not perceived when two objects are in the area of mere presence. Thus, two objects in the area of concern may look different, whereas the same two objects may look alike when in the area of mere presence.

In meeting people, we usually do not concern ourselves with their hands, *i.e.*, hands are in the area of mere presence. Because the observer perceives fewer details in this area, hands which on examination look different can appear alike to the stranger and thus may not provoke attention during casual contacts. This would account for the infrequency with which the cosmetic hand was recognized in Experiments I and II. Since looking directly at or focusing on an object does not necessarily mean that the object is examined, glancing and looking at the hands directly, as did some of our subjects, failed to result in observation of significant differences.

When something unusual happens, the hands shift from the area of mere presence to that of concern or, to put it in another way, the observer changes the position of the hand from the area of mere presence to that of concern. If, for instance, the subject expects the wearer to use a given hand, and if this hand is not

¹⁰ It appears that a distinction related to the one formulated here has been advanced within the framework of "sensory-tonic field theory." Werner and Wapner have made a distinction between "extraneous" and "object" stimulation. See *Psychological Review*, Vol. 59, No. 4, 1952, p. 332.

used as expected, or if the action is interrupted (Experiment I), the observer becomes concerned with the hand, examines it, and becomes aware of its deviation from an ordinary hand. Again, if examination of the hands is suggested to a subject, the area in which they are seen becomes one of concern. Moreover, if the subject is told that the hand is artificial, an incentive is provided to examine it. In this case, too, the hand is perceived in the area of concern.

The physical properties of the cosmetic hand are such that, on examination, they are seen not to match those of an ordinary hand. Yet the handlike prosthesis is sufficiently similar to a normal hand that, in the area of mere presence, it may be seen as an ordinary hand. A hook, however, differs to such an extent in physical properties that, even in the area of mere presence, it can hardly be mistaken for a hand. This accounts for the results of Experiment III, in which the hook was noticed by all but one subject.

In comparatively few instances (Experiments I and II), the cosmetic hand was seen as "different" from the other hand but was not recognized as artificial. The existence of cases in which differences are recognized, but in which the hand is not recognized as a prosthesis, may be due to the fact that, as a rule, people are not aware that a realistic hand prosthesis exists. Were that fact commonly known, the 20 percent who noticed the hand as "injured" in the first experiment, and the 10 percent who noticed it as "different" in the second experiment, might have seen it as a prosthesis. But knowledge of the existence of such a prosthesis would not affect the proportion of those who saw *no* difference (80 percent in both the first and second experiments). Since they did not notice any difference, these subjects would not even begin to concern themselves with the hand. As long as the hands match in the area of presence, knowledge that artificial hands exist would not in itself lead to an examination of hands.

FUTURE WORK

Briefly stated, the results show that strangers in everyday contacts with the wearer rarely notice a difference between the two hands. Yet noticeability is only one aspect of the larger problem of social usefulness of the cosmetic hand. Recognition of the cosmetic hand as a prosthesis is bound to occur in repeated contacts with the wearer. Furthermore, friends and relatives know that a wearer is an amputee. When the hand is recognized as artificial, a new problem arises. The appearance of the hand in the area of concern becomes important. Preliminary investigations indicate that, when the cosmetic glove is recognized as such, its appearance evokes in some people very unpleasant feelings. The study of the appearance of the cosmetic glove thus is necessary in order to determine the emotional impact relative to that of other prostheses and to ascertain which properties of the hand provoke negative feelings.

Some people perceive a cosmetic hand as having a yellowish-greenish shade. This circumstance might evoke toward the prosthesis feelings as toward a dead hand. Such feelings might be alleviated if the color of the cosmetic hand approached more closely that of an ordinary hand (page 57). It might even be shown that, to appear as real as possible, the cosmetic hand should have a definitely less yellowish tinge than does an ordinary hand. For such determinations, the subjects chosen should have strong negative feelings toward the hand available now, and observations should be made when the hand is worn.

In conclusion, it should be stressed again that the problem of noticeability is only one aspect of the larger problem of the social usefulness of prostheses. Further studies are required to uncover those psychological properties of the observer which have to be taken into account in order to develop not only "functionally" but also "socially" (or rather "socio-psychologically") useful prostheses.